InteliNeo 6000

Controller for parallel hybrid microgrid applications

SW version 2.2.0

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1.1 Clarification of Notation

Note: *This type of paragraph calls the reader's attention to a notice or related theme.*

IMPORTANT: This type of paragraph highlights a procedure, adjustment etc., which can cause a damage or improper function of the equipment if not performed correctly and may not be clear at first sight.

WARNING: This type of paragraph highlights a procedure, adjustment etc., which can cause a damage or improper function of the equipment if not performed correctly and may not be clear at first sight.

CAUTION: This type of paragraph highlights a procedure, adjustment etc., which can cause a damage or improper function of the equipment if not performed correctly and may not be clear at first sight.

Example: This type of paragraph contains information that is used to illustrate how a specific function works.

1.2 About this Global Guide

This manual contains important instructions for InteliNeo 6000 controller that shall be followed during installation and maintenance of the controllers.

This manual provides general information how to install and operate InteliNeo 6000 controllers.

This manual is dedicated for:

- Owners & Operators
- System integrators and control panel builders
- For anyone involved in the design, installation, operation and maintenance of the product.

1.3 Legal notice

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Pay attention to the following recommendations and measures to increase the level of security of ComAp products and services.

Please note that possible cyber-attacks cannot be fully avoided by the below mentioned recommendations and set of measures already performed by ComAp, but by following them the cyber-attacks can be considerably reduced and thereby to reduce the risk of damage. ComAp does not take any responsibility for the actions of persons responsible for cyber-attacks, nor for any damage caused by the cyber-attack. However, ComAp is prepared to provide technical support to resolve problems arising from such actions, including but not limited to restoring settings prior to the cyber-attacks, backing up data, recommending other preventive measures against any further attacks.

Warning: Technical support for these services may not be free of charge. There is no legal or factual entitlement for technical services provided in connection to resolving problems arising from cyber-attack or other unauthorized accesses to ComAp's Products or Services.

General security recommendations and set of measures

1. Production mode
   - Disable production mode BEFORE the controller is put into regular operation.
2. User accounts
   - Change password for the existing default administrator account or replace that account with a completely new one BEFORE the controller is put into regular operation mode.
   - Do not leave PC tools (e.g. InteliConfig) unattended while a user, especially administrator, is logged in.

3. AirGate Key
   - Change the AirGate Key BEFORE the device is connected to the network.
   - Use a secure AirGate Key – preferably a random string of 8 characters containing lowercase, uppercase letters and digits.
   - Use a different AirGate Key for each device.
4. MODBUS/TCP
   - The MODBUS/TCP protocol (port TCP/502) is an instrumentation protocol designed to exchange data between locally connected devices like sensors, I/O modules, controllers etc. By it's nature it does not contain any kind of security – neither encryption nor authentication. Thus it is intended to be used only in closed private network infrastructures.
   - Avoid using MODBUS/TCP in unprotected networks (e.g. Internet).
5. SNMP
   - The SNMP protocol (port UDP/161) version 1 and version 2 are not encrypted. They are intended to be used only in closed private network infrastructures.
   - Avoid using SNMP v1 and v2 in unprotected networks (e.g. Internet).

IMPORTANT: Controller issues Wrn Default Password alarm, if the factory default password is used. It is necessary to change the factory default settings of password to be able to clear the alarm.

1.4 Used open source software:

Name of software	Modified	Type	License condition web address	
CMSIS FreeRTOS	✓	MIT	license	Copyright (C) 2020 Amazon.com, Inc. or its affiliates. All Rights Reserved.
FreeRTOS	✓	MIT	license	Copyright (C) Amazon Web Services, Inc. or its affiliates. All rights reserved.
Mbed TLS	✓	Apache 2.0	license	Copyright (C) 2006-2015, ARM Limited, All Rights Reserved
lwIP	✓	BSD 3	license	Copyright (c) 2001-2004 Swedish Institute of Computer Science. All rights reserved.
MD5	–	Free ad-hoc license	license	Copyright (C) 1991-2, RSA Data Security, Inc. Created 1991. All rights reserved RSA Data Security, Inc. MD5 Message-Digest Algorithm
Embedded Template Library	✓	MIT	license	Copyright (c) 2016 jwellbelove www.etlcpp.com
STM32Cube_ FW_H7	✓	BSD 3	license	
FatFs	✓	Modify BSD	license	Copyright (C) 20xx, ChaN, all right reserved. This software is provided by the copyright holder and contributors "AS IS" and any warranties related to this software are DISCLAIMED. The copyright owner or contributors be NOT LIABLE for any damages caused by use of this software.

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GCC Runtime Library	–	GPL 3	license exception, license	GCC Runtime Library Exception - GNU Project - Free Software Foundationd

1.5 General warnings

1.5.1 Remote control and programming

The controller can be controlled remotely. In the event that maintenance of the site has to be done, or the controller has to be programmed, check the following points to ensure that any part of the site will not react unpredictably (unwanted/random start of the BESS or any other part of the system).

To be sure:

- Disconnect remote control
- Disconnect binary outputs

1.5.2 SW and HW versions compatibility

Be aware to use the proper combination of SW and HW versions. The compatibility check is performed on two levels.

The controller itself checks its hardware identification against the uploaded configuration at start up and evaluates the match.

The configuration tool InteliConfig performs a compatibility check when the firmware upload menu is opened and displays the compatible software for the connected controller.

1.5.3 Dangerous voltage

In no case touch the terminals for voltage and current measurement!

Always connect grounding terminals!

Other than when removing or replacing the controller, do not under any circumstances, disconnect the controller CT terminals!

1.5.4 Adjust the setpoints

All parameters are adjusted to their typical values. However, the setpoints have to be checked and adjusted to their real values before the first starting of the BESS .

IMPORTANT: Wrong adjustment of setpoints can destroy the BESS.

Note: *The controller contains a large number of configurable setpoints, because of this it is impossible to describe all of its functions. Some functions can be changed or have different behavior in different SW versions. Always check the Global guide and New feature list for SW version which is used in controller. This manual only describes the product and is not guaranteed to be set for your application.*

IMPORTANT: Be aware that the binary outputs can change state during and after software reprogramming (before the controller is used again ensure that the proper configuration and setpoint settings are set in the controller).

The following instructions are for qualified personnel only. To avoid personal injury do not perform any action not specified in related guides for product.

1.6 Functions and protections

Support of functions and protections as defined by ANSI (American National Standards Institute):

Description	ANSI code	Description	ANSI code	Description	ANSI code
Master unit	1	Reverse power	32R	AC circuit breaker	52
Stopping device	5	Master sequence device	34	Power factor	55
Multi-function device	11	Undercurrent	37	Overvoltage	59
Speed and frequency matching device	15	Unit sequence starting	44	Alarm relay *	74
Data communications device	16EFT 16SC	Current unbalance	46	Vector shift	78
Starting-to-running transition contractor	19	Voltage unbalance	47	Reclosing relay	79
Synchronizing-check	25	Incomplete sequence relay	48	Overfrequency	81H
Thermal relay	26	Temperature monitoring	49T	Underfrequency	81U
Undervoltage	27	Overcurrent	50/50TD	ROCOF	81R
Annunciator	30	Earth fault current	50N+64	Auto selective control/transfer	83
Overload	32	Overcurrent IDMT	51	Regulating device	90
Load shedding	32P	Earth fault current IDMT	51+64		

* extension module IGL-RA15 required

1.7 Certifications and standards

EN 61000-6-2 EN 61000-6-4 EN 61010-1 EN 60255-1 EN 60529 (IP20)	EN 60068-2-1 (-40 °C/16 h) EN 60068-2-2 (70 °C/16 h) EN 60068-2-6 (2÷25 Hz / ±1,6 mm; 25÷100 Hz / 4,0 g) EN 60068-2-27 (a=500 m/s^2; T=6 ms) EN 60068-2-30 (25/55 °C, RH 95%, 48 h)	UL6200 * UKCA	

* ULC 6200:2019 Certified (see the NFL File for the FW version with the Witness test if it is required by the certification of the end product)

Supplier's Declaration of Conformity **47 CFR § 2.1077 Compliance Information**
Unique identifier: INEO6000BBB
Responsible Party:
Kevin Counts
10 N Martingale Rd #400
60173 - Schaumburg, IL
USA
Tel: +1 815 636 2541
E-mail: info.us@comap-control.com
FCC Compliance Statement This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

1.8 Document history

Revision number	Related sw. version	Date	Author
9	2.1.0	31.5.2025	ComAp
8	1.5.0	12.04.2024	ComAp
7	1.4.0	14.02.2024	ComAp
6	1.4.0	31.01.2024	ComAp
5	1.3.0	27.11.2023	ComAp
4	1.2.0	24.10.2023	ComAp
3	1.1.1.1	20.9.2023	ComAp
2	1.1.0	10.2.2023	Adam Stocek Jakub Slavata
1	1.0.0	14.10.2022	Jakub Slavata

1.9 Symbols in this manual

3x 3 x Phases

Active current sensor

AirGate

Alternating current

Analog modem

Battery

Battery Energy Storage System

Binary output

Breaker contact

Breaker contact

Breaker

Breaker

Breaker

Capacitor

Coil

Connector - female

Connector - male

Contact

Contactor

Controller simplified

Module simplified

Current measuring

Current measuring

Danger

Danger - Electric Hazard

DC to AC Inverter

Diode

Ethernet male

Ethernet female

Fuel solenoid

Fuse

Fuse switch

Generator

Generator schematic

Grounding

GSM

GSM modem

IG-AVRi

IG-AVRi TRANS

Jumper

Load

Mains

Mains

Mobile provider

Passive current sensor

Pick - up

Relay coil

Relay coil of slow-operating

Renewable s

Resistor

Resistor adjustable

Resistive sensor RPTC

RS 232 male

RS 232 female

Shaft Generator

Starter

Switch - manually operated

Transformer

USB type B male

USB type B female

Voltage measuring

Wifi / WAN / LAN

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1.10 Used Technical Terms

Technical term	Description
BESS	Battery Energy Storage System – device for storing electrical energy in batteries.
CAN	Controller Area Network – communication bus for connecting devices.
Grid Following	Control mode where the device follows the grid voltage and frequency and adjusts accordingly.
Grid Forming	Control mode where the device (e.g., BESS) sets the voltage and frequency in island mode.
InteliConfig	PC tool for configuring and managing ComAp control units.
InteliVision	External display for visualization and control of control units.
Modbus	Communication protocol for data transfer between devices.
PCS	Power Conversion System – device for converting electrical energy between AC and DC.
Precharge	Process of charging the DC bus before connecting the BESS to the load.
Soft Load / Unload	Gradual connection or disconnection of power using ramping.

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1.11 Used Abbreviations

Abbreviation	Description
AC	Alternating Current
AOUT	Analog Output
BCB	BESS Circuit Breaker

Abbreviation	Description
BIN	Binary Input
BOUT	Binary Output
DC	Direct Current
f	Frequency
GCB	Generator Circuit Breaker
LAI	Logical Analog Input
LBI	Logical Binary Input
LBO	Logical Binary Output
MCB	Mains Circuit Breaker
P	Active Power
PF	Power Factor
PVCB	Photovoltaic Circuit Breaker
Q	Reactive Power
SOC	State of Charge (battery charge level)
THD	Total Harmonic Distortion
V	Voltage

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2.1 General description

The InteliNeo 6000 is a next-generation microgrid controller engineered for advanced hybrid energy applications. It enables seamless integration of distributed energy resources (DERs) in both on-grid and off-grid environments, offering unmatched flexibility, scalability, and compliance with international standards.

All-in-One DER Integration: Supports BESS, solar PV, wind turbines, and third-party generator controllers via the UniGen function.

Smart Energy Management: Built-in firmware enables automatic DER dispatch, peak shaving, load balancing, and smooth transitions between grid-connected and islanded modes.

Robust Communication: Integrated Modbus client (RTU and TCP) for direct, modular communication with energy sources and system components for up to 32 devices on TCP

Grid Code Compliance: Fully compliant with major international standards including:

- European Grid Codes (RfG)
- VDE-AR-N 4105:2019
- VDE-AR-N 4110:2018
- TOR A & B

2.1.1 The key features of InteliNeo 6000

- **Multi-Island Operation**: Coordinate up to 64 controllers (InteliNeo, gen-set, mains, tie) for complex microgrid topologies.
- **Advanced Paralleling**: Compatible with the latest generation of ComAp paralleling controllers.
- **Ultra-Fast Load Transfers**: Multiple transfer options with switchover times of less than 100 ms.
- **Cybersecurity** by Design: Built to ISA 62443 standards, with controller data encryption and PLC Editor protection.
- **Precision Control**: High-accuracy AC measurements for primary frequency control, grid balancing, and demand response.
- **Redundancy Built-In**
- **Redundant inter-controller communication line**
- **Double redundancy in kW and kVAr sharing**
- **Remote Connectivity**: AirGate 2.0 ensures fast, secure remote access over the internet.
- **Custom Logic Made Easy**: Internal PLC interpreter with intuitive PLC Editor for rapid development of custom control logic.

- **Enhanced Usability**: Supports up to 32-character text fields for parameters, alarms, and system messages—improving clarity and troubleshooting.

2.2 Getting Started

Congratulations on your new InteliNeo 6000 ComAp controller. Follow the steps below for the first run of your controller.

> ***Note:*** *For a better experience with our controller, do not forget to see the [InteliConfig manual]() before starting the configuration.*

1. **Connect controller to power supply**
   - Controller requires power supply between 8-36 V DC. Plug **+BAT** to the terminal no. 03 and **GND** to the terminal no. 01.
   - See **Terminal Diagram** for more information
2. **Connect your computer to the controller**
   - We suggest you to use USB or ETH 1 - Trusted Interface for the first connection to your new controller. Plug the USB/ETH cable to USB type B/Ethernet 1 terminal on the controller. Open InteliConfig and select "Connect to controller". Now you can use "Detected controllers" feature, which should offer you the controller.
   - "Auto detection" works only with USB, for Ethernet its necessary to setup the same LAN setting on both devices.
3. **Authorizing as Administrator**
   - The alarmlist should show **Wrn Default Password**. If this alarm is not present, this procedure below will not work. You will need to use your changed password or **Reset accounts to factory default**. If you see the warning, use function "Enter password" which is located in tab "Control".
     - Username = administrator
     - Password = serial number of your controller

     Serial number is located at the front of your controller or you can see it in left top corner of InteliConfig when connected to the controller.

     You can verify that you have been successfully logged in by seeing opened lock with number "3". This means that you verified on the highest level - administrator and you have all possible rights.
4. **Changing Administrator Password**
   - You should change the default password as soon as possible via InteliConfig. In the InteliConfig select tab "Tools", function "User administration" and "Change password". Do not forget to add your email address which is used in case of lost access to the account.

5. **Adding users**
   - If you are logged in as any account with permissions level 3, you can add another user. The whole procedure is explained in chapter **Adding account**.

6. **Connecting external display**
   - For InteliVision displays wiring diagram see the chapter **InteliVision Displays**.
   - See more information about using the display in the chapter **Operator Guide**.

2.3 Measurement methods

The InteliNeo 6000 contains two methods for measuring physical quantities. The method of Symmetrical components is measured all the time and the values are used whenever Grid Codes standard requires them. In all other cases True RMS method is used.

Symmetrical components visible to user are **+Mains/Bus Voltage** and **+Mains/Bus Voltage Relative**.

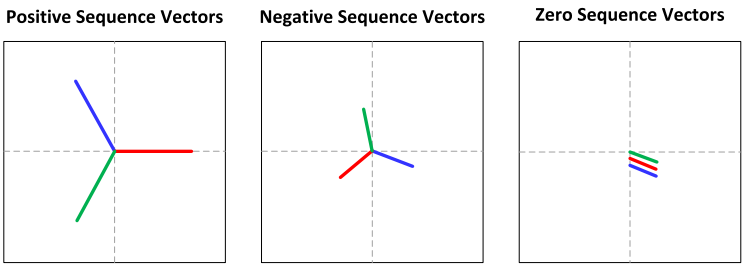
2.3.1 True RMS measurement

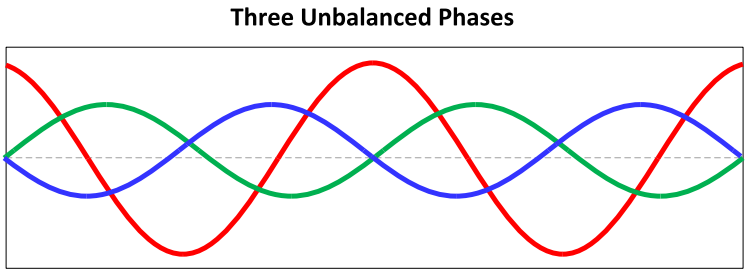
This controller measures AC values based on True RMS principle. This principle corresponds exactly to the physical definition of alternating voltage effective values. Under normal circumstances the Mains voltage should have a pure sinusoidal waveform. However some nonlinear elements connected to the Mains produce harmonic waveforms with frequencies of multiples of the basic Mains frequency and this may result in deformation of the voltage waveforms. The True RMS measurement gives accurate readings of effective values not only for pure sinusoidal waveforms, but also for deformed waveforms.

Note: *The harmonic deformation causes that the Power Factor of a BESS working parallel with the Mains cannot reach values in a certain range around the PF 1.00. The higher the deformation, the wider the power factor dead range. If the requested power factor is adjusted inside the dead range, the controller cannot reach the requested value because of this fact.*

2.3.2 Symmetrical components

The method of symmetrical components simplifies analysis of unbalanced three-phase power systems under both normal and abnormal conditions. The basic idea is that an asymmetrical set of N phasors can be expressed as a linear combination of N symmetrical sets of phasors by means of a complex linear transformation.In the most common case of three-phase systems, the resulting "symmetrical" components are referred to as direct (or positive), inverse (or negative) and zero (or homopolar). The analysis of power system is much simpler in the domain of symmetrical components, because the resulting equations are mutually linearly independent if the circuit itself is balanced.





Note:
These images are based on:
https://upload.wikimedia.org/wikipedia/commons/e/e0/Unbalanced_symmetrical_components.pdf
Which has license: https://creativecommons.org/publicdomain/zero/1.0/deed.en

2.4 AC measurement

With InteliNeo 6000 it is possible to easily set the parameters for measuring.

2.4.1 AC measurement settings

AC Voltage measurement settings

The value of the AC voltage measured on the terminals of the controller can be adapted according to the used meas voltage. For measuring AC voltage use setpoints **BESS VT Ratio** and **Mains/Bus Voltage Input Range**, **BESS Nominal Voltage Ph-N**, **BESS Nominal Voltage Ph-Ph**, **Mains/Bus Nominal Voltage Ph-N**, **Mains/Bus Nominal Voltage Ph-Ph**.

Note: *From the FW 2.0 the voltage can be measured from Analog signal as eg: Modbus communication, Physical analog signal. For more information please check the Setpoint **BESS AC Measurement**.*

AC Current measurement settings

The value of the AC current measured on the terminals of the controller can be adapted phase application with neutral according to the used meas current. For measuring AC current use setpoints **BESS CT Ratio Prim**, **BESS CT Ratio Sec**, **Mains/Bus CT Ratio Prim / EFC** and **Mains/Bus CT Ratio Sec / EFC**.

Note: *From the FW 2.0 the current can be measured from Analog signal as eg: Modbus communication, Physical analog signal. For more information please check the Setpoint **BESS AC Measurement**.*

2.4.2 Frequency measurement accuracy and resolution

The resolution of the measurement is in mHz within a 45–75 Hz range. Values **Mains/Bus Frequency** and **BESS Frequency** are used for visualization of measured frequency.

2.4.3 PF measurement and evaluation

Power factor of BESS and mains is measured with a resolution of 0.001.

Setpoints used for setting the Power factor regulation are **Base Power Factor**, **Import Power Factor** with a 0.001 resolution and **#System Power Factor** with a 0.01 resolution.

Values for the Power factor are:

- **BESS Power Factor**, **BESS Load Character**
- **BESS Power Factor L1**, **BESS Load Character L1**
- **BESS Power Factor L2**, **BESS Load Character L2**
- **BESS Power Factor L3**, **BESS Load Character L3**
- **Load Power Factor**, **Load Character**
- **Mains PFMains PF**, **Mains Load CharacterMains Load Character**

2.4.4 Waveform distortion measurements

The controller also measures Total Harmonic Distortion (THD) for current and voltage using formulas below.

Voltage Total Harmonic Distortion

$$THD_V = \frac{\sqrt{V_2^2 + V_3^2 + V_4^2 + \cdots + V_{40}^2}}{V_1} = \frac{\sqrt{\sum_{k=2}^{40} V_k^2}}{V_1},$$

Where V_k is the True RMS voltage of *k*th harmonic.

- Related values:
  - **BESS Voltage THD L1**
  - **BESS Voltage THD L2**
  - **BESS Voltage THD L3**

Current Total Harmonic Distortion

$$THD_I = \frac{\sqrt{I_2^2 + I_3^2 + I_4^2 + \cdots + I_{40}^2}}{I_1} = \frac{\sqrt{\sum_{k=2}^{40} I_k^2}}{I_1},$$

where I_k is the True RMS current of *k*th harmonic.

- Related values:
  - **BESS Current THD L1**
  - **BESS Current THD L2**
  - **BESS Current THD L3**

2.5 Communication peripherals

InteliNeo 6000 contains 3x Ethernet terminals, 4x CAN terminals, 1x RS485 terminal and 1x USB type B terminal. Each terminal functions are slightly different, which depends on the purpose of usage.

IMPORTANT: Use correct terminal according to your purpose of usage for correct function.

Peripherals	Description	Relevant links
CAN1A	This terminal is used for connecting of external modules and Electronic Control Units. See the chapters **Supported combinations of modules** and **Multiple ECU** for more information.	**CAN bus wiring**
CAN2A	This terminal is used for CAN Intercontroller Communication. **CAN Intercontroller Communication**.	
RS485	This terminal is used for Modbus RTU communication.(see here for details **Modbus-RTU, Modbus/TCP**).	**RS485 wiring**
USB Type B	This terminal is used for UART communication eg. InteliConfig, WinScope1000, etc. It is considered as **Trusted** terminal and the default account is used for connection.	**Controller configuration and PC tools connection**
Ethernet 2		**Ethernet**

You can see layout of the peripherals in the chapter **Terminal Diagram**.

2.6 Configurability and monitoring

One of the key features of the controller is the system's high level of adaptability to the needs of each individual application and wide possibilities for monitoring. This can be achieved by configuring and using the powerful PC/mobile tools.

The firmware of controller contains a large number of binary inputs and outputs needed for all necessary functions available. However, not all functions are required at the same time on the same controller and also the controller hardware does not have so many input and output terminals. One of the main tasks of the configuration is mapping of "logical" firmware inputs and outputs to the "physical" hardware inputs and outputs.

2.6.1 Supported configuration and monitoring tools

- InteliConfig - complete configuration and single/multi controller monitoring
- WebSupervisor - web-based system for monitoring and controlling
- WebSupervisor mobile - supporting application for smart-phones
- WinScope 1000 - special graphical monitoring software
- InteliSCADA - customizable SCADA diagram for monitoring

2.6.2 Configuration parts

- Mapping of logical binary inputs (functions) or assigning alarms to physical binary input terminals
- Mapping of logical binary outputs (functions) to physical binary output terminals
- Mapping of logical analog inputs (functions) to physical analog input terminals, assigning sensor characteristics (curves) or assigning alarms to analog inputs
- Mapping of values to physical analog outputs, assigning output HW type with conversion characteristic
- Selection of peripheral modules, which are connected to the controller, and doing the same (as mentioned above) for them
- Selection of ECU (electronic control unit) type or/and Modbus devices (Photovoltaic Inverters, Battery Inverters)
- Changing the language of the controller interface

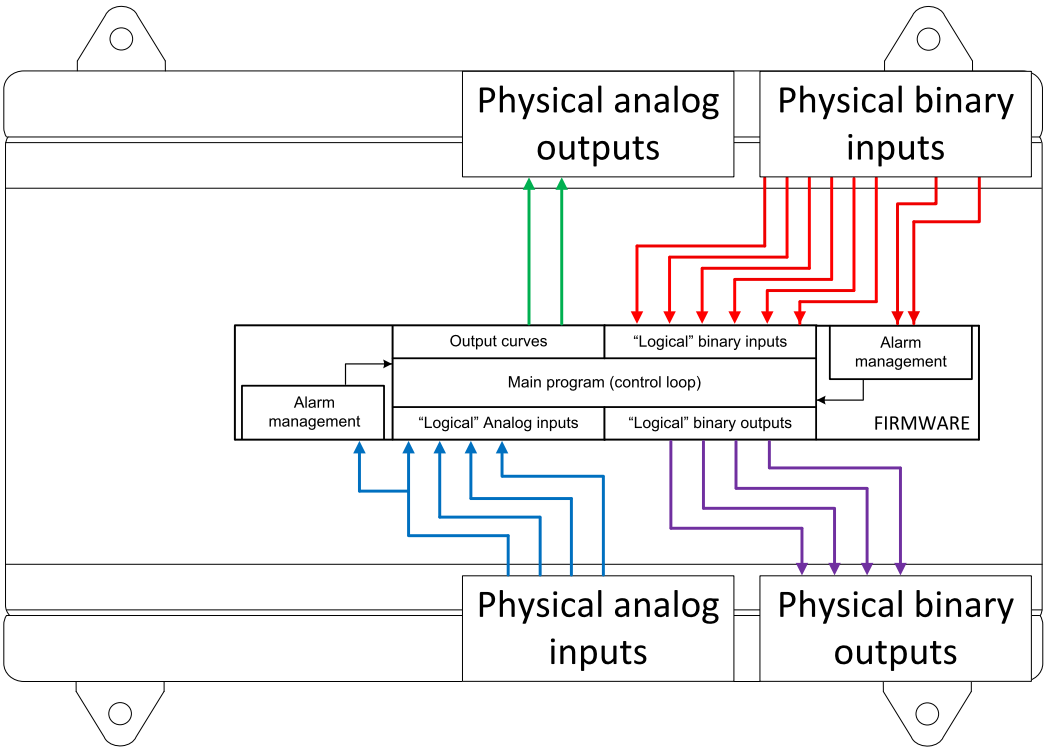


Image 2.1 Principle of inputs and outputs configuration

The controller is shipped with a Default configuration , which should be suitable for most standard applications. This configuration can be changed only by using a PC with the InteliConfig software. See InteliConfig documentation for details.

Once the configuration is modified, it can be saved to a file for later usage with another controller or for backup purposes. The file is called archive and has the file extension .aig4. An archive contains a full image of the controller at the time of saving (if the controller is online for the PC) except the firmware. Besides configuration it also contains current adjustment of all setpoints, all measured values, a copy of the history log and a copy of the alarm list.

The archive can be simply used for cloning controllers, i.e. preparing controllers with identical configuration and settings.

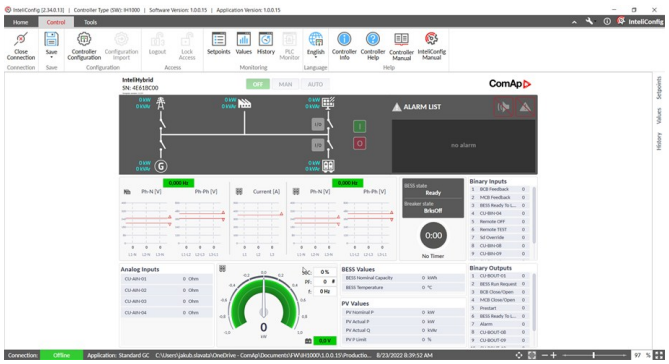
2.7 PC tools

2.7.1 InteliConfig

PC Tool for configuration and monitoring of controllers. See more in the InteliConfig Global Guide.

This tool provides the following functions:

- Direct or remote internet communication with the controller
- Offline or online controller configuration
- Controller and module configuration, programming and cloning
- Remote display programming
- Reading/writing/adjustment of setpoints
- Reading of measured values
- Controllers and ECU Alarm monitoring + complete real time history
- Exporting data into a XLS file
- Controller language translation
- Power format and ECU unit selection
- Embedded manuals and F1 helps
- Auto-hiding of unused setpoints and values

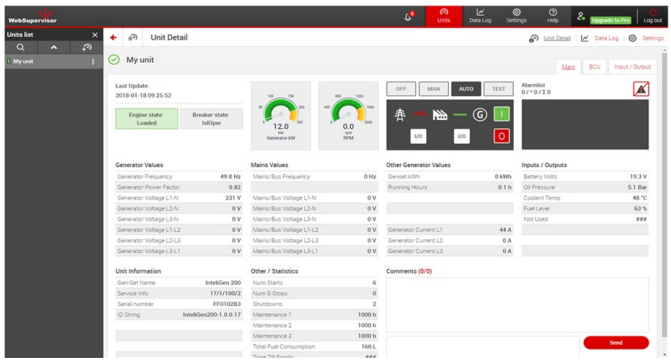


2.7.2 WebSupervisor

Cloud-based system designed for monitoring and management of ComAp and 3rd party devices via the internet. See more in the WebSupervisor Global Guide.

This tool provides the following functions:

- Site and fleet monitoring
- Reading of measured values
- Browsing of controller history records
- On-line notification of alarms
- Email notification
- Also available as a smart-phone application



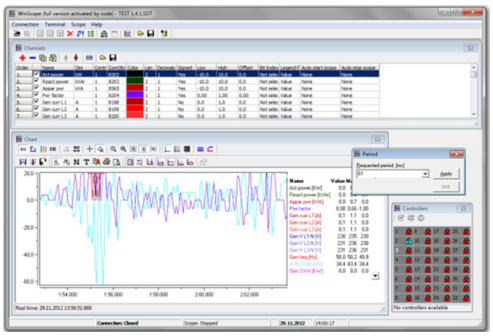
WebSupervisor available at: www.websupervisor.net

2.7.3 WinScope 1000

Special graphical controller monitoring software used mainly for commissioning and BESS troubleshooting. See more in the WinScope 1000 Global Guide.

This tool provides the following functions:

- Monitoring and archiving of ComAp controller's parameters and values
- View of actual/historic trends in the controller
- On-line change of controller's parameters for easy regulator setup

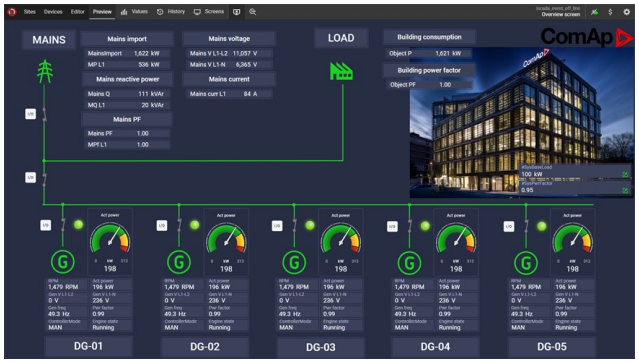


2.7.4 InteliSCADA

InteliSCADA is a Windows based software for monitoring of multiple controllers. See more in the InteliSCADA Global Guide.

This tool provides the following functions:

- Basic (auto-generated) SCADA in a few minutes
- Broad range of instruments with easy and fast configuration
- Fully customizable SCADA diagram
- Browsing of all measured and computed values
- Browsing of controllers' history records



2.8 Displays

Remote Displays / Panel PC Displays

2.8.1 InteliVision 5.2

Remote colour display for ComAp controllers, designed as an easy-to-use Plug & Play display for monitoring and control of single BESS in various applications. See more in the InteliVision 5.2 Global Guide.

This Display unit provides the following functions:

- 5" colour screen with a resolution of 800 × 480 pixels
- Plug & Play operation (auto configuration based on the controller application)
- Easy screen customization using Screen Editor in InteliConfig)
- 5 configurable user buttons under the screen
- Multi-language support
- Trends monitoring screen (up to 4 channels)
- Communication with controller via Ethernet
- Front face protection compliant with IP65

2.8.2 InteliVision 10Touch

Panel PC Display equipped with a projective capacitive touch display. See more in the InteliVision 10Touch Global Guide.

This Panel PC Display provides the following functions:

- 10.1” touch screen with a resolution 1280 x 800 pixels
- ComAp PC tools pre-installed
- Direct monitoring (and control) of 3rd party devices via Modbus (using InteliFieldbus Gateway)
- Possibility to remotely connect to the display using for example Remote Desktop
- 2 Ethernet ports
- Support of IP camera
- Front face protection compliant with IP66

2.8.3 InteliVision 13Touch

Marine certified Panel PC Display with multi-controller support and buttons for brightness change on its front face. See more in the InteliVision 13Touch Global Guide.

This Panel PC Display provides the following functions:

- 13.3" touch screen with a resolution 1920 × 1080 pixels
- ComAp PC tools pre-installed
- Multi-controller support for up to 4 controllers
- Buttons for brightness change on front face
- Possibility to remotely connect to the display using for example Remote Desktop
- 2 Ethernet ports
- Front face protection compliant with IP66

2.8.4 InteliVision 18Touch G1/G2

Panel PC Display perfectly suitable for the most complex applications and also the simple ones. With InteliVision 18Touch you can easily monitor and control sites consisting of many controllers, or you can use it for your CHP or Hybrid application. See more in the InteliVision 18Touch Global Guide G1 / InteliVision 18Touch Global Guide G2.

This Panel PC Display unit provides the following functions:

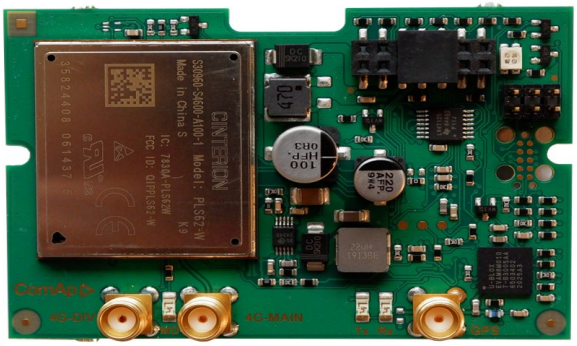
- 18,5“ touch screen with a resolution 1366 × 768 pixels
- ComAp PC tools preinstalled
- Display for monitoring and control of the entire site
- History logs of all controllers
- Multi-controller support for up to 32 controllers
- Onscreen keyboard
- Possibility to remotely connect to the display using for example Remote Desktop
- 2 Ethernet ports
- Front face protection compliant with IP66

2.9 Plug-in Modules

2.9.1 CM2-4G-GPS

GSM/4G module

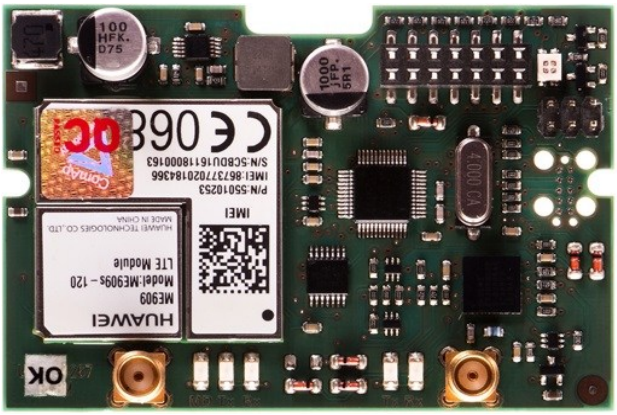
- GSM/4G Internet module and GPS locator
- Global 4G (LTE) module with 3G/2G backup
- Remote control and monitoring of the controller via InteliConfig, WebSupervisor
- Active e-mail and SMS support
- AirGate 2 technology support for easy connection – no need of public and static IP address
- Tracking via GNSS (GPS,GLONASS) module



2.9.2 CM-4G-GPS

GSM/4G Internet module and GPS locator

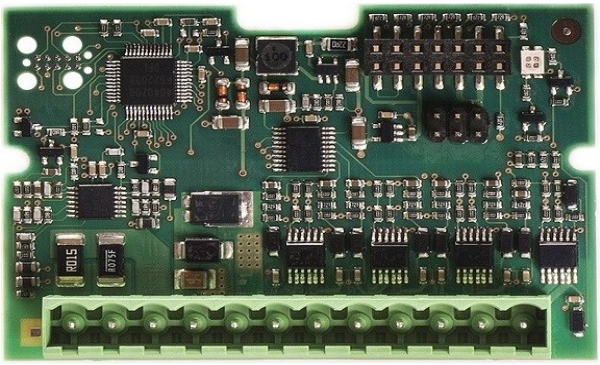
- Wireless integrated solution
- Quick and easy installation
- Support of WebSupervisor
- Instant alarm SMS notification
- System control over SMS
- Quad Band GPRS/EDGE modem, 850/900/1800/1900 MHz, FDD LTE: Band 1, Band 2, Band 3, Band 4, Band 5, Band 7, Band 8, Band 20, all bands with diversity, WCDMA/HSDPA/HSUPA/HSPA+: Band 1, Band 2, Band 5, Band 8, all bands with diversity
- GPRS multi-slot class 10
- Tracking via GNSS (GPS,GLONASS) module



2.9.3 EM-BIO8-EFCP

Input and binary input/output extension module.

- Up to 8 additional configurable binary inputs or outputs



2.10 CAN Extension Modules

2.10.1 Inteli AIN8

The module allows users to expand the amount of analog inputs for sensors and add Impulse/RPM input that can be attached to a controller. Up to 8 configurable inputs (sensors) can be attached to the module. See more information on web page Inteli AIN8.

Supported sensors:

- Resistor 3-wire input
  - Common resistor: 0-250Ω, 0-2400Ω, 0-10kΩ
  - Temperature sensor: Pt100, Pt1000, Ni100, Ni1000
- Current (active or passive sensors)
  - ±20mA , 0-20mA, 4-20mA
- Voltage
  - ±1V, 0-2,4V, 0-5V, 0-10V
  - Lambda probes
  - Thermocouples are not supported (the measuring loop was designed for lambda probes, what caused non-support of thermocouples)

Impulse/RPM sensor:

- RPM measuring pulses with frequency 4Hz – 10kHz
- Impulse
  - Possibility to measure pulses from electrometer, flowmeter, etc.

> **IMPORTANT: Impulse input is not supported by the controller.**

back to CAN Extension Modules

2.10.2 Inteli IO8/8

The module to expand the amount of binary inputs and outputs for ComAp controllers. It is possible to configure the unit to have 8 binary inputs, 8 binary outputs, and 2 analog outputs, or 16 binary inputs, 0 binary outputs and 2 analog outputs via switches inside the controller. See more information on web page Inteli IO8/8.

Configuration 8/8

- 8 Binary inputs (options: pull up or pull down logic)
- 8 Binary outputs (options: Low side switch (LSS) or High side switch (HSS))
- 2 Analog outputs (options: voltage (0-10V), current (0-20mA) and PWM (5V, adjustable frequency 200Hz-2,4kHz))

Configuration 16/0

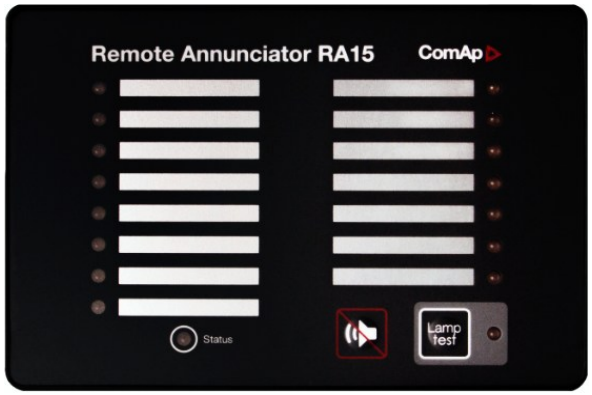
- 16 Binary inputs (options: pull up or pull down logic)
- 0 Binary outputs
- 2 Analog outputs (options: voltage (0-10V), current (0-20mA) and PWM (5V, adjustable frequency 200Hz-2,4kHz))

back to CAN Extension Modules

2.10.3 IGL-RA15

Remote annunciator. See more information on web page IGL-RA15.

- 15 programmable LEDs with configurable colors red-green-yellow
- Lamp test function with status LED
- Customizable labels
- Local horn output
- Maximal distance 200 m from the controller
- Up to 4 units can be connected to the controller
- UL certified



IMPORTANT: This module is not compatible with different than 250 kbps communication speed. If the ECU module with 125 kbps communication speed is connected the whole system will automatically switch to the 125 kbps, and IGL-RA15 module will stop communicating.

back to CAN Extension Modules

2.10.4 IGS-PTM

The module expands the amount of binary/analog inputs and outputs for ComAp controllers. It is possible to configure the unit to have 8 binary inputs, 8 binary outputs, 4 analog inputs and 1 analog output. See more information on web page IGS-PTM.

- Configurable 8 binary and 4 analog inputs
- Configurable 8 binary and 1 analog output
- LEDs indicate the state of binary inputs/outputs
- Measures values from Pt100 and Ni100 sensors
- Analog inputs (resistance range 0-250 Ohms, voltage range 0-100mV, current range 0-20mA - selectable via jumper)
- UL certified

back to CAN Extension Modules

2.10.5 Inteli AIO9/1

The module is suitable for measurement and control of analog inputs and output through CAN interface. It is possible to configure the unit to have 9 analog inputs and 1 analog output. See more information on web page Inteli AIO9/1.

- 4x differential voltage inputs for measurement in range of ±65 V DC
- 4x shielded, galvanic separated sensors: thermocouples J,K,L, ±75 mV inputs
- Resistance analog input (sensors: 0-2400Ω, PT1000 or NI1000)
- Analog output with options : 0-20mA, 0-10V or PWMt

back to CAN Extension Modules

2.10.6 Inteli AIN8TC

The module allows customers to configure up to 8 analog input channels for measuring temperature by thermocouples. The Inteli AIN8TC is useful in situations where extremely accurate temperature readings is required. See more information on web page Inteli AIN8TC.

Supported sensors:

- J, K or L thermocouples
- Thermocouples with and without cold junction compensation are supported

back to CAN Extension Modules

2.10.7 I-AOUT8

The module allows customers to configure up to 8 analog outputs. AGND terminals are on the same potential. See more information on web page I-AOUT8.

Each analog output can be switched to

- 0 to 10 V DC
- 0/4 to 20 mA DC
- 1,2 kHz PWM (Pulse With Modulatio)

back to CAN Extension Modules

2.10.8 IS-AIN8

The module is equipped with 8 analog inputs. This module is compatible with MTU ECU-7 at communication speed 125 kbps when uploaded with firmware 1.2.0 and higher. See more information on web page IS-AIN8.

- Precision of inputs is 1%
- 2/3 wire resistive, current, voltage sensors
- Predefined sensors (Pt100, Pt1000, Ni100, Ni1000, thermocouple type J/K/L)
- Current and voltage inputs 0-20mA and 0-10V

back to CAN Extension Modules

2.10.9 IS-AIN8TC

The module is equipped with 8 analog inputs dedicated for thermocouple sensors only. See more information on web page Inteli AIN8TC.

- J, K or L thermocouples
- Thermocouples with and without cold junction compensation are supported

back to CAN Extension Modules

2.10.10 IS-BIN16/8

The module allows users to expand the amount of binary inputs and outputs, and add 2 impulse inputs. It is possible to configure the unit to have 16 binary inputs (galvanic separated) and 8 binary outputs (galvanic separated), 2 pulse inputs (frequency measurement or pulse counting). See more information on web page IS-BIN16/8.

To operate external modules:

- Configurable 16 galvanically separated inputs
- Configurable 8 outputs
- 2 pulse inputs (frequency measurement or pulse counting)
- LEDs indicate the state of binary inputs and outputs

Note: *CAN address 0 disables corresponding CAN message (Group data are not send).*

IMPORTANT: Impulse inputs are not supported by the controller.

back to CAN Extension Modules

2.11 CAN Communication Modules

2.11.1 InteliGateway 300

IFG is communication gateway with configurable interfaces between Modbus TCP/RTU, ComAp CAN, WebSupervisor and InteliScada protocols allowing user-defined interconnection of all attached devices. See more information on web page InteliGateway.

- Bidirectional connectivity of 3rd party Modbus devices to ComAp controllers
- Data buffering capability for avoiding loss of data during connectivity outage
- Inbuilt support of energy industry Modbus controlled devices such as Inverters, BESS, from leading manufacturers
- Support for customizable user templates for any additional Modbus devices that are not inbuilt
- Dual ethernet interfaces decoupling trusted (private) and untrusted (public) network segments for enhanced cyber security
- Terminals: 2x Ethernet, 2x RS485, 3x CAN

back to CAN Extension Modules

2.11.2 I-CR

If the distance between units is too high to fit into the 200 m limit (or 900 m for 8 controllers), CAN repeater module (I-CR) can be used to extend it. See more information on web page I-CR.

- Intercontroller CAN bus repeater
- **Supported CAN modes: CAN8C and CAN32C**
- CAN bus redundancy
- One or more I-CR modules can be used
- Intercontroller CAN bus bus-tie bridging - makes groups of controllers in CAN segments A and B "invisible" one for another depending on bus-tie breaker state

back to CAN Extension Modules

2.12 Virtual modules

Note: *The protection for all virtual modules' values is working only if the User protection is set for the specific bit of the virtual module. If the protection is set and communication with virtual module is lost, all bits with user protection will show ####.*

Note: *When communication with any virtual module is lost the behavior of the value is defined according to the setpoint* ***Fail Safe Binary State*** *.*

2.12.1 Distributed modules

DIST-IN

DIST-IN virtual modules receives binary and analog values from other controllers via **CAN Intercontroller Communication**. There are 64 modules, DIST-IN 1 to DIST-IN64, which are firmly connected with **CAN Controller Address**.

> **IMPORTANT: This means that if you need to receive data from Controller Unit with CAN Controller Address = 5, you need to use module DIST-IN 5. Please keep in mind that the controller with CAN Controller Address = 5 must have DIST-OUT 5 set, and you need to define the data that will be shared across the CAN line with other controllers.**

Proper alarm from a range **Wrn DISTIN 01** to **Wrn DISTIN 64** is activated in case that data are not received from the Controller Unit.

Binary Inputs

32 binary states are paired by eight to two shared values:

- **Binary inputs 1 1-8**
- **Binary inputs 1 9-16**
- **Binary inputs 1 17-24**
- **Binary inputs 1 25-32**

Note: *Values above are related to virtual module DIST-IN 1. See values for other modules here:*
GROUP: DIST-IN 1-32
GROUP: DIST-IN 33-64

> **IMPORTANT: Binary inputs X 9-16 and higher can be shared only if CAN ICC Mode = 64C CAN FD or 32C CAN FD or 8C CAN FD.**

Analog Inputs

Up to 4 analog values are shared:

- **DISTAIN-1 1**
- **DISTAIN-1 2**
- **DISTAIN-1 3**
- **DISTAIN-1 4**

Note: *Values above are related to virtual module DIST-IN 1. See values for other modules here:*
GROUP: DIST-IN 1-32
GROUP: DIST-IN 33-64

> **IMPORTANT: Analog values can be shared only if CAN ICC Mode = 64C CAN FD or 32C CAN FD or 8C CAN FD.**

Note: *If the CAN communication is lost, the DIST-IN analog inputs become invalid and the values are shown as '####'.*

Configuration

Configuration of the virtual module itself, binary and analog outputs is done via InteliConfig. As with other modules, you can choose whether history columns and display screens are added as well as select type of protection upon module failure.

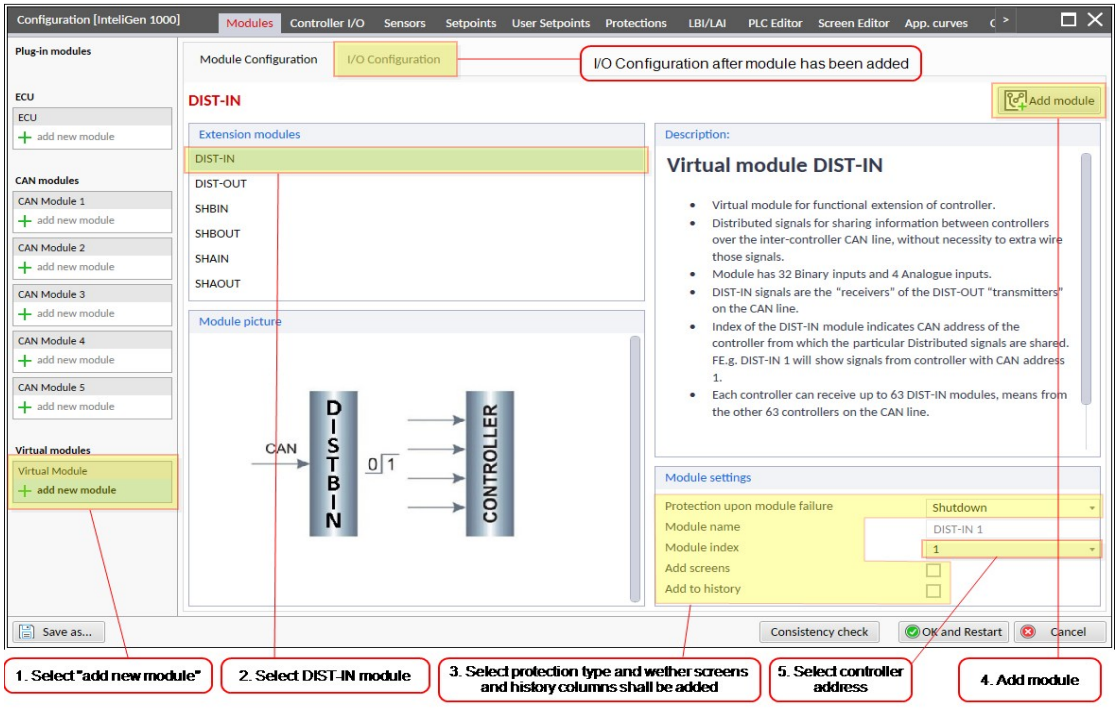


Image 2.2 Configuration of virtual module DIST-IN

DIST-OUT

This virtual module shares binary and analog values to other controller units via **CAN Intercontroller Communication**.

In case that there is detected module failure, alarm **Wrn DISTOUT** is activated. The CAN connection is lost with another CU or this module is not configured.

Binary Outputs

32 binary states are paired by eight to four shared values:

- **Binary outputs 1-8**
- **Binary outputs 9-16**
- **Binary outputs 17-24**
- **Binary outputs 25-32**

> **IMPORTANT: Binary outputs 9-16 and higher can be shared only if CAN ICC Mode = 64C CAN FD or 32C CAN FD or 8C CAN FD.**

Analog Outputs

Up to 4 analog values can be shared.

> **IMPORTANT: Analog values can be shared only if CAN ICC Mode = 64C CAN FD or 32C CAN FD or 8C CAN FD.**

Configuration

Configuration of the virtual module itself, binary and analog outputs is done via InteliConfig. As with other modules, you can choose whether history columns and display screens are added as well as select type of protection upon module failure.

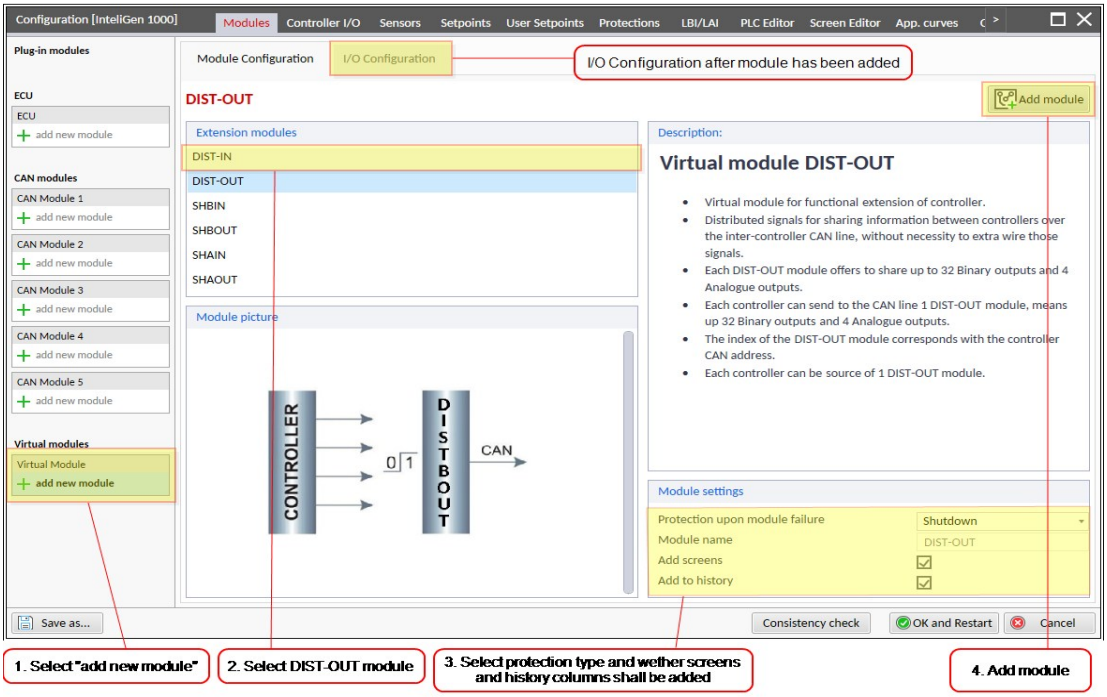


Image 2.3 Configuration of virtual module DIST-OUT

2.12.2 Shared modules

Shared modules are not connected with **CAN Controller Address**, which means that you need to pay close attention during configuration so that you do not create collision. Each SHBOUT and SHAOUT module index can be used only once in CAN topology.

Binary shared modules

SHBIN

SHBIN virtual modules receives binary values from other controllers via **CAN Intercontroller Communication**. There are 6 modules, SHBIN-1 to SHBIN-6, which are firmly connected with SHBOUT-1 to SHBOUT-6.

> **IMPORTANT: This means that you need to use module SHBIN-1 if you wish to receive data from SHBOUT-1.**

An alarm **Wrn SHBIN Collision**- is activated in case that more than just one controller has configured SHBOUT module with same module index in CAN topology.

> **IMPORTANT: Shared modules work only if CAN ICC Mode = 8C, 16C or 32C.**

Proper alarm from a range **Wrn SHBIN 1** to **Wrn SHBIN 6** is activated in case that data are not received.

Binary Inputs

- **SHBIN-1**

> ***Note:*** *Value above is related to virtual module SHBIN-1. See values for other modules here:* ***Group: SH Modules***

Configuration

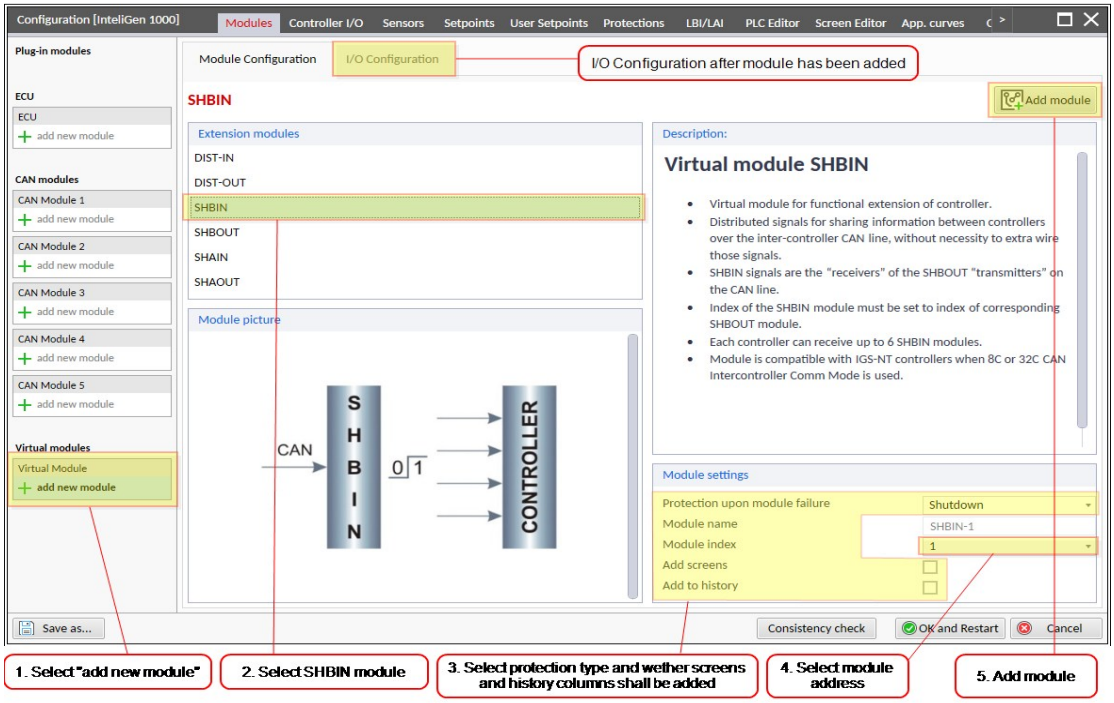


Image 2.4 Configuration of shared module SHBIN

SHBOUT

SHBOUT virtual modules share binary values to other controllers via **CAN Intercontroller Communication**. There are 6 modules, SHBOUT-1 to SHBOUT-6, which are firmly connected with SHBIN-1 to SHBIN-6.

> **IMPORTANT: This means that you need to use module SHBOUT-1 if you wish to send data to SHBIN-1.**

> **IMPORTANT: Shared modules work only if CAN ICC Mode = 8C, 16C or 32C.**

Binary Outputs

- **SHBOUT-1**

Note: *Value above is related to virtual module SHBIN-1. See values for other modules here:* ***Group: SH Modules***

Configuration

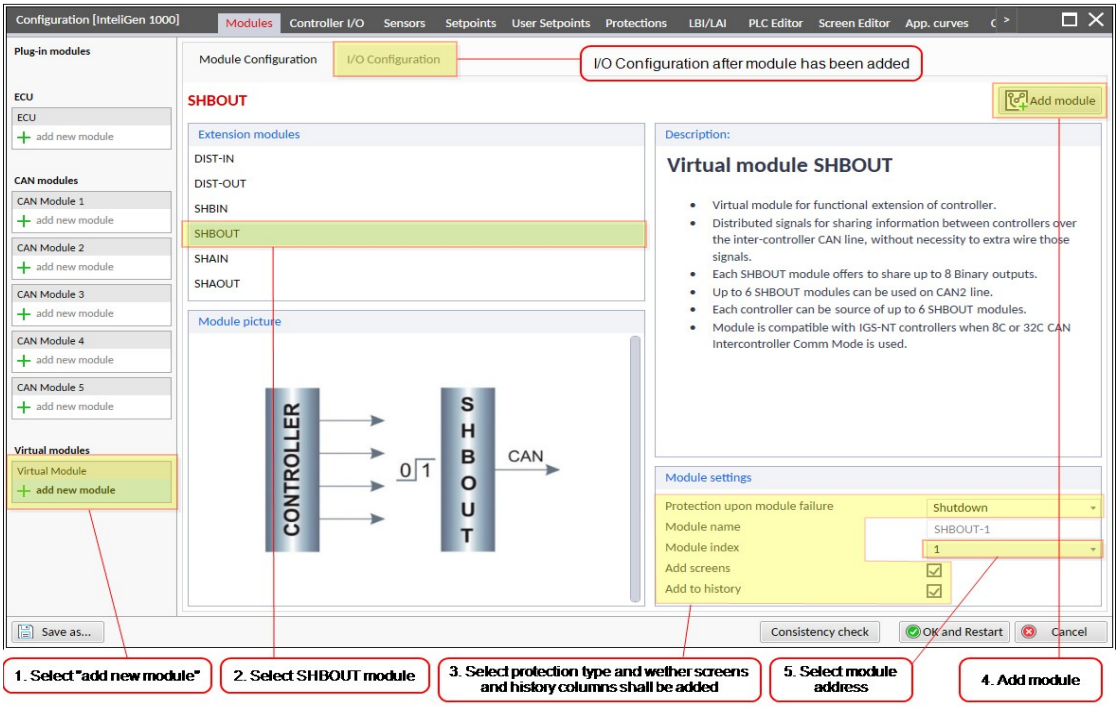


Image 2.5 Configuration of shared module SHBOUT

Analog shared modules

SHAIN

SHAIN virtual modules receives analog values from other controllers via **CAN Intercontroller Communication**. There are 2 modules, SHAIN-1 and SHAIN-2, which are firmly connected with SHAOUT-1 and SHAOUT-2.

> **IMPORTANT: This means that you need to use module SHAIN-1 if you wish to receive data from SHAOUT-1.**

An alarm **Wrn SHAIN Collision** is activated in case that more than just one controller has configured SHAOUT module with same module index in CAN topology.

> **IMPORTANT: Shared modules work only if CAN ICC Mode = 8C, 16C or 32C.**

Proper alarm from a range **Wrn SHAIN 1** to **Wrn SHAIN 2** is activated in case that data are not received.

Analog Inputs

- **SHAIN-1 1**
- **SHAIN-1 2**
- **SHAIN-1 3**
- **SHAIN-1 4**

Note: *Value above is related to virtual module SHAIN-1. See values for other modules here:* ***Group: SH Modules***

Configuration

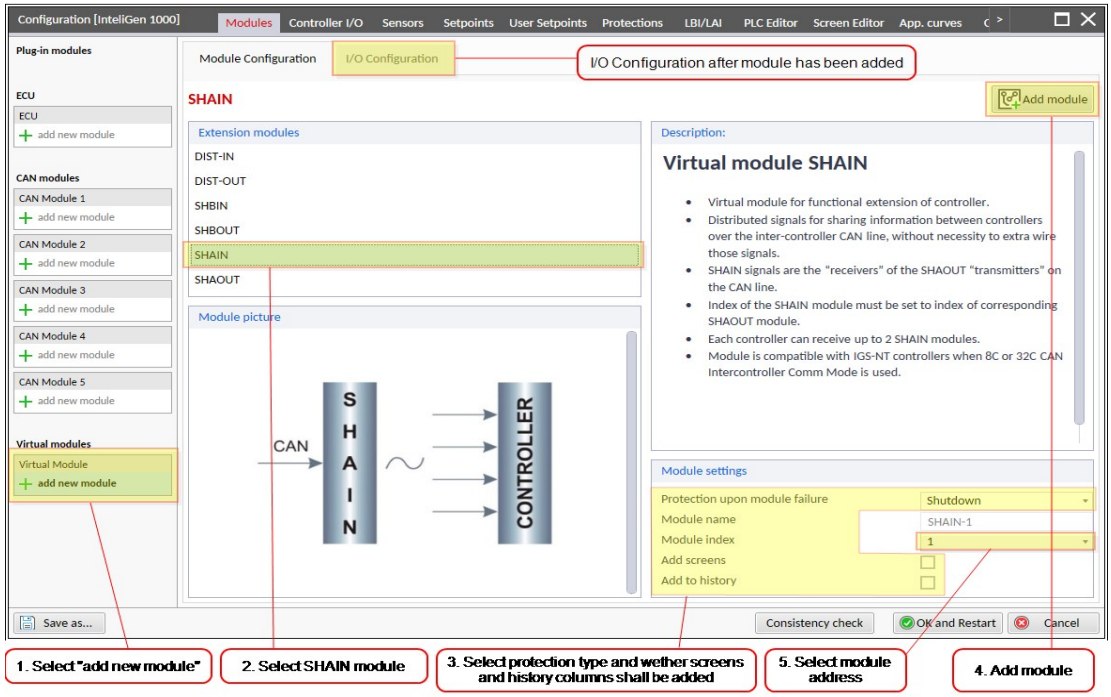


Image 2.6 Configuration of shared module SHAIN

SHAOUT

SHAOUT virtual modules share analog values to other controllers via **CAN Intercontroller Communication**. There are 2 modules, SHAOUT-1 and SHAOUT-2, whicha re firmly connected with SHAIN-1 and SHAIN-2.

> **IMPORTANT: This means that you need to use module SHAOUT-1 if you wish to send data to SHAIN-1.**

> **IMPORTANT: Shared modules work only if CAN ICC Mode = 8C, 16C or 32C.**

Configuration

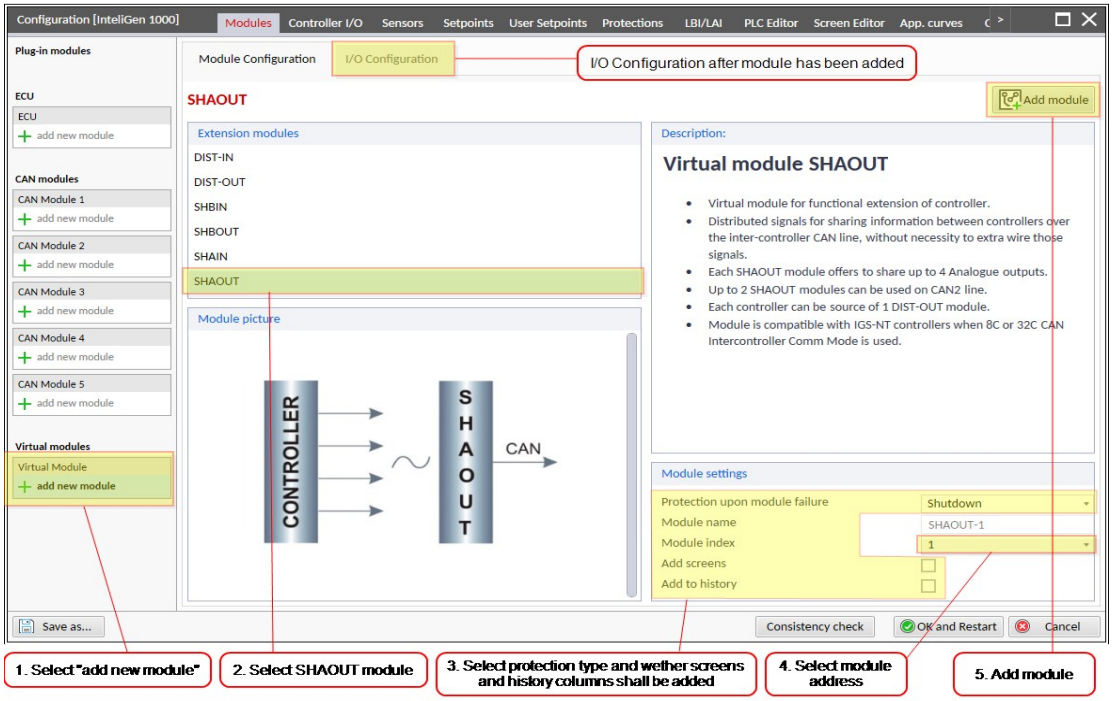


Image 2.7 Configuration of shared module SHAOUT

back to System overview

3 Applications overview

The InteliNeo 6000 is designed to operate with two types of system architectures: MPTM (microgrid parallel to mains)and MINT (multiple island-parallel). In each of these, the InteliNeo 6000 directly supports a single BESS (battery energy storage system) along with multiples of PV (photovoltaics), wind and non-ComAp generators.

The system architecture is determined by primarily by the types of prime power connected in parallel to the microgrid controlled by the InteliNeo 6000. In simpler systems where there is only renewable energy connected in parallel to a single mains incomer, we consider this as MPTM application. For more complex systems with multiple main incomers or diesel/gas generators, we categorize these as MINT applications.

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3.1 MPTM – Microgrid Parallel to Mains

The MPTM system architecture applies when there is integration of renewable energy generation and storage technologies with a single mains incomer. No other traditional synchronous power sources such as diesel or gas generators are supported in this typology.

Features supported by InteliNeo 6000 in MPTM:

- Mains Import/Export control
- Constant production (Baseload)
- Increased self-consumption (of renewables)
- Schedule based operation of renewables and storage
- Grid support services
- Backup power (if BESS can operate in island mode)
- Wholesale electricity market participation (energy arbitrage)

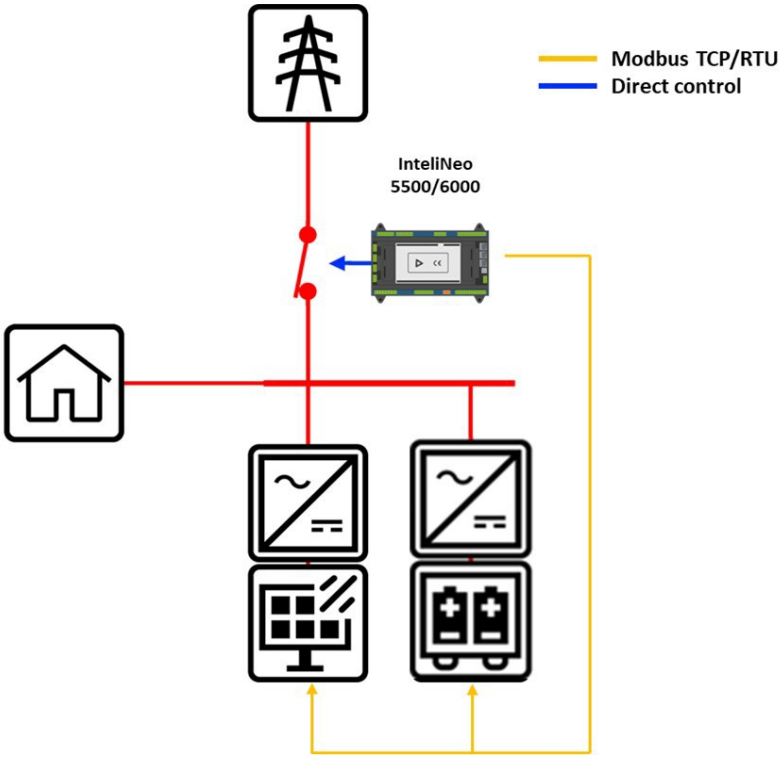

Image 3.1 MPTM application – general overview

3.1.1 MPTM System Schematic

The typical scheme of a Microgrid Parallel To Mains application is shown below. The InteliNeo6000 controller controls up to three breakers – a mains breaker, battery energy storage system breaker and a photovoltaic (renewable source) breaker. Feedback from all breakers is required. In the case of a Genset or second BESS, the **MINT – Multiple island-parallel** application has to be used.

Note: *The **System variability** allows user to configure the system in following variants: BESS only, PV (renewables) only, or BESS + PV (renewables).*

IMPORTANT: In the MPTM scheme dashed line at BCB breaker is for start with closed BCB to energized bus and full line is for start with opened BCB.

IMPORTANT: The MPTM application does not support Genset or second BESS.

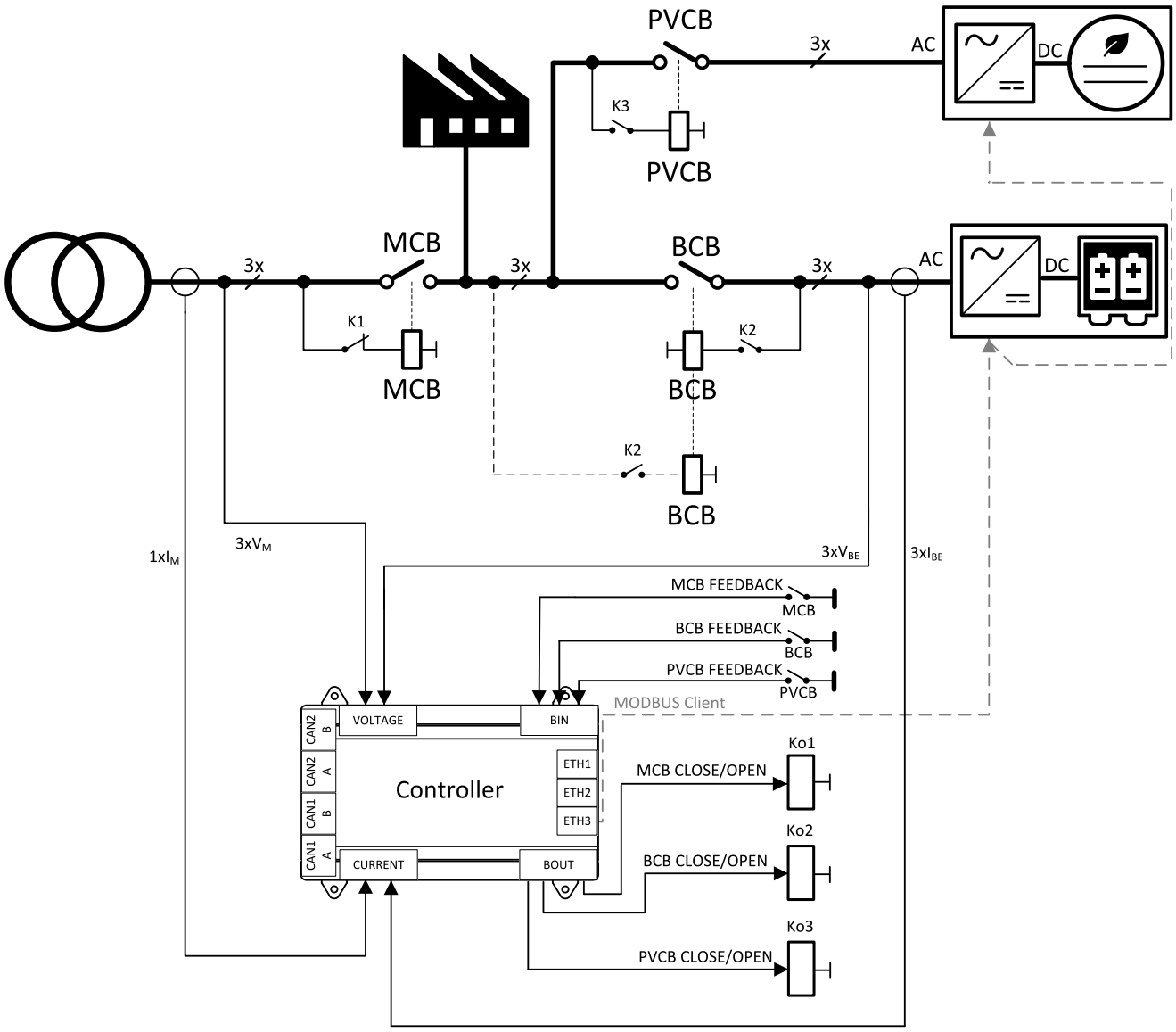

Image 3.2 Microgrid Parallel To Mains application

3.2 MINT – Multiple island-parallel

The MINT system architecture represents complex systems where there are multiple mains incomers, synchronous generators and renewable energy sources. There is are individual source controllers at the mains and paralleling controllers on each gen-set; all of which cooperate with the InteliNeo under a distributed architectural principle. This mean that in the case of an event- for example, the genset has an alarm and disconnects via the circuit breaker, the mains and microgrid controlled by InteliNeo continue operation to the loads.

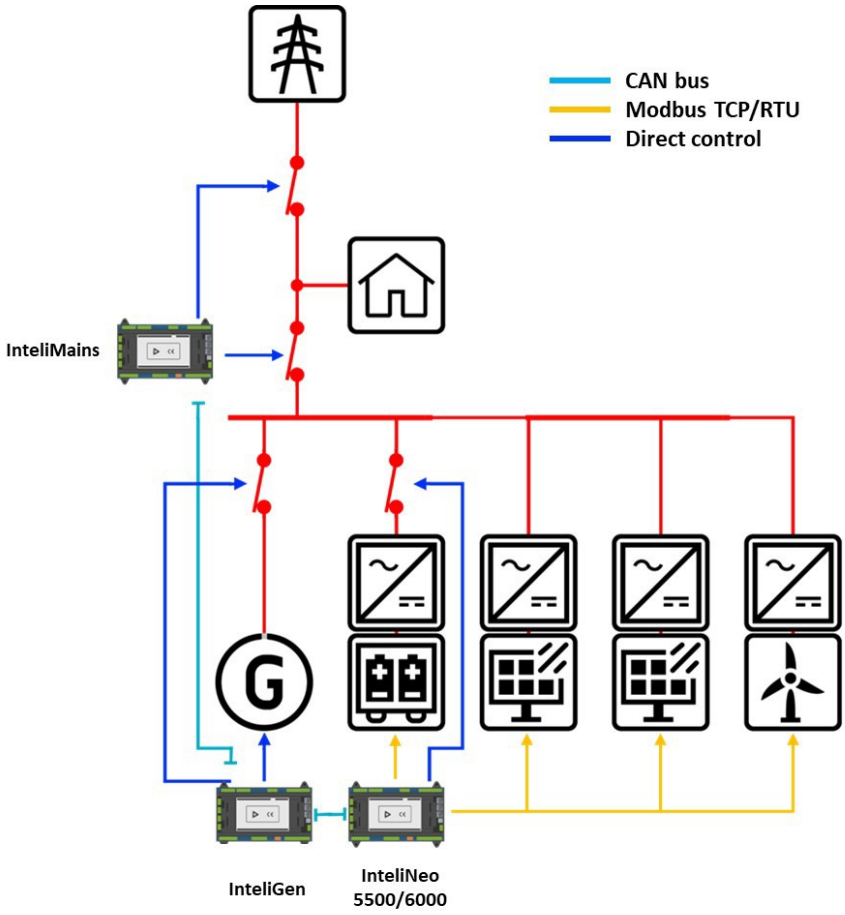

Image 3.3 MINT application – general overview

Features supported by InteliNeo 6000 in MINT:

- Mains Import/Export control
- Constant production (Baseload)
- Self-consumption
- Schedule based Charging/Discharging
- Mains connection support (peak shaving over MCB)
- Grid support services
- Backup power (if BESS can operate in island mode)
- Wholesale electricity market participation (energy arbitrage)

3.2.1 MINT System Schematic

The typical scheme of Multiple Island-Parallel application for on grid is shown below. The cooperation of Microgrid, Gen-set, and Mains controllers can be seen in the picture below. The InteliNeo6000 controller controls up to two breakers, the battery energy storage system breaker and photovoltaic (renewable source) breaker. Feedback from the both breakers is required.

Note: *The **System variability** allows user to configure whether the microgrid contains BESS, PV (renewables), Gen-sets or Mains.*

IMPORTANT: The InteliNeo6000 can work together with multiple Gen-set and Mains controllers. Since firmware version 2.0, it has also been compatible with other Microgrid/BESS controllers (IN6000, IN5500, IN530).

IMPORTANT: In the MINT scheme dashed line at BCB breaker is for start with closed BCB to energized bus and full line is for start with opened BCB.

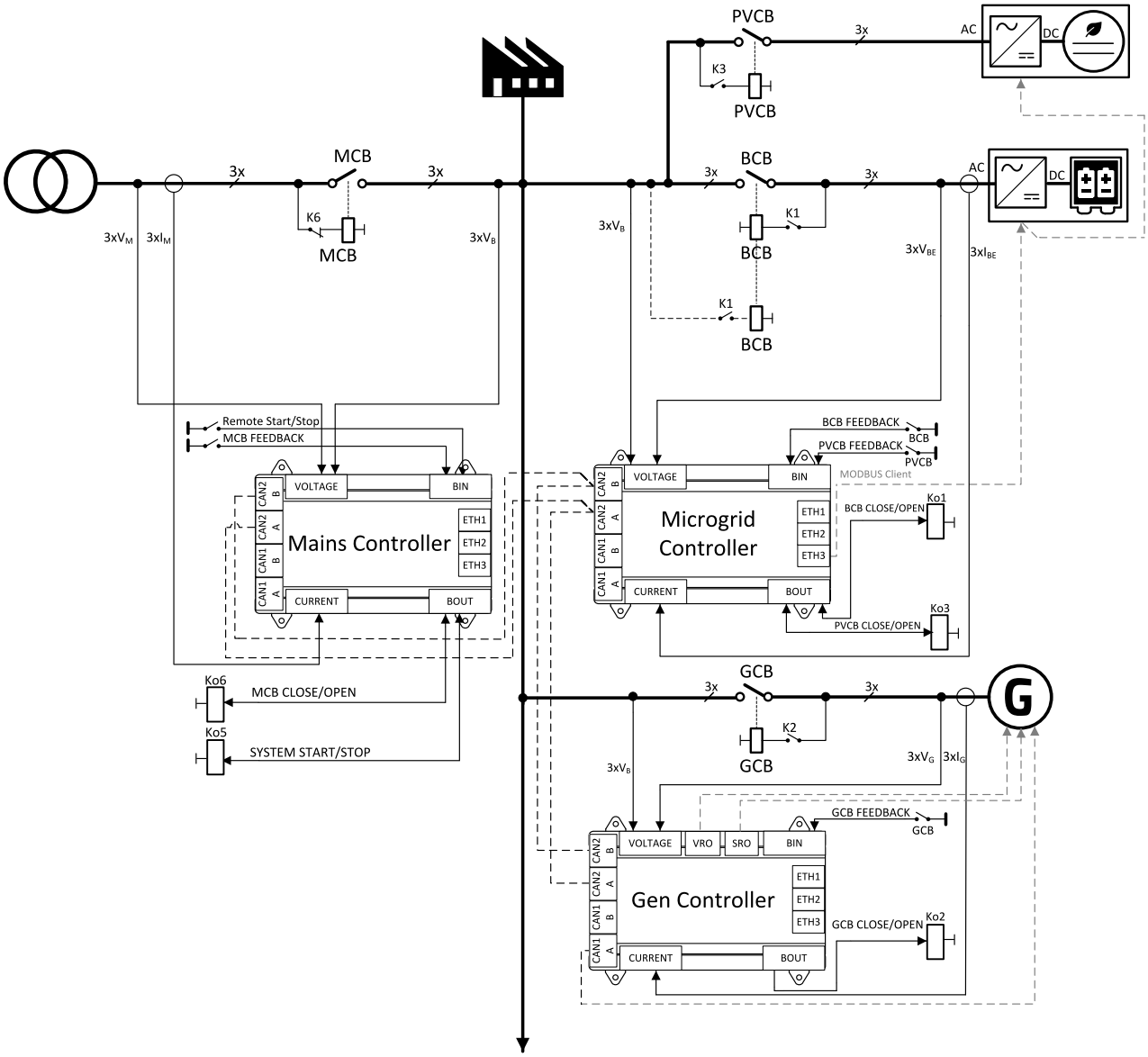

Image 3.4 Multiple island-parallel application with mains

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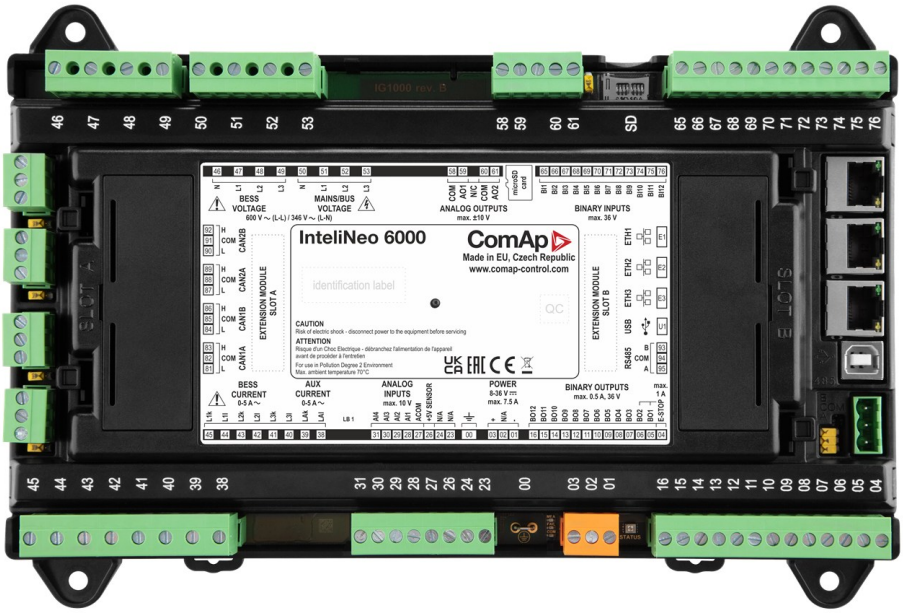
4.1 Package content

The package contains:

- Controller InteliNeo6000
- Terminal blocks

Note: *The package does not contain a communication or extension modules. The required modules should be ordered separately.*



4.2 Controller installation

4.2.1 Dimensions

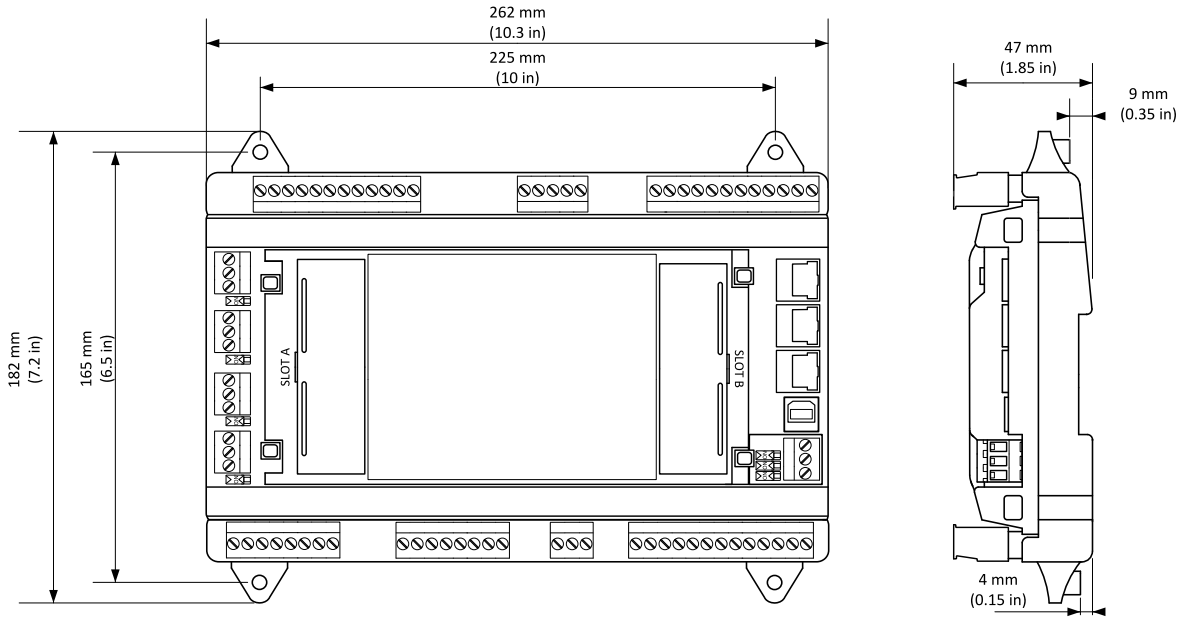


Image 4.1 Controller dimensions

Note: *Dimensions are in millimeters.*

Note: *The controller is mounted into panel doors as a standalone unit using provided holders. The requested cutout size is 187 × 132 mm. Use the screw holders delivered with the controller to fix the controller into the door.*

4.2.2 Mounting

The controller should be mounted into the switchboard which should be inaccessible to nonauthorized people. There are two ways to mount the controller into the switchboard.

Mounting on DIN rail

Mount the controller on the DIN rail as described on the picture below. The controller must be fixed on a DIN rail by two DIN rail lockers.

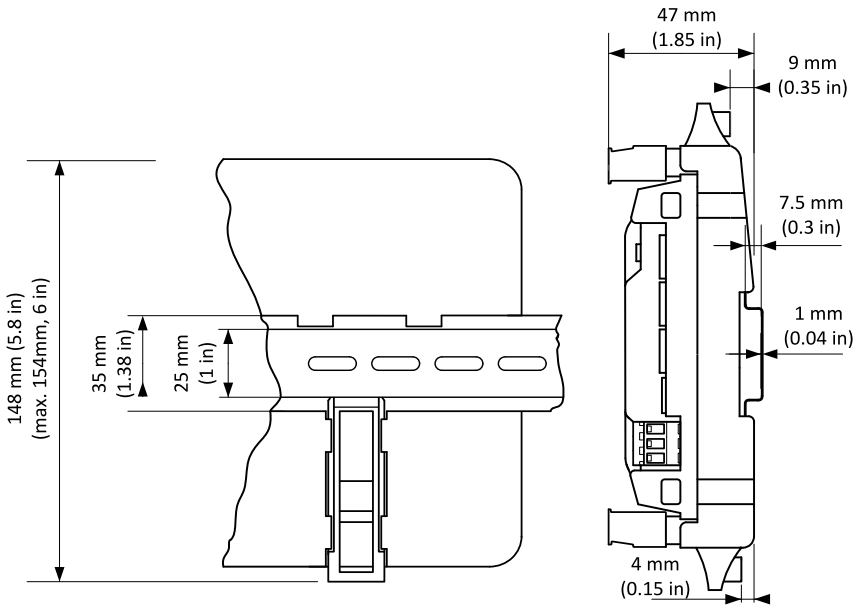


Image 4.2 Controller mounting on DIN rail

Mounting outside of DIN rail (in switchboard doors)

The upper part of the back side of the controller cover is not same as the lower part, the spacers have to be placed between switchboard doors and the controller cover. Use the 10 mm spacers for the upper part of the CU cover and the 5 mm spacers for the lower part of the CU cover. Use the screws and spacers to fix the controller into the door as described on the picture below.

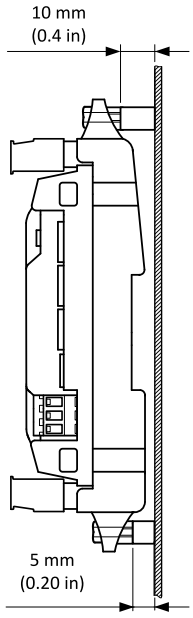
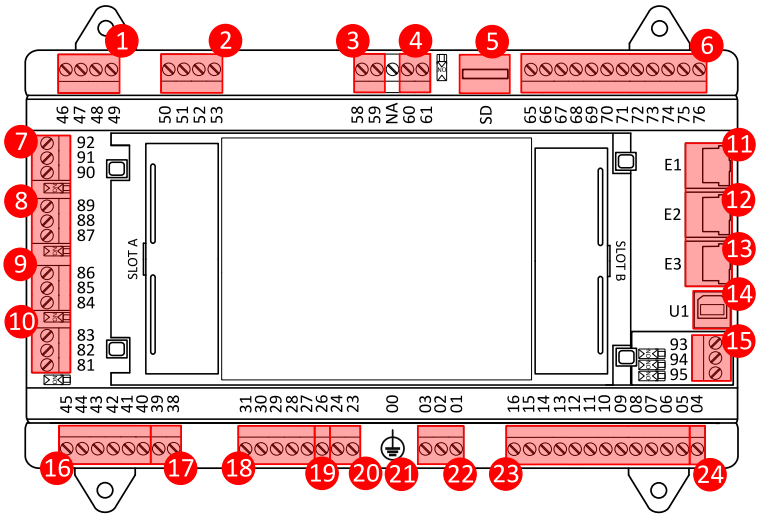


Image 4.3 Controller mounting in the switchboard doors

4.3 Terminal Diagram

① **BESS VOLTAGE**	46	N	⑥ **BINARY INPUTS**	65	BI1	⑧ **CAN2A**	89	H
	47	L1		66	BI2		88	COM
	48	L2		67	BI3		87	L
	49	L3		68	BI4	⑨ **CAN1B**	86	H
② **MAINS/BUS VOLTAGE**	50	N		69	BI5		85	COM
	51	L1		70	BI6		84	L
	52	L2		71	BI7	⑩ **CAN1A**	83	H
	53	L3		72	BI8		82	COM
③ ④ **ANALOG OUTPUTS**	58	AO1 COM		73	BI9		81	L
	59	AO1 OUT		74	BI10	⑪ ⑫ ⑬ **ETHERNET**	E1	Ethernet 1
	60	AO2 COM		75	BI11		E2	Ethernet 2
	61	AO2 OUT		76	BI12		E3	Ethernet 3
⑤ **SD Card**	SD	SD Card	⑦ **CAN2B**	92	H	⑭ **USB**	U1	USB
				91	COM			
				90	L			



⑮ **RS 485**	93	B	⑱ **ANALOG INPUTS**	31	AI4	㉒ **BINARY OUTPUTS**	16	BO12
	94	COM		30	AI3		15	BO11
	95	A		29	AI2		14	BO10
⑯ **BESS CURRENT**	45	L1k		28	AI1		13	BO9
	44	L1l		27	ACOM		12	BO8
	43	L2k	⑲ **+5V SENSOR**	26	+5V SENSOR		11	BO7
	42	L2l					10	BO6
	41	L3k	⑳ **GROUNDING**	00	GROUND		09	BO5
	40	L3l					08	BO4
⑰ **AUX CURRENT**	39	LAk					07	BO3
			㉑ **POWER SUPPLY, D+**	03	+		06	BO2
	38	LAl		02	D+		05	BO1
				01	-	㉓ **E-STOP**	04	E-STOP

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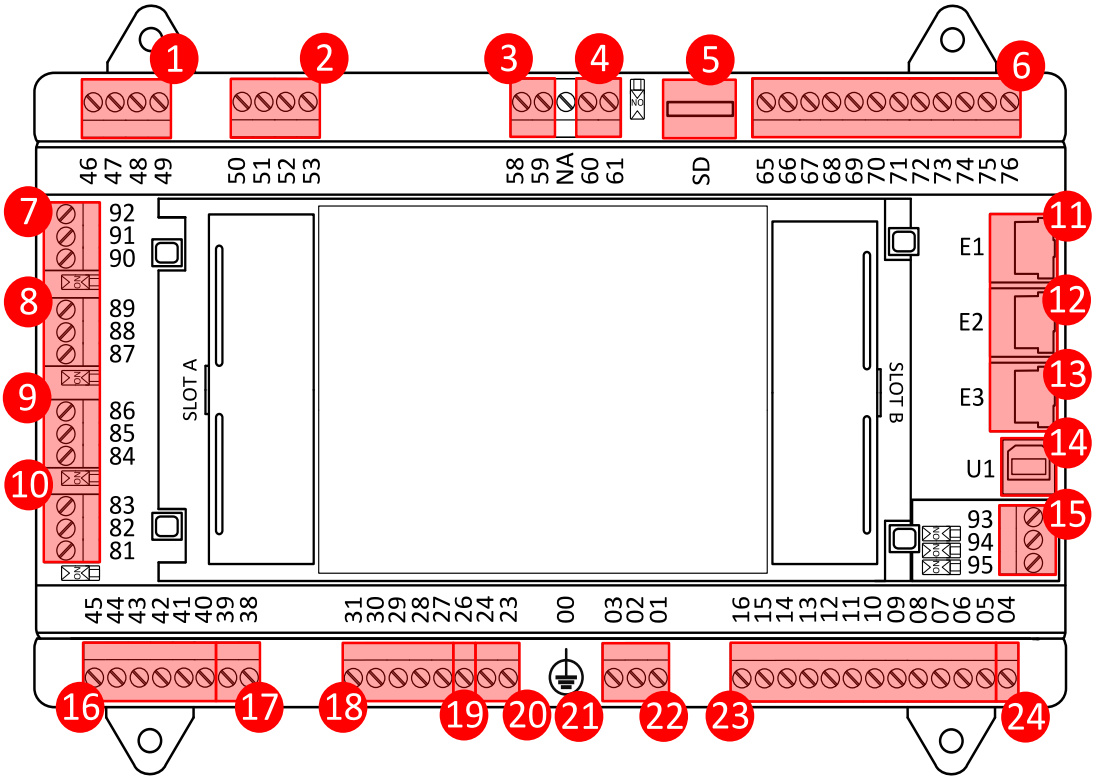


1	BESS voltage inputs	max 600 V AC Ph-Ph	**Voltage measurement wiring**
2	Mains/Bus voltage inputs	max 600 V AC Ph-Ph	**Voltage measurement wiring**
3	Analog Output	max ± 10 V DC	**Analog Outputs**
4	Analog Output	max ± 10 V DC	**Analog Outputs**

5	SD card slot		
6	Binary inputs	max 36 V DC	**Binary Inputs**
7	CAN2B	H, COM, L	**CAN bus and RS485 wiring**
8	CAN2A	H, COM, L	**CAN bus and RS485 wiring**
9	CAN1B	H, COM, L	**CAN bus and RS485 wiring**
10	CAN1A	H, COM, L	**CAN bus and RS485 wiring**
11	Ethernet 1	ETH 1	**Ethernet**
12	Ethernet 2	ETH 2	**Ethernet**
13	Ethernet 3	ETH 3	**Ethernet**
14	USB		**USB**
15	RS485	A, COM, B	**CAN bus and RS485 wiring**
16	BESS current	max 5 A AC	**Current measurement wiring**
17	Aux current	max 5 A AC	**Current measurement wiring**
18	Analog inputs	max 10 V DC	**Analog Inputs**
19	Sensor power supply	5 V DC max 100 mA	
20	Power supply	+, N/A, - 8 - 36 V DC max 7,5 A	**Power supply**
21	Grounding		Improves resistance to electrical interference if connected to the ground.
22	Binary outputs	max 36 V; 0,5 A	**Binary Outputs**
23	E-stop	max 1 A	**E-Stop**

4.4.1 General

To ensure proper function:

- Use grounding terminals.
- Wiring for binary inputs and analog inputs must not be run with power cables.
- Analog and binary inputs should use shielded cables, especially when the length is more than 3 m.

Tightening torque and allowable wire size and type for the Field-Wiring Terminals:	
For BESS Voltage and Mains Voltage terminals	
	Specified tightening torque is 0.5 Nm (4.425 In-lbs).
	Use only diameter 2.0 - 0.5 mm (12 - 26 AWG) copper conductor rated for 90 °C minimum.
For Current terminals	
	Specified tightening torque is 0.5 Nm (4.425 In-lbs).
	Use only diameter 2.0 - 0.5 mm (12 - 26 AWG) copper conductor rated for 90 °C minimum.
For other controller field wiring terminals	
	Specified tightening torque is 0.5 Nm (4.425 In-lbs).
	Use only diameter 2.0 - 0.5 mm (12 - 26 AWG) copper conductor rated for 75 °C minimum.

4.4.2 Grounding

The shortest possible length of wire should be used for controller grounding. Use cable min 2.5 mm^2.

The negative " - " battery terminal used as power supply for CU must be properly grounded.

Switchboard must be grounded at common point. Use as short cable as possible to the grounding point.

4.4.3 Power supply

To ensure proper function:

- Use power supply cable min. 1.5 mm^2
- Maximum continuous DC power supply voltage is 36 V DC
- Minimum continuous DC power supply voltage is 8 V DC
- It is strongly recommended to use 8 A fusing (12xBOUT 0.5 A)

The controller's power supply terminals are protected against large pulse power disturbances. When there is a potential risk of the controller being subjected to conditions outside its capabilities, an outside protection device should be used.

Note: *The controller should be grounded properly in order to protect against lighting strikes. The maximum allowable current through the controller's negative terminal is 4 A (without consumption of the binary outputs).*

The controller includes internal capacitors that allows the controller to continue in operation if the voltage dip occurs. The capacitors are useful mainly during short voltage dips, if the voltage dip goes to 0 V and after 50 ms it recovers to 8 V, the controller continues operating. When this situation occurs the binary outputs are temporarily switched off and after recovering to 8 V back on. This cycle can be repeated several times.

Note: *It is also possible to further support the controller by connecting the external capacitor and separating diode. The capacitor size depends on required time. It shall be approximately thousands of µF. The capacitor size should be 5 000 µF to withstand 150 ms voltage dip under following conditions: Voltage before dip is 12 V, after 150 ms the voltage recovers to min. allowed voltage, i.e. 8 V.*

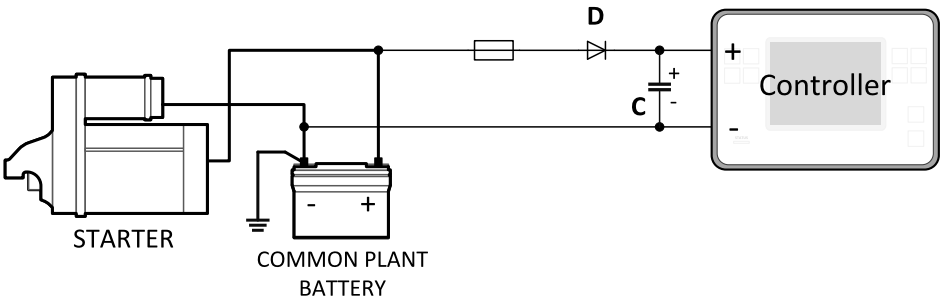


Image 4.4 Controllers power supply with external capacitor, separating diode and fusing

IMPORTANT: It is strongly recommended to use fusing in-line with the battery positive terminal to the controller and modules.

Note: *Suitable conductor protection shall be provided in accordance with NFPA 70, Article 240.*

Power supply fusing

It is strongly recommended to use 8 A fuse in-line with the battery positive terminal to the controller and modules. These electronics should never be connected directly to the energy storage system battery. Fuse value and type depends on number of connected devices and wire length. It is recommended to use slow blow fuse T4 A. The fast blow fuse is inappropriate due to internal capacitors charging during power up.

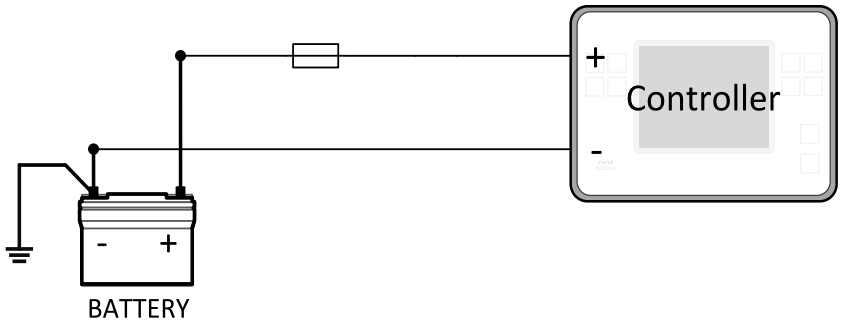


Image 4.5 Controllers power supply fusing

IMPORTANT: 8 A fuse is calculated without BOUT consumption nor extension modules. Real value of fuse depends on consumption of binary outputs and modules.

Example: Maximal consumption of binary outputs can be 22 A

- 2 x 10 A on high current outputs (for 10 seconds)
- 2 A on all others binary outputs

4.4.4 Measurement wiring

Use 1.5 mm^2 cables for voltage connection and 2.5 mm^2 for current transformers connection. Adjust **Connection type**, **Mains/Bus Nominal Voltage Ph-N**, **Mains/Bus Nominal Voltage Ph-Ph**, **BESS Nominal Voltage Ph-N**, **BESS Nominal Voltage Ph-Ph** and **Nominal Current** by appropriate setpoints in the Basic Settings group.

IMPORTANT: Risk of personal injury due to electric shock when manipulating voltage terminals under voltage. Be sure the terminals are not under voltage before touching them.
Do not open the secondary circuit of current transformers when the primary circuit is closed. Open the primary circuit first.

Current measurement wiring

The number of CT's is automatically selected based on selected value of setpoint **Connection type**. Current and power measurement is suppressed if current level is below 1 % of CT range.

The auxiliary current measurement (T38, T39) is used for the Mains/Bus measurement.

ConnectionType: 3Ph4Wire / High Leg D / 3Ph3Wire

Connection type = 3Ph4Wire / High Leg D / 3Ph3Wire

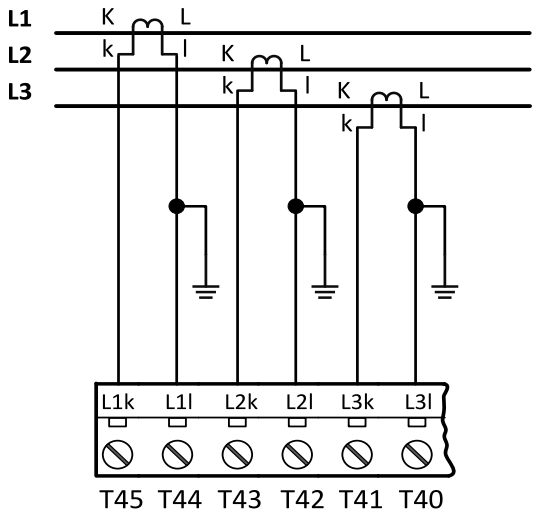


Image 4.6 BESS current measurement wiring

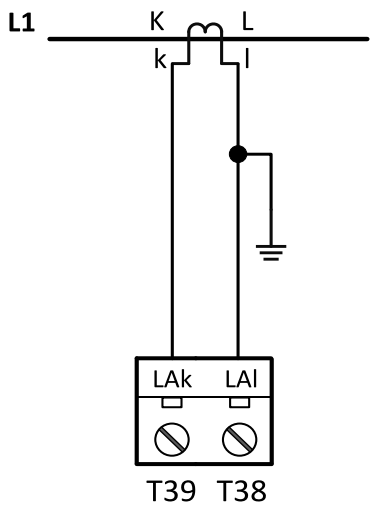


Image 4.7 AUX Mains/Bus current measurement wiring

ConnectionType: SplitPhase

Connection type = SplitPhase

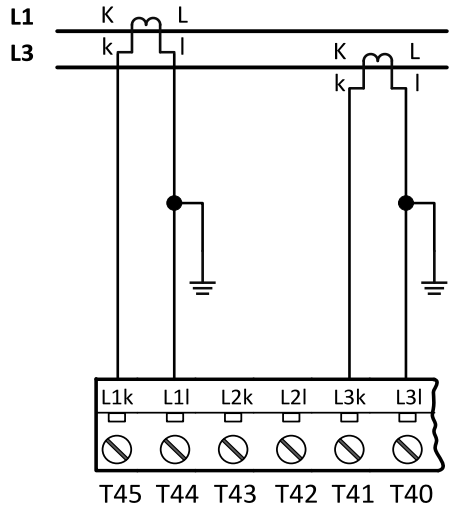


Image 4.8 BESS current measurement wiring

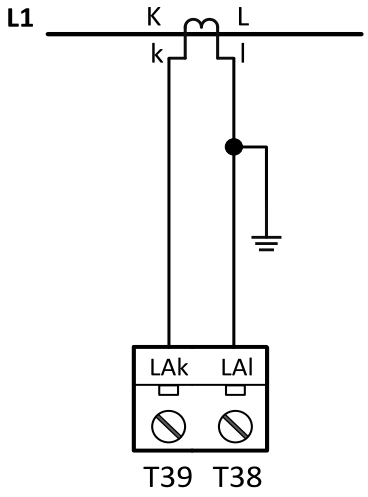


Image 4.9 AUX Mains/Bus current measurement wiring

ConnectionType: MonoPhase

Connection type = MonoPhase

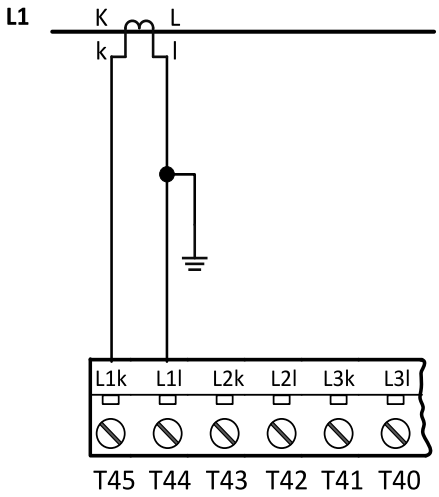


Image 4.10 BESS current measurement wiring

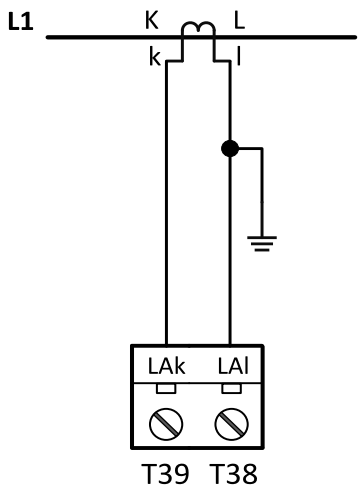


Image 4.11 AUX Mains/Bus current measurement wiring

Principle of two transformers measuring for 3 phase connections

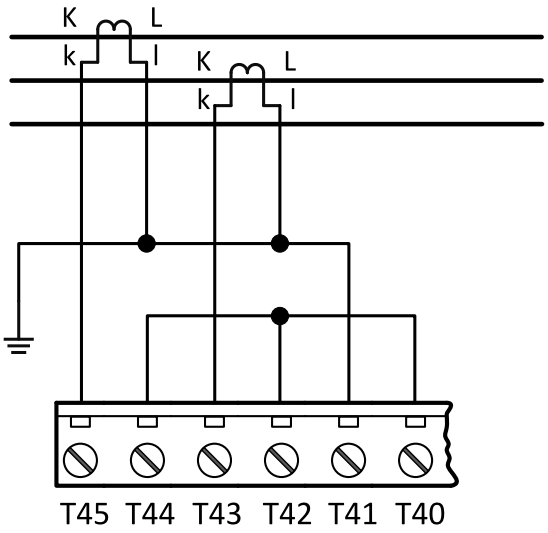


Image 4.12 Principle of two current transformers measuring

> **IMPORTANT: Check measurement connections carefully! Failure is possible if phases are connected in wrong order (WrongPh Sequence detected by the controller) but this is not detected if the phases are just rotated (i.e. instead of phase sequence L1, L2, L3, phase sequence is e.g. L2, L3, L1.**

EFC measurement wiring

The auxiliary current measurement (T38, T39) is used for the Earth Fault Current measurement.

Simple earth fault current measurement wiring

The simple earth fault current arrangement covers all zones from the BESS inverter to the final circuits in the load network.

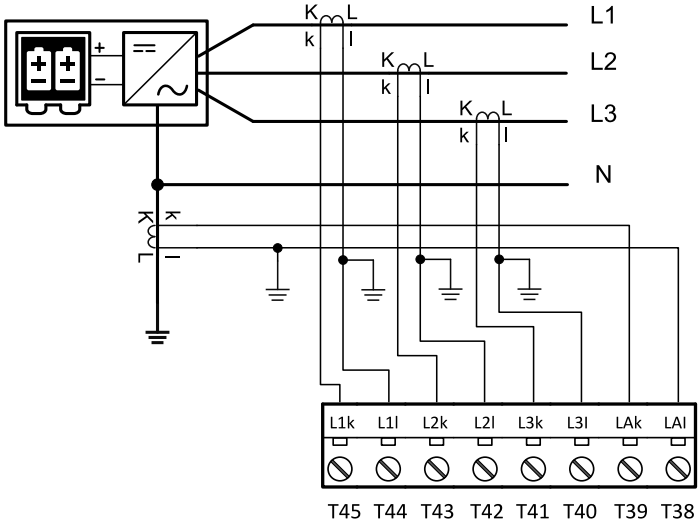


Image 4.13 AUX Simple EFC measurement wiring

EFC measurement wiring for load network only

This arrangement covers earth faults in the load network only.

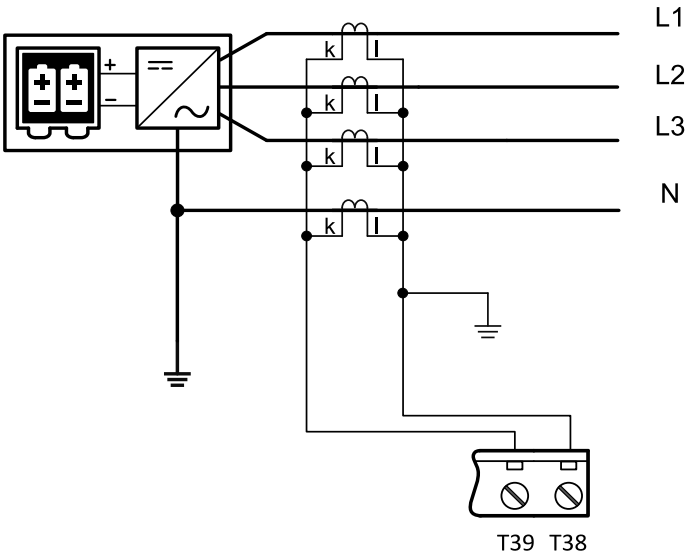


Image 4.14 AUX EFC measurement wiring for load network only

EFC measurement wiring for restricted earth protection

This arrangement is necessary for restricted earth fault protection. The location of the neutral earthing point in relation to the protection current transformers in the neutral conductor determines whether four or five current transformers are employed.

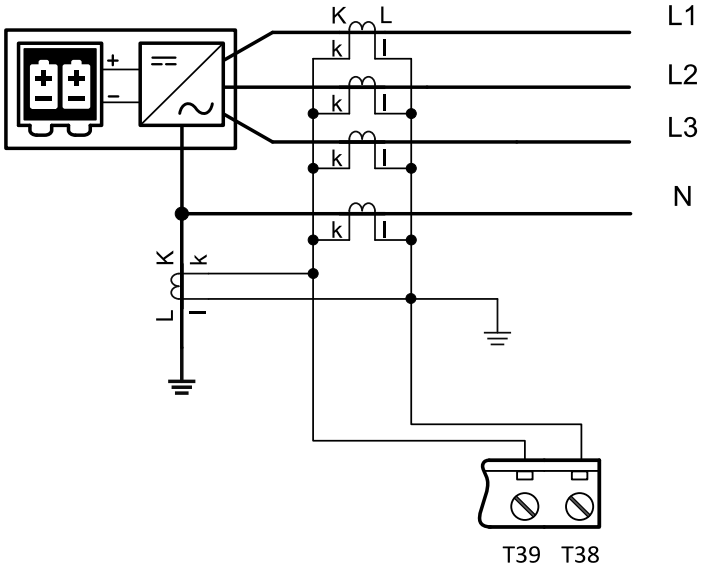


Image 4.15 AUX EFC measurement wiring for restricted earth protection

Voltage measurement wiring

The BESS and Bus protections are evaluated from different voltages based on **Connection type** setting:

- 3Ph4Wire – Ph-Ph voltage, Ph-N voltage
- High Leg D – Ph-N voltage, Ph-N voltage
- 3Ph3Wire – Ph-Ph voltage
- SplitPhase – Ph-N voltage, Ph-N voltage
- MonoPhase – Ph-N voltage

ConnectionType: 3 Phase 4 Wires

Connection type = 3Ph4Wire

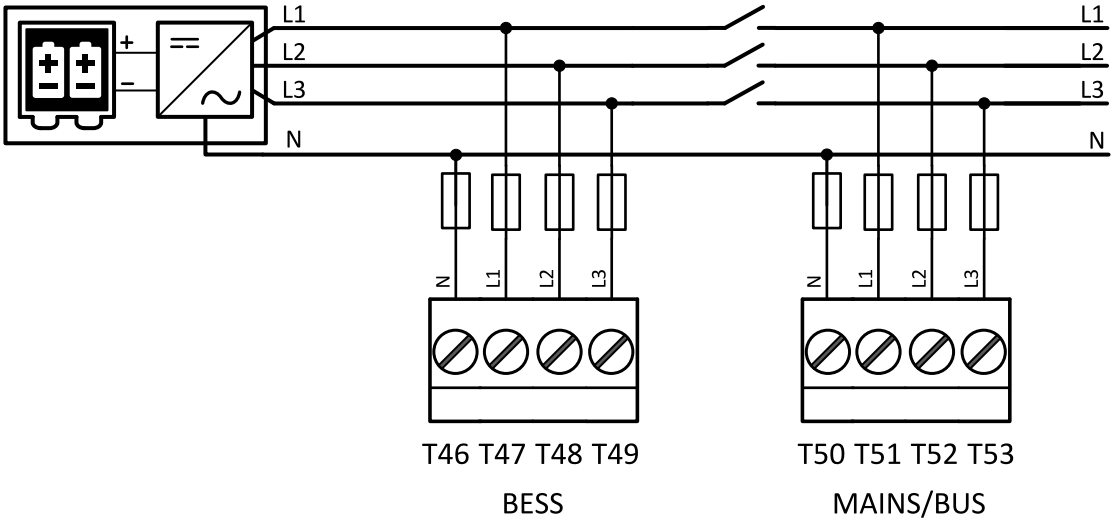


Image 4.16 Controller wiring for voltage measurement of 3 phase application with neutral

Note: *Fuse on "N" wire is not obligatory but recommended.*

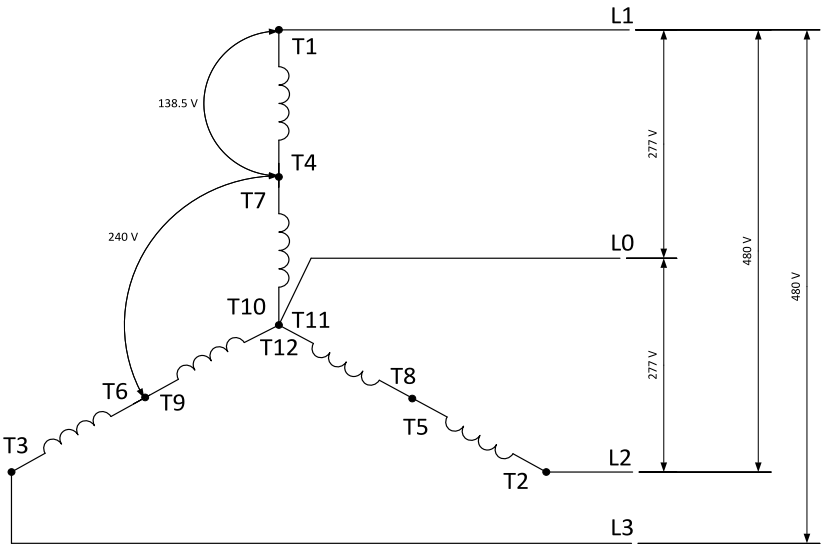


Image 4.17 Typical BESS wiring of 3 phase application with neutral

Note: *Terminals marked by Tx in the picture above are BESS's terminals. These markers are not the same as markers for the controller wiring.*

ConnectionType: High Leg D

Connection type = High Leg D

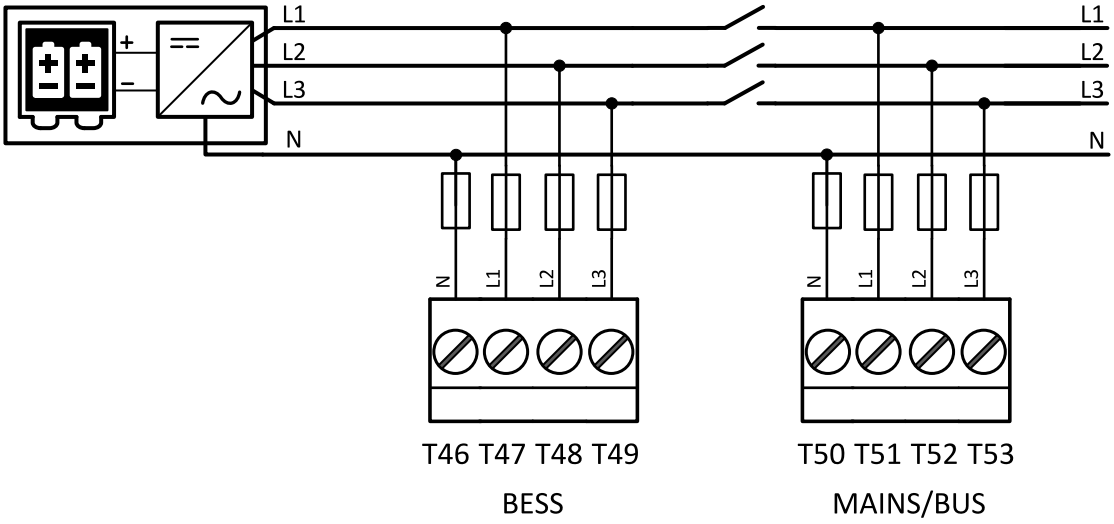


Image 4.18 Controller wiring for voltage measurement of High Leg Delta application

Note: *Fuse on "N" wire is not obligatory but recommended.*

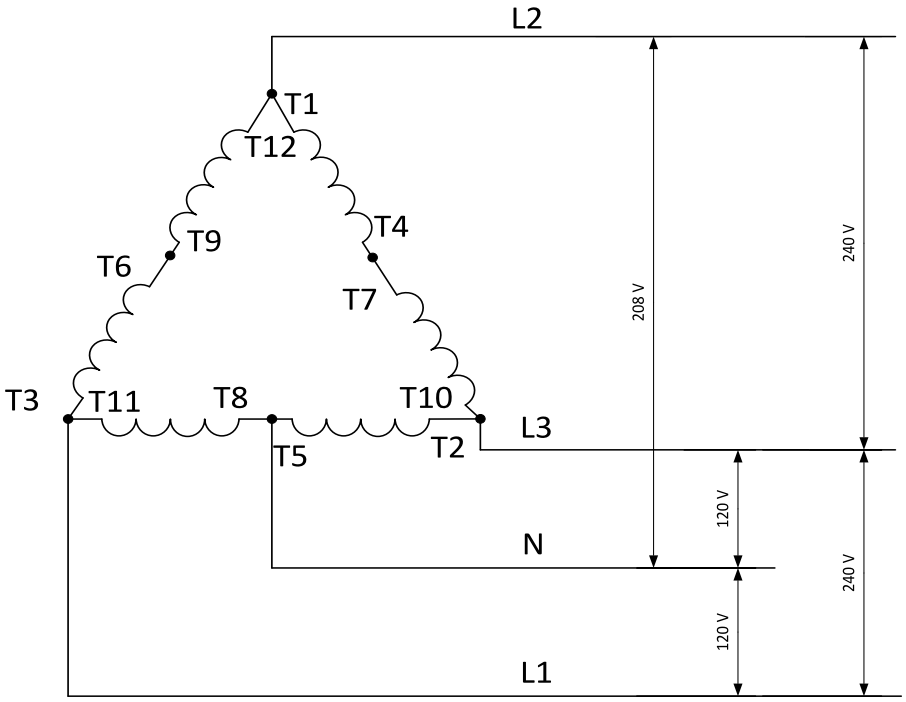


Table 4.1 Typical BESS wiring of High Leg Delta application

Note: *Terminals marked by Tx in the picture above are BESS's terminals. These markers are not the same as markers for the controller wiring.*

ConnectionType: 3 Phase 3 Wires

Connection type = 3Ph3Wire

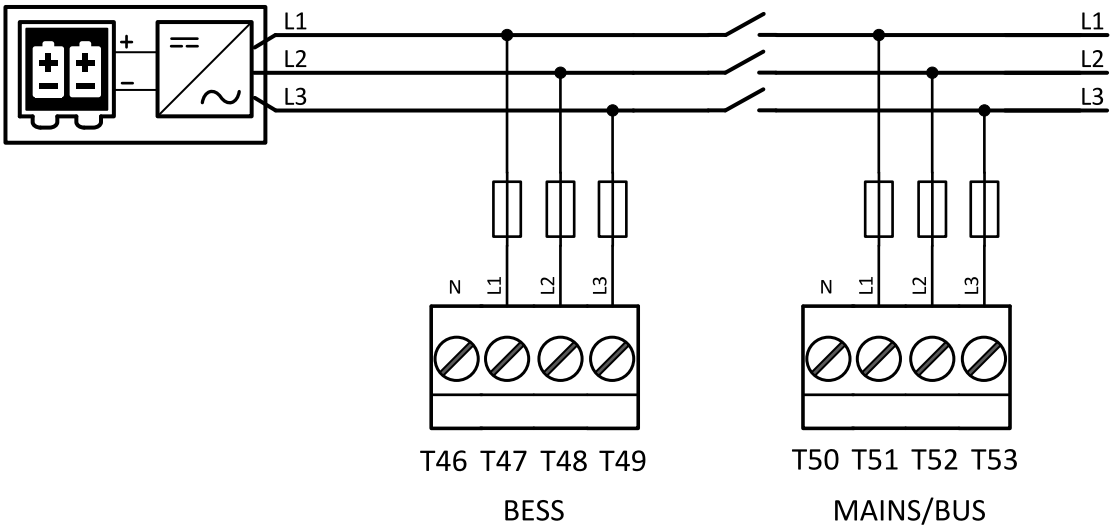


Image 4.19 3 Controller wiring for voltage measurement of 3 phase application without neutral

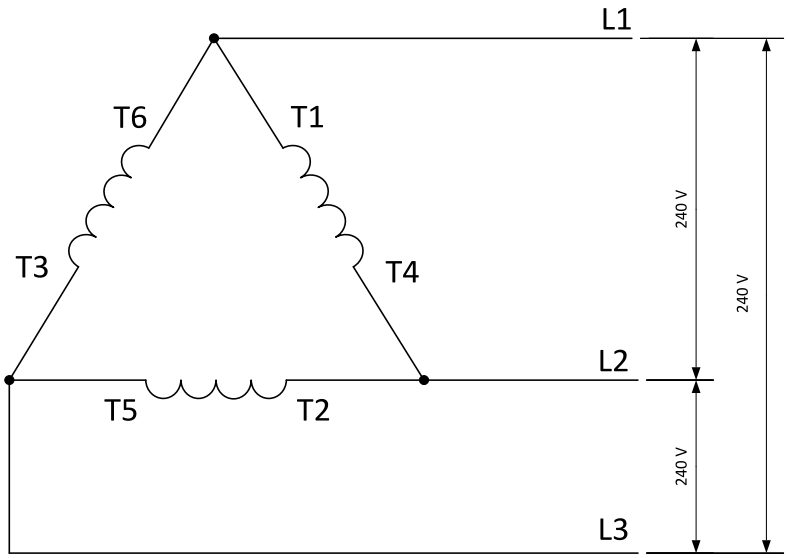


Image 4.20 Typical BESS wiring of 3 phase application without neutral

Note: *Terminals marked by Tx in the picture above are BESS's terminals. These markers are not the same as markers for the controller wiring.*

ConnectionType: SplitPhase

Connection type = SplitPhase

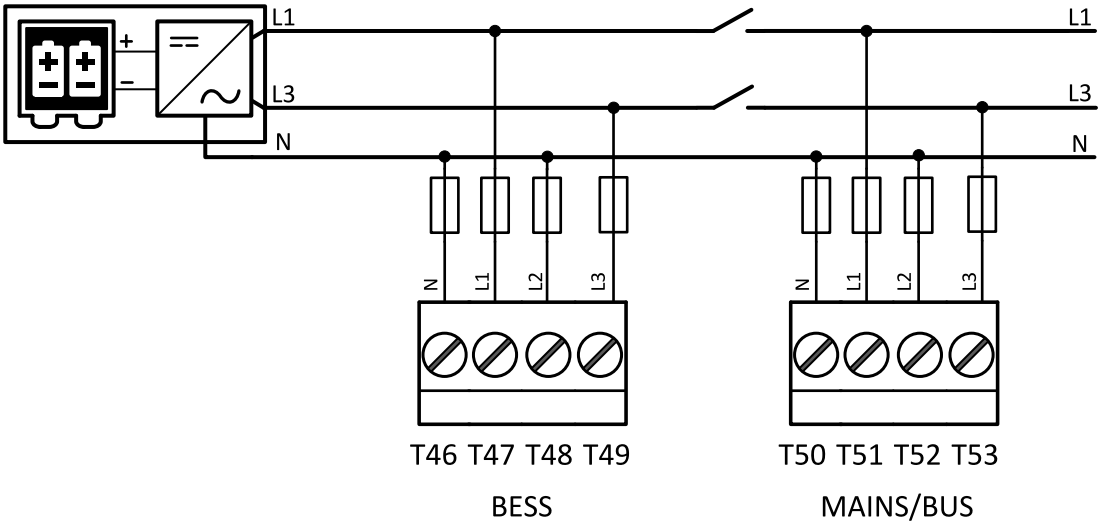
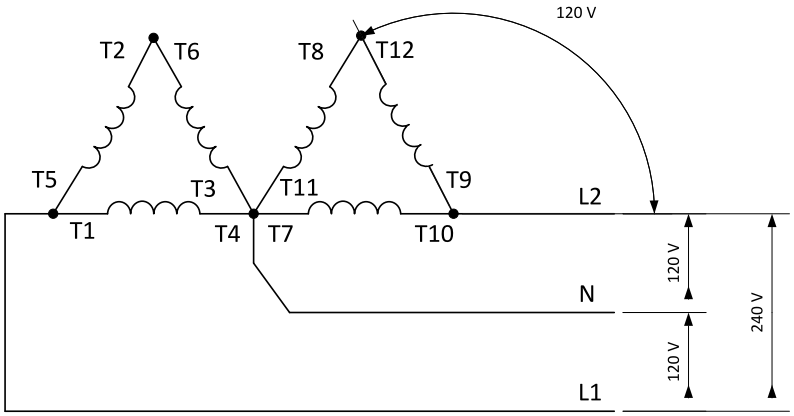


Image 4.21 Controller wiring for voltage measurement of SplitPhase application

Note: *Fuse on "N" wire is not obligatory but recommended.*

DOUBLE DELTA Connection



ZIG ZAG (DOG LEG) Connection

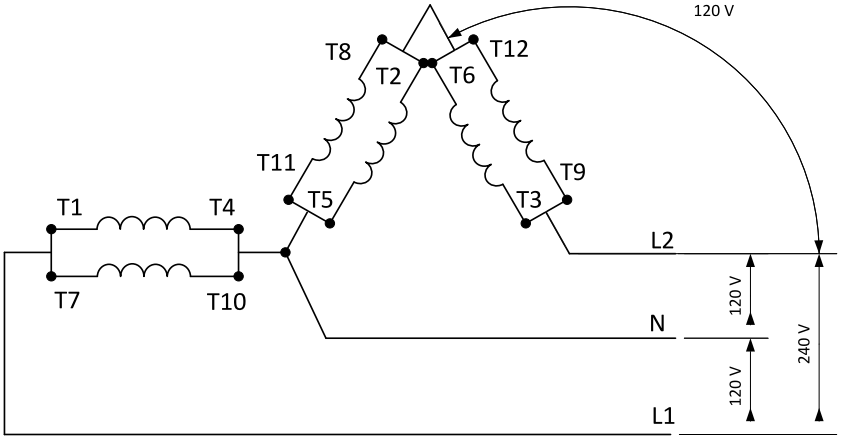


Image 4.22 Typical BESS wiring of SplitPhase application

Note: *Terminals marked by Tx in the pictures above are BESS's terminals. These markers are not the same as markers for the controller wiring.*

ConnectionType: Mono Phase

Connection type = MonoPhase

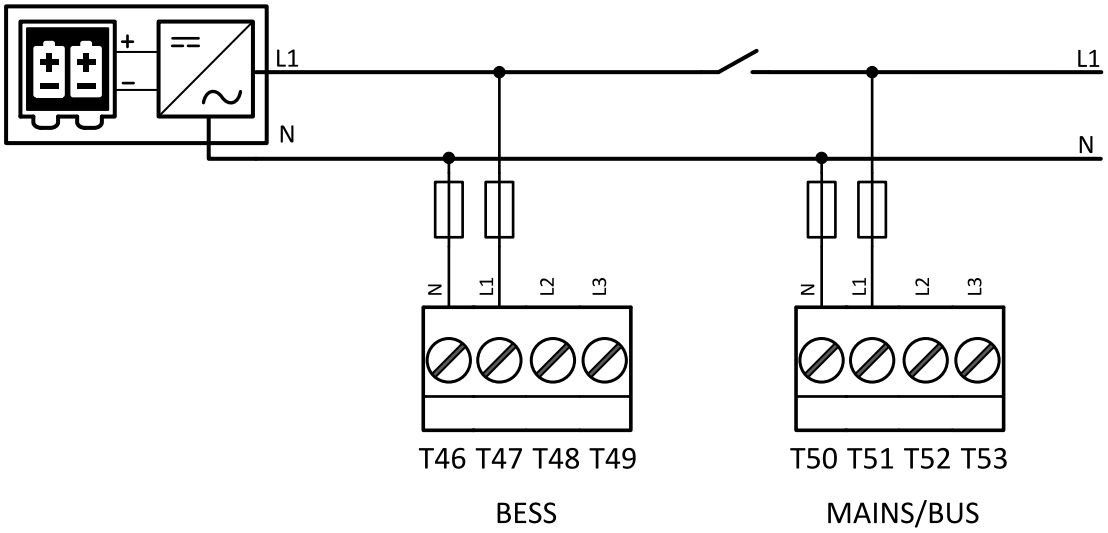


Image 4.23 Controller wiring for voltage measurement of MonoPhase application

Note: *Fuse on "N" wire is not obligatory but recommended.*

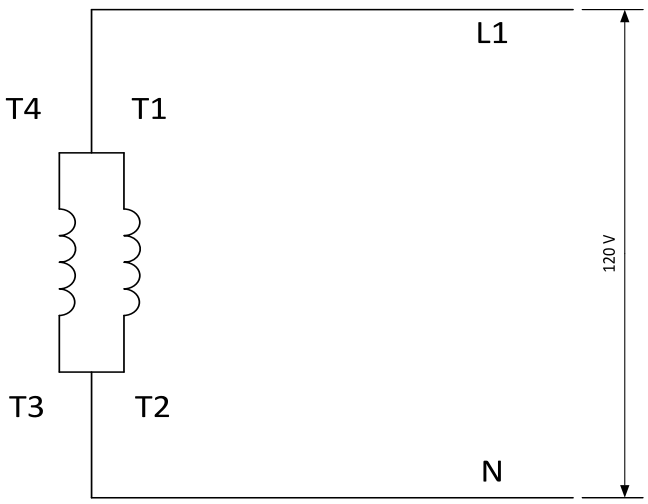


Image 4.24 Typical BESS wiring of MonoPhase application

Note: *Terminals marked by Tx in the picture above are BESS's terminals. These markers are not the same as markers for the controller wiring.*

Principle of two transformers measuring for 3 phase connections

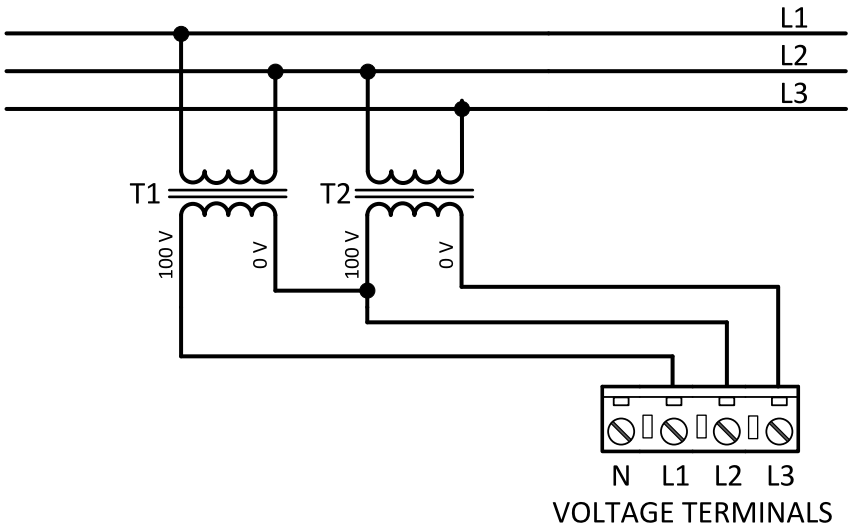


Image 4.25 Principle of two voltage transformers measuring

4.4.5 Binary Inputs

InteliNeo 6000 offers switchable types of inputs. You can select from **Pull Up** and **Pull Down** settings. Use minimally 1 mm^2 cables for wiring of Binary inputs. It is recommended to separate inputs by diodes when two or more binary inputs are connected in parallel to avoid wrong input activation when one controller is switched off.

See the chapter **Binary inputs** for more information about Pull Up and Pull Down settings.

Note: *The name and function or alarm type for each binary input have to be assigned during the configuration.*

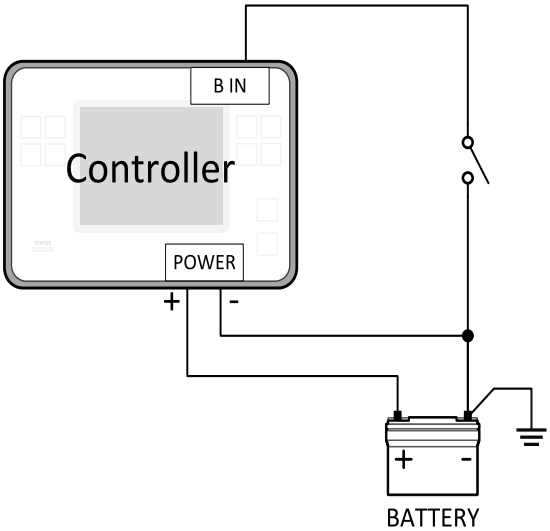


Image 4.26 Wiring binary inputs - Pull Up

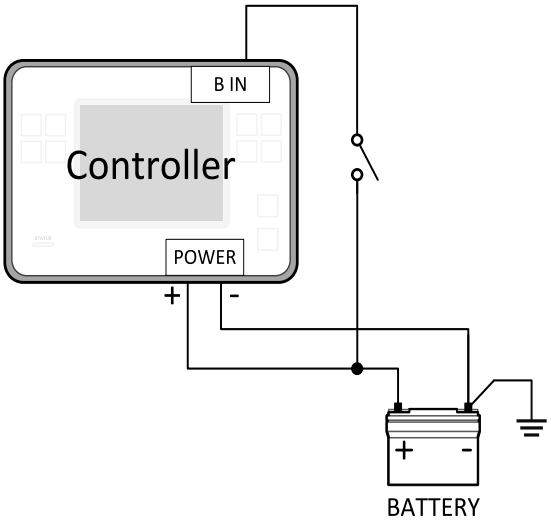


Image 4.27 Wiring binary inputs - Pull Down

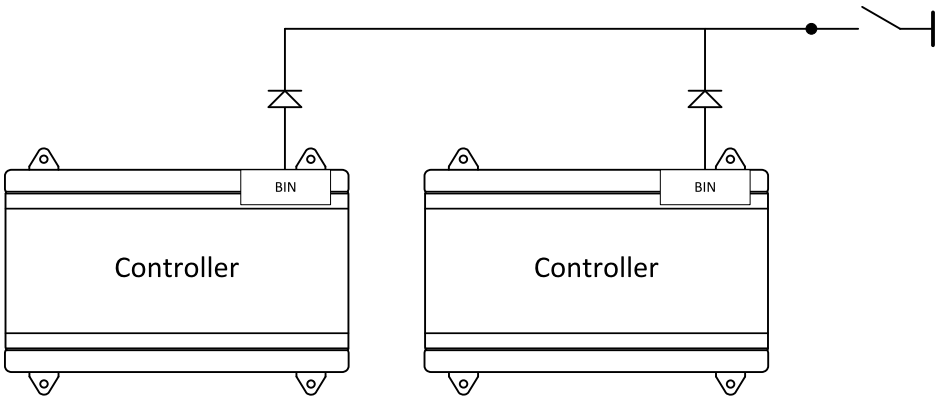


Image 4.28 Separation of connected binary inputs by diodes (pull up)

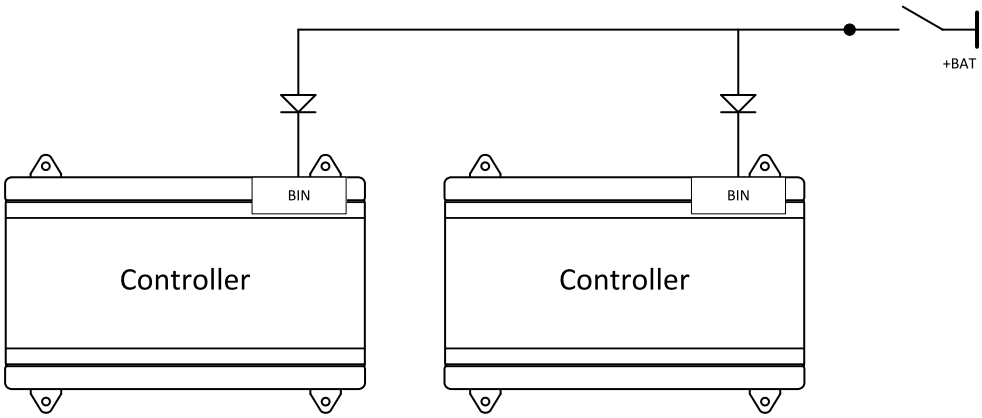


Image 4.29 Separation of connected binary inputs by diodes (pull down)

4.4.6 Binary Outputs

Use min. 1 mm^2 cables for wiring of binary outputs. Use external relays as indicated on the schematic below for all outputs except those where low-current loads are connected (LED signalization etc.). There are two Binary Output groups, the first one is powered by E-STOP (BO1 and BO2) and second one is powered by the controllers main power supply connector (BO3 .. BO12). Every group of outputs can provide steady current of up to 2 A. Every single binary output can provide up to 0.5 A of steady current unless the total current of the group of outputs does not exceed 2 A.

> **IMPORTANT: Use suppression diodes on all relays and other inductive loads even if they are not connected directly to the controller Binary Outputs.**

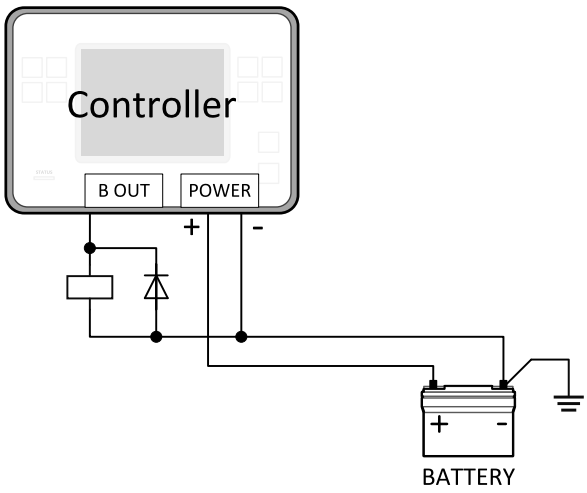


Image 4.30 Binary outputs wiring

4.4.7 E-Stop

The E-Stop is commonly used for quick emergency stop of the BESS. It has dedicated terminal T04 which should be wired trough the Emergency Stop button to the battery voltage. The E-Stop is also used as power supply for binary output 1 (T05) and binary output 2 (T06). . So, these binary outputs will not work if the E-Stop is not powered up, that means higher security and faster disconnection of these outputs. For more information about E-Stop functions see chapter **E-STOP**.

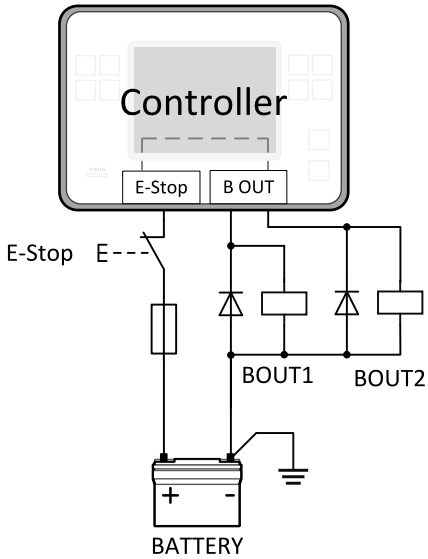


Image 4.31 E-Stop wiring

Note: *Recommended fusing is 1 A fuse.*

Note: *Grey dashed line symbolizes internal connection between E-Stop and binary outputs 1 and 2.*

Note: *For proper functionality of E-Stop, the terminal T04 must be always wired. Terminal can be connected to battery+ or to terminal T03 (BATT+)*

IMPORTANT: Use suppression diodes on all relays and other inductive loads even if they are not connected directly to the controller Binary Outputs.

4.4.8 Analog Inputs

On each analog input there is possibility to connect a voltage, current, or resistive sensor.

Resistive sensors

The analog inputs for resistive automotive type sensors like VDO or DATCON are connected either by one wire (the second pole is the sensor body) or by two wires.

- In the case of grounded sensors, connect the **ACOM** terminal to the analog inputs for resistive sensors connected between the ACOM terminal and the negative power supply terminal of the controller as well as one pole of each sensor.
- In the case of isolated sensors, connect the **ACOM** terminal to the negative power supply terminal of the controller as well as one pole of each sensor.

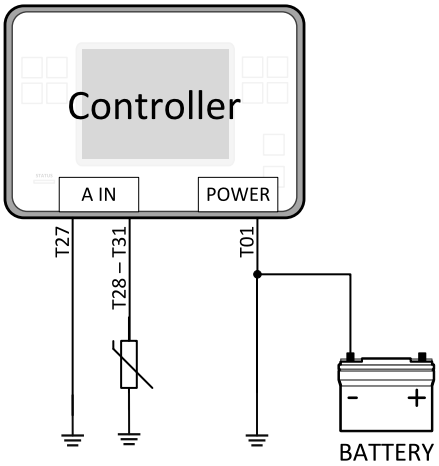


Image 4.32 Grounded sensors

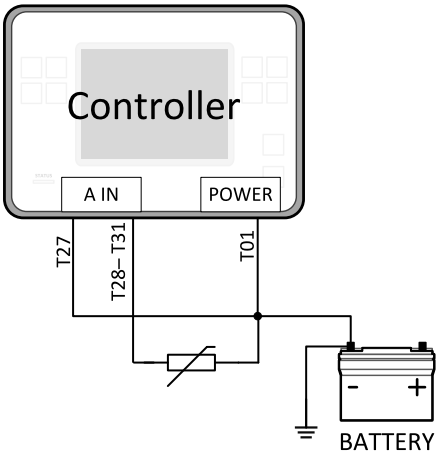


Image 4.33 Isolated sensors

Note: *Schemes show only analog input connection overview, not actual wiring.*

Note: *The name, sensor characteristic and alarm types for each analog input have to be assigned during configuration.*

Voltage sensors

Recommended wiring for the voltage measurement with voltage divider. The voltage sensor is displayed as voltage source which is usually powered from battery or any external DC power source. The **ACOM** terminal is connected to the negative power supply terminal of the controller as well as negative pole of each sensor.

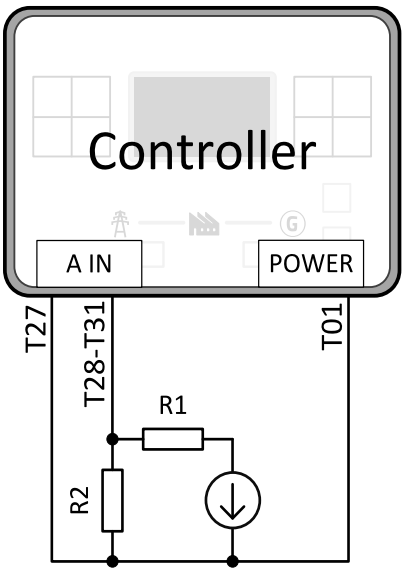


Image 4.34 Wiring of analog input with voltage sensor

Note: *The voltage divider is only relevant for sensors which are outside the 0-10 VDC range.*

Current sensors

Recommended wiring connections for the active and passive current sensors. The active sensor is displayed as current source which is usually powered from battery or any external DC power source. The passive sensor is displayed as resistive load which is placed between battery + and AIN. The passive sensor does not require additional power supply.

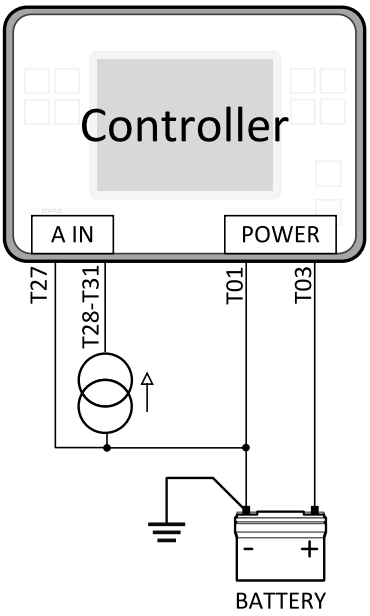


Image 4.35 Wiring of analog input with active current sensor

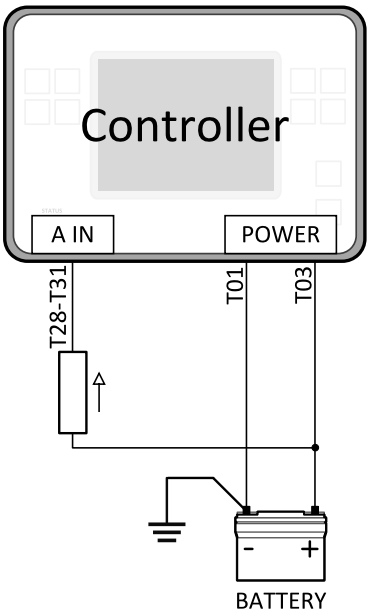


Image 4.36 Wiring of analog input with passive current sensor

Analog as binary or tristate inputs

Analog inputs can be used also as binary or tri-state, i.e. for contact sensors without or with circuit check. The threshold level is 750 Ω. In the case of tri-state, values lower than 10 Ω and values over 2500 Ω are evaluated as sensor failure (short or open circuit), values over 750 Ω are evaluated as log 0 and values below 750 Ω are evaluated as log 1. This can be used for example to prevent running the engine with failed temperature sensor, so it wont be overheated.

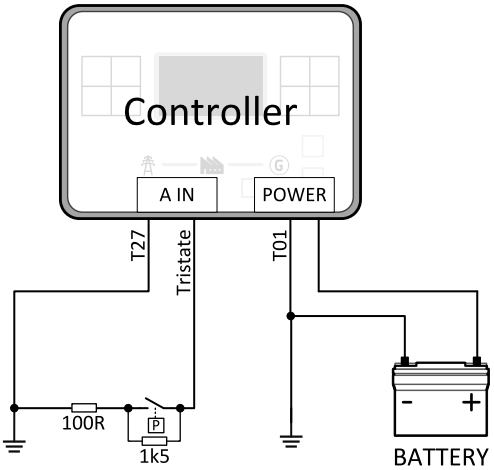


Image 4.37 Analog inputs as tristate

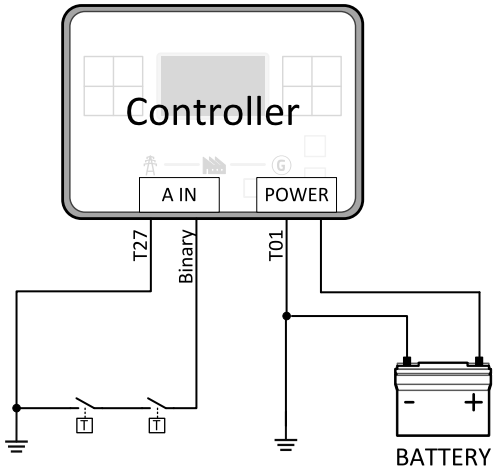


Image 4.38 Analog inputs as binary

Note: *The name, sensor characteristic and alarm types for each analog input have to be assigned during configuration.*

Curve of tristate sensor is prepared for resistive analog inputs 0 .. 2500 Ω.

Tristate sensor has 3 states:

- FIs – fail of sensor
- 1 – value is in logical 1
- 0 – value is in logical 0

Curve of sensor:

- < 10 Ω – fail of sensor
- 10 .. 750 Ω – logical 1
- 750 .. 2500 Ω – logical 0
- > 2500 – fail of sensor

4.4.9 Analog Outputs

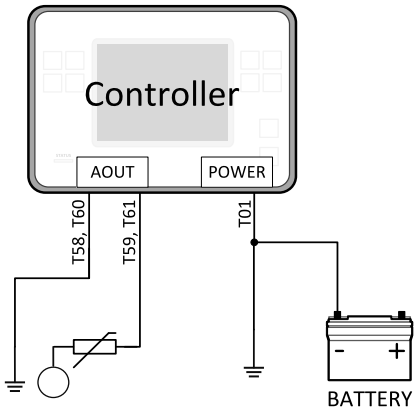


Image 4.39 Analog outputs - Wiring

Analog outputs can be used for any purpose and their outputs can be switched according to options below.

Note: *The jumper switch next to the terminal 61 is a short switch of 10k serial resistor at analog output 2. By default, the jumper is switched off (the resistor is included in the circuit).*

- **Voltage**
  - Output range: -10 to +10 V
  - Maximum load: 5 mA
  - Output accuracy: 1 % from set value ±100 mV (measured at load 10 kΩ)
  - Minimum step: 1/10000 of full range (approx. 14bit resolution)
  - Step response: 10 ms max. (measured between 10 and 90 %)
  - Output ripple: 30 mV max. (measured at 50% duty cycle at 3000 Hz PWM)
- **Current**
  - Output range -20 to +20 mA
  - Maximum load: 500 Ω
  - Output accuracy: 1 % from set value ±200 µA
  - Minimum step: 1/10000 of full range (approx. 14bit resolution)
  - Step response: 10 ms max. (measured between 10 and 90 %)
  - Output ripple: 60 µA max. (measured at 50% duty cycle at 3000 Hz PWM)
- **PWM**
  - Output voltage levels: 0 V / 5 V
  - Maximum load: 10 mA
  - Output High level: >4 V @ 10 mA
  - Output Low level: <1 V @ 10 mA
  - Minimum step: 1/10000 of full range (approx. 14bit resolution)
  - Frequency range: 500 to 3000 Hz (settable during configuration)

4.4.10 CAN bus and RS485 wiring

CAN bus wiring

The wiring of the CAN bus should be provided in such a way that the following rules are observed:

- The maximum length of the CAN bus depends on the communication speed. For a speed of 250 kbps, which is used on the **CAN1A** bus (extension modules, ECU) and **CAN2A** (**Communication peripherals**) bus, the maximum length is 200 m.
- The bus must be wired in linear form with termination resistors at both ends. No nodes are allowed except on the controller terminals.
- Shielded cable[1] has to be used, shielding has to be connected to the terminal T01 (Grounding).
- External units can be connected on the CAN bus line in any order, but keeping line arrangement (no tails, no star) is necessary.
- The CAN bus has to be terminated by 120 Ohm resistors at both ends use a cable with following parameters:

Cable type	Shielded twisted pair
Impedance	120 Ω
Propagation velocity	≥ 75% (delay ≤ 4.4 ns/m)
Wire crosscut	≥ 0.25 mm^2
Attenuation (@1MHz)	≤ 2 dB/100 m

Note: *Communication circuits shall be connected to communication circuits of Listed equipment.*

Note: *A termination resistor at the CAN (120 Ω) is already implemented on the PCB. For connecting, close the jumper near the appropriate CAN terminal.*

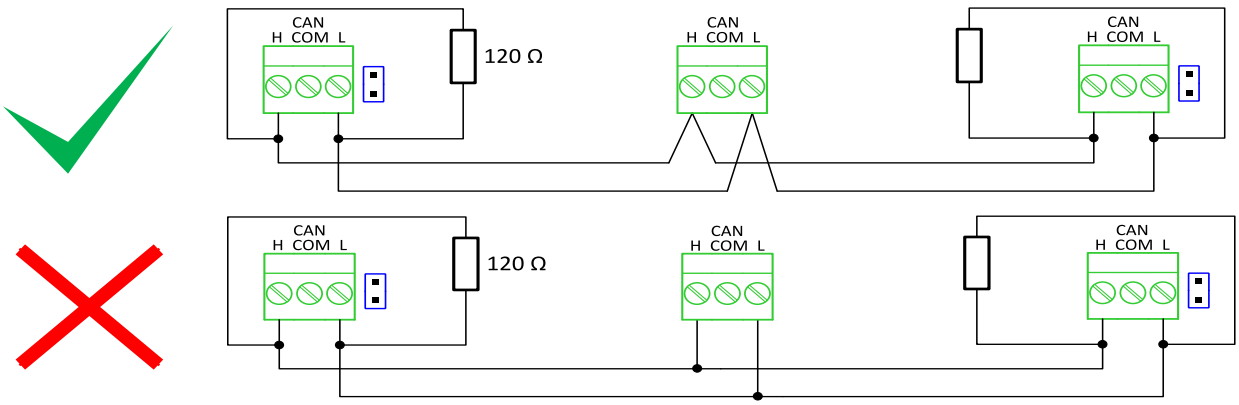


Image 4.40 CAN bus topology

[1]Recommended data cables: BELDEN (http://www.belden.com) - for shorter distances: 3105A Paired - EIA Industrial RS-485 PLTC/CM (1x2 conductors); for longer distances: 3106A Paired - EIA Industrial RS-485 PLTC/CM (1x2+1 conductors)

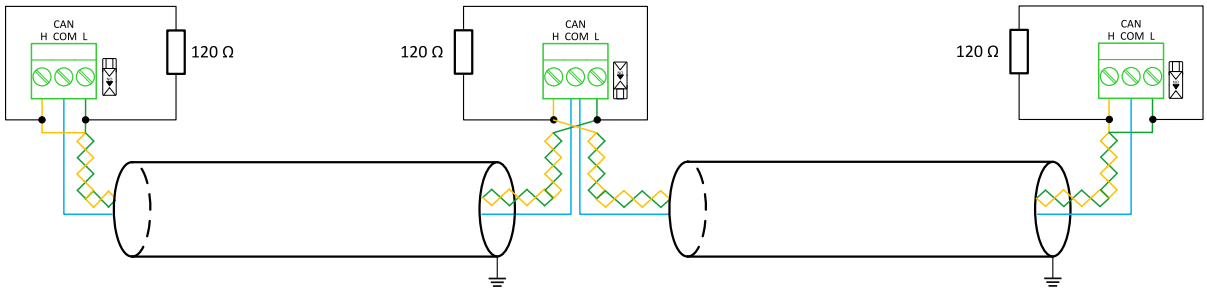


Image 4.41 CAN bus wiring for longer distances

Note: *Shielding shall be grounded at one end only. Shielding shall not be connected to CAN COM terminal.*

Note: *In case of surge hazard (long distances, connection out of building, storms, etc.), consider using surge protection[1].*

RS485 wiring

The wiring of the RS485 communication should be provided in such a way that the following rules are observed:

Note: *A termination resistor at the RS485 (120 Ω) is already implemented on the PCB. For connecting, close the jumper near the RS485 terminal.*

- Standard maximum bus length is 1000 m.
- Shielded cable[2] has to be used, shielding has to be connected to the terminal T00 (Grounding).
- External units can be connected on the RS485 line in any order, but keeping line arrangement (no tails, no star) is necessary.
- The line has to be terminated by 120 Ohm resistors at both ends.
- For shorter distances (connection within one building).

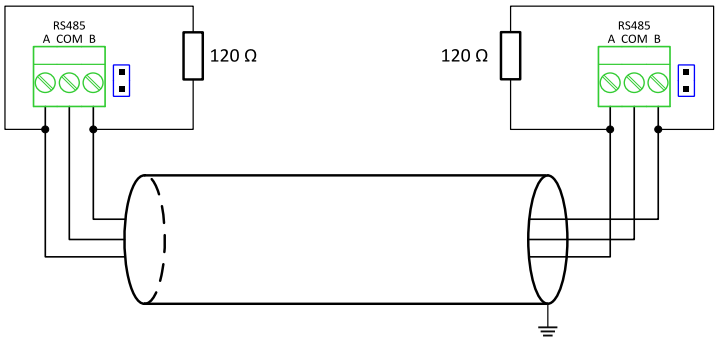


Image 4.42 RS485 wiring for shorter distances

[1]Protections recommended: Phoenix Contact (*http://www.phoenixcontact.com*): PT 5-HF-12DC-ST with PT2x2-BE (base element) or Saltek (*http://www.saltek.cz*): DM-012/2 R DJ

[2]Recommended data cables: BELDEN (http://www.belden.com) - for shorter distances: 3105A Paired - EIA Industrial RS-485 PLTC/CM (1x2 conductors); for longer distances: 3106A Paired - EIA Industrial RS-485 PLTC/CM (1x2+1 conductors)

- For longer distances or in case of surge hazard (connection out of building, in case of storm etc.)

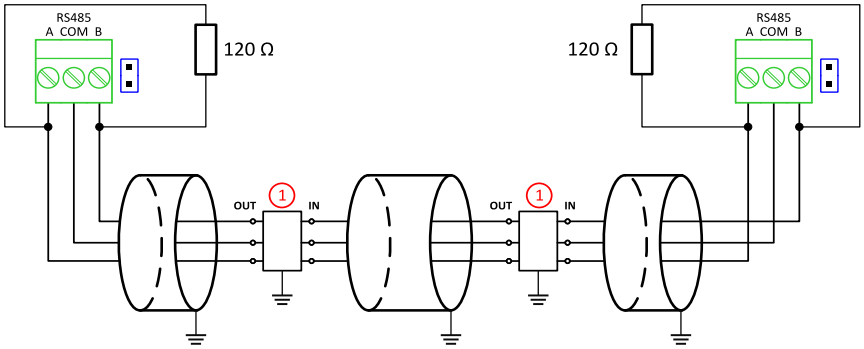


Image 4.43 RS485 wiring for longer distances

① Recommended PT5HF-5DC-ST[1]

Note: *Communication circuits shall be connected to communication circuits of Listed equipment.*

[1]Recommended protections: Phoenix Contact (http://www.phoenixcontact.com): PT 5-HF-5DC-ST with PT2x2-BE (base element)(or MT-RS485-TTL) or Saltek (http://www.saltek.cz): DM-006/2 R DJ

On board RS485 description

Balancing resistors

The transmission bus into the RS-485 port enters an indeterminate state when it is not being transmitted to. This indeterminate state can cause the receivers to receive invalid data bits from the noise picked up on the cable. To prevent these data bits, you should force the transmission line into a known state. By installing two 560 Ohm balancing resistors at one node on the transmission line, you can create a voltage divider that forces the voltage between the differential pair to be less than 200 mili-Volts, the threshold for the receiver. You should install these resistors on only one node. The figure below shows a transmission line using bias resistors. Balancing resistors are placed directly on the PCB of controller. Use jumpers PULL UP/PULL DOWN to connect the balancing resistors.

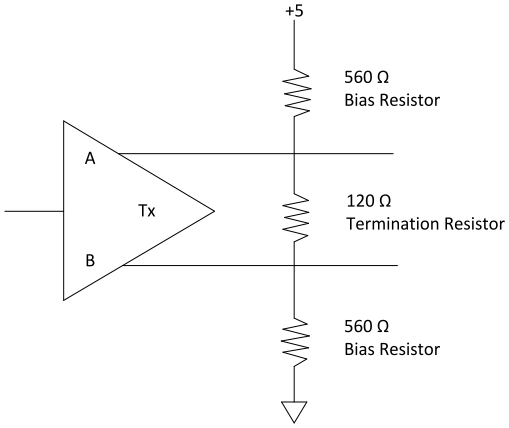


Image 4.44 Balancing resistors

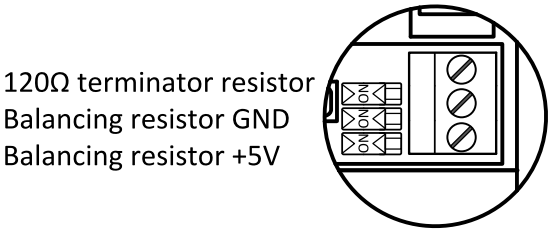


Image 4.45 RS485 on board

4.4.11 USB

The USB can be used for direct computer connection. Use the shielded USB A-B cable. See the chapter **Connection via USB** for more information.

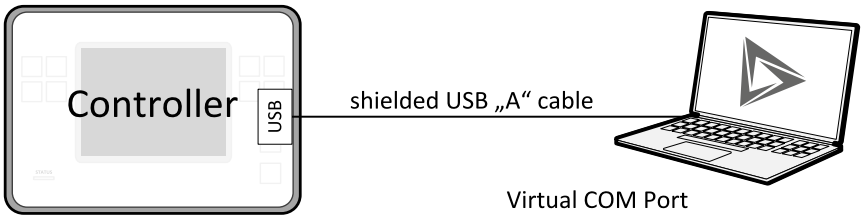


Image 4.46 USB connection

The USB cannot be used instead of power supply. The controller will not be turned on when the USB is connected and the controller is not powered from power supply.

4.4.12 Ethernet

Ethernet Cat5/Cat6 cable fitted with the RJ45 connector can be connected to the ethernet interface. The ethernet can be used for direct computer connection. See the chapter **Connection via Ethernet** for more information.

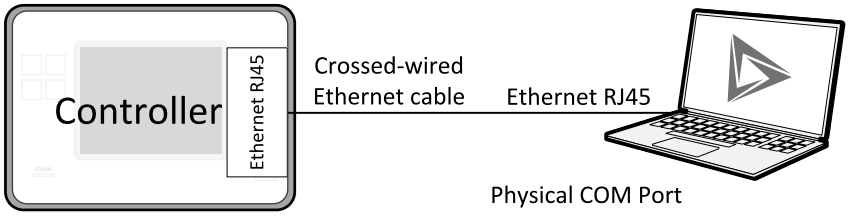


Image 4.47 Ethernet Connection

In the image below you can see the topology using all 3 Ethernet ports with one Modbus Client. The ETH1 is used for connection of displays (IV5.2) or it can be also used for remote LAN connection. The ETH2 is used for remote connection using the internet (WAN). The ETH3 is used for Modbus Server and Client which are connected to the LAN with Modbus Devices.

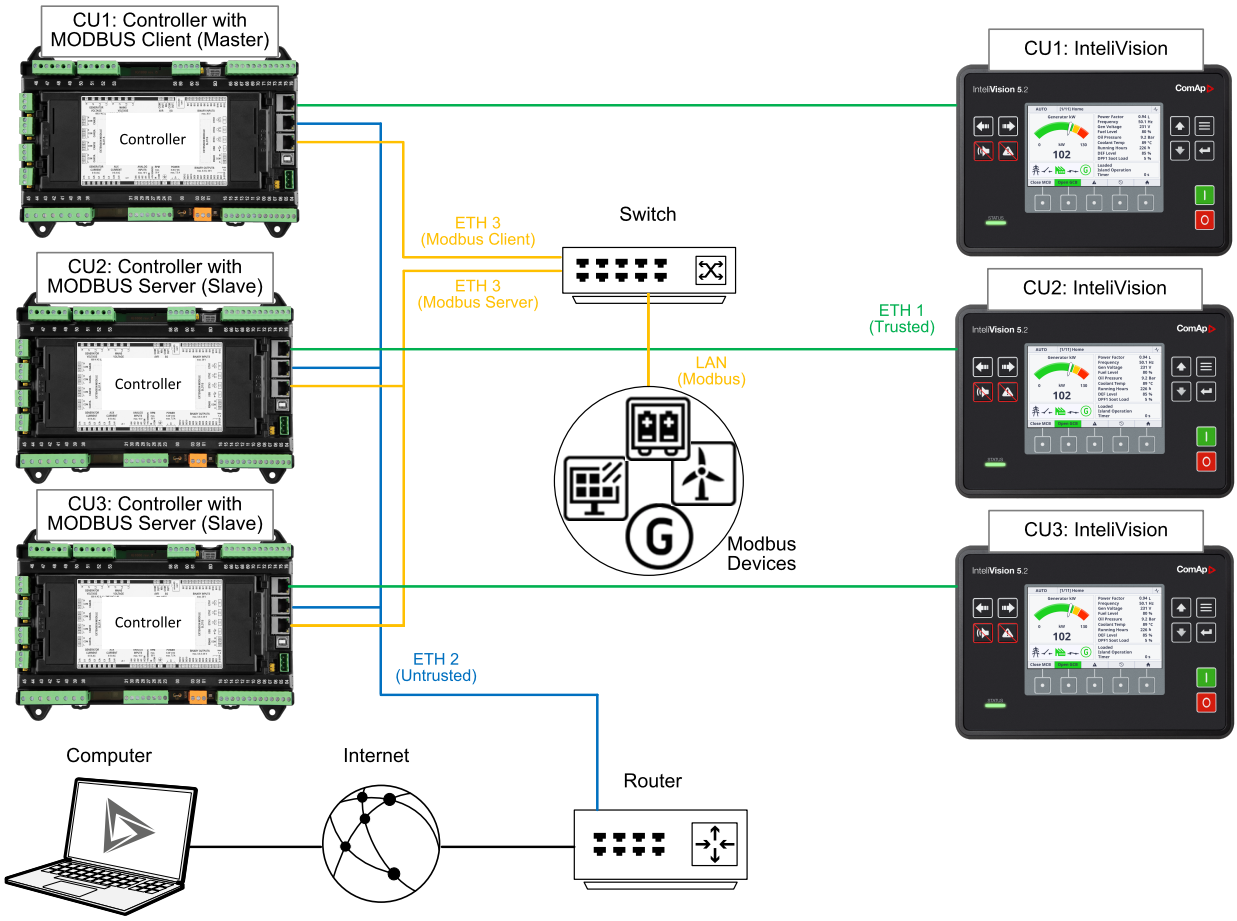


Image 4.48 Advanced Ethernet Topology With One Modbus Client

In the image below you can see the topology using all 3 Ethernet ports with multiple Modbus Clients (CU 1 is the first level client, CU 2 and CU 3 are second level clients). The ETH1 is used for Modbus Server, connection of displays (IV5.2), or it can be also used for remote LAN connection. The ETH2 is used for remote connection using the internet (WAN). The ETH3 is used for Modbus Clients which are connected between CU 1 and other CUs, and between other CUs and Modbus Devices.

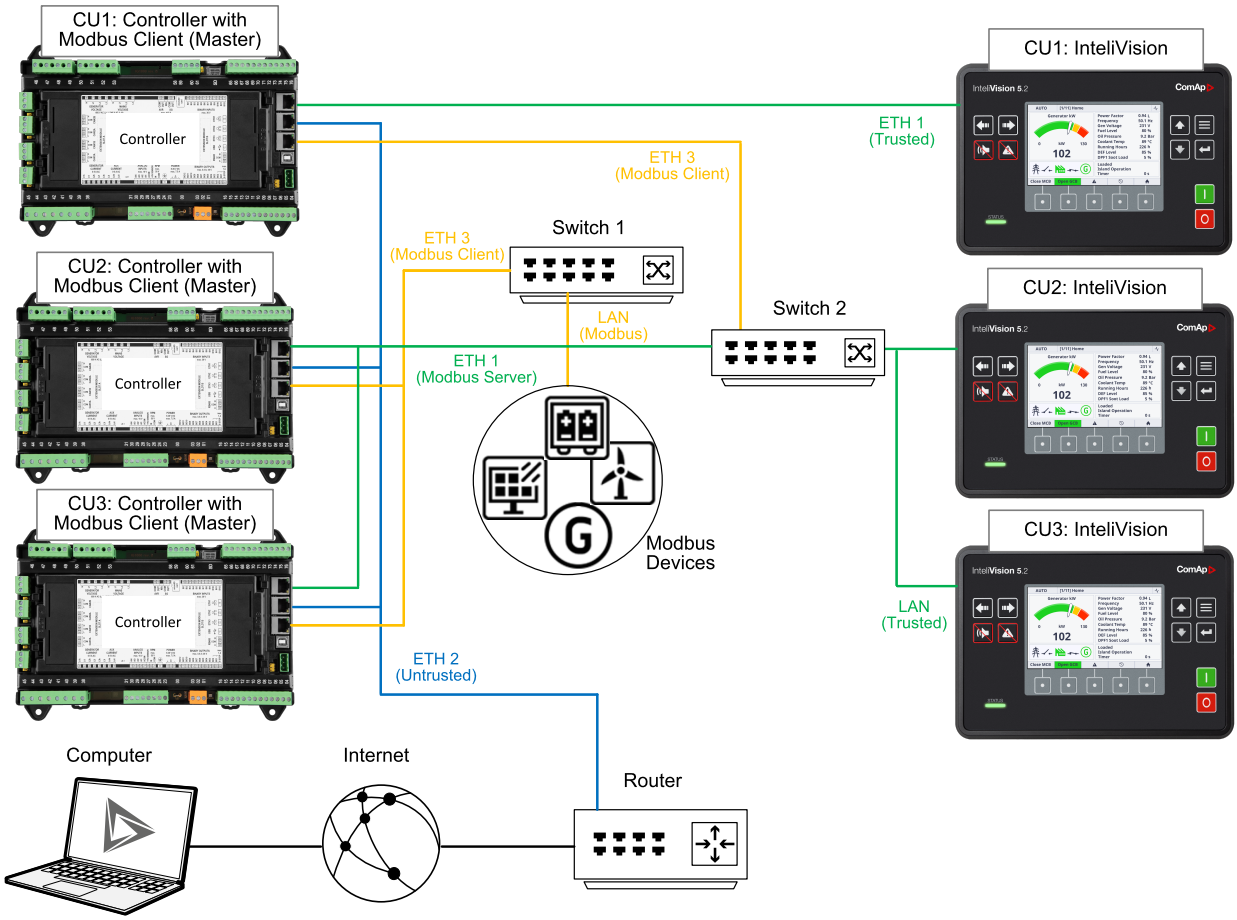


Image 4.49 Advanced Ethernet Topology With Multiple Modbus Clients

Note: *The IP address of each device in the same network must vary.*

Note: *InteliVision 5.2 is used for illustrative purposes, the same wiring diagrams apply for all supported displays mentioned in* ***Displays****.*

4.4.13 Cellular Connection

Cellular connection of controllers can be created by using a router, which is a device that represents the gateway between the controllers and the Internet.

- It creates a Local Area Network (LAN) in which the controllers are connected
- On the opposite side it is connected to Internet (Wide Area Network, WAN)

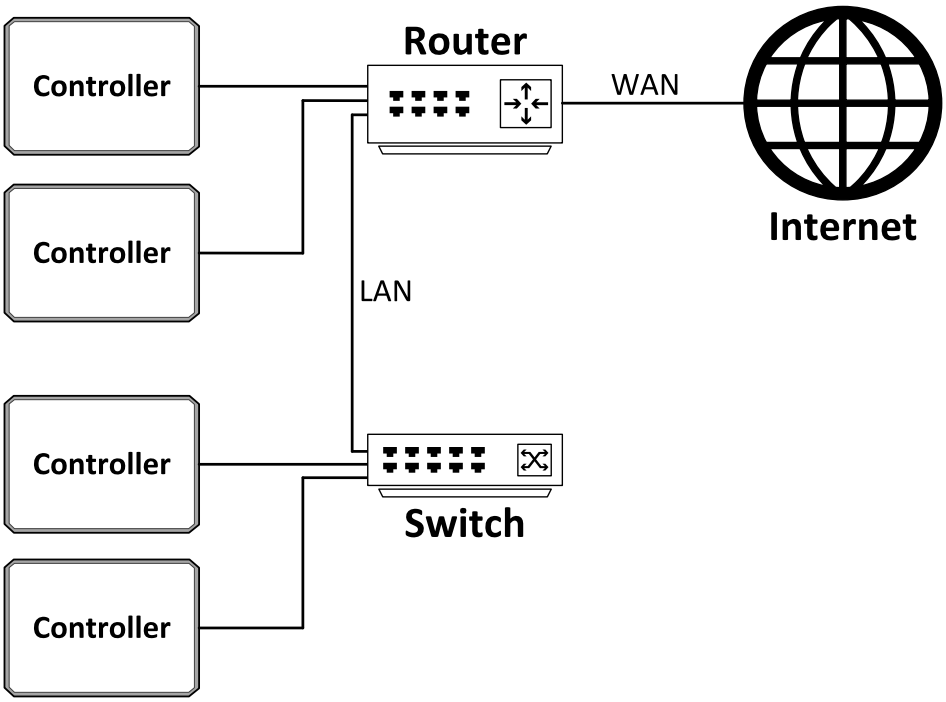


Image 4.50 Example of a topology

Note: *The picture above is only an example of the topology. An additional switch/switches may be needed to match the required network topology (i.e. number and location of the LAN connection points). Please consult this topic with ethernet network specialist.*

While selecting a suitable cellular router following aspects should be considered:

- What cellular network technology and frequency bands are available in the target region?
- Is the cellular connection the primary Internet connection or just a backup connection while the primary one is wired ethernet?
- Power supply and operating conditions

Note: *We recommend to only use devices designed for industrial applications.*

Cellular network technology

There are multiple cellular technologies available on the market. They are called either as "generations" (G) or abbreviations are used.

Technology	Description
4G (LTE)	Current, most advanced, technology. It is being deployed rapidly in some areas it may replace the legacy 2G networks. We recommend using this technology if it is available in the target area › Provides highest data throughput rate and lowest latency › Best user experience – like a wired connection
3G (UMTS, HSPA, CDMA)	Successor of 2G. It is in operation in some areas, but it is not expanding anymore. › Provides lower throughput rate and higher latency then 4G* › Still quite good user experience
2G (GSM, GPRS, EDGE)	Very first digital cellular network technology. It is still available in many areas, however it is slowly starting to decline. › Provides lowest throughput rate and quite high latency › Generally not suitable for connection of multiple ComAp devices via a router

Frequency bands

It is very important that selected cellular router matches the frequency bands used by providers in the target country or area. 4G networks worldwide use many of frequency bands and manufacturers of cellular modules and routers sell their devices in multiple variants according to the region. A useful overview of LTE frequency bands is available at Wikipedia page.

Note: *Consult the technical documentation and/or technical support of the router's manufacturer to get more information about ordering proper regional version of your selected router.*

Additional router functions

Backup WAN connection

Router may provides secondary SIM card slot which is used as a backup connection when the main connection is lost. You can also combine cellular and wired Internet connection as the main and backup one.

Connection alive check

Router may periodically checks whether the cellular connection is alive - has access to the Internet. When there is not access to the Internet, router may perform automatic reboot to reinitialize the connection or switch to backup SIM card.

Automatic scheduled reboot

Router may perform periodically scheduled reboot. This function is a bit "harder" alternative to the **Connection alive check**.

Note: *It may be very helpful at remote sites where freezing of the connection would require traveling to the site.*

Typical router configuration

Note: *Please always refer to the documentation of the specific router for detailed setup procedure.*

> **IMPORTANT: When configuring a router, the very first step to do should be changing the username and password for administration access.**

Cellular network

Usually the only setpoint that needs to be adjusted is the APN name. A frequent APN name is "internet", but if you are not sure ask your SIM card provider for proper APN name.

WAN interface

If the router contains also ethernet socket for WAN connection it may be required to select cellular module as the main WAN interface.

LAN setup

Most routers do not require any changes in the LAN configuration as their default configuration contains DHCP server activated. Clients will get IP settings automatically.

Cellular router examples

- Teltonika RUT955 – comprehensive industrial LTE router based on Linux and customized OpenWRT distribution.
- Gemalto ELS61T – industrial cellular modem with LTE router function based on Linux and OpenWRT distribution.

4.5 External display

InteliNeo 6000 does not have an integrated display. External Remote Displays or PC Panel Displays are used when needed. InteliNeo 6000 package does **not** include any external displays. External displays must be acquired separately, see the chapter **Displays**.

4.5.1 InteliVision Displays

Wiring diagrams

> **IMPORTANT: Fixed IP address must be configured if the terminal is not connected to the DHCP server.**

For display connection it is recommended to use Ethernet 1 (trusted interface in default). Direct connection of InteliVision display to InteliNeo 6000 via ethernet cable can be used only for connection of single device. Using switch for connection allows you to connect multiple devices such as display, computer and Modbus to InteliNeo 6000 at one time.

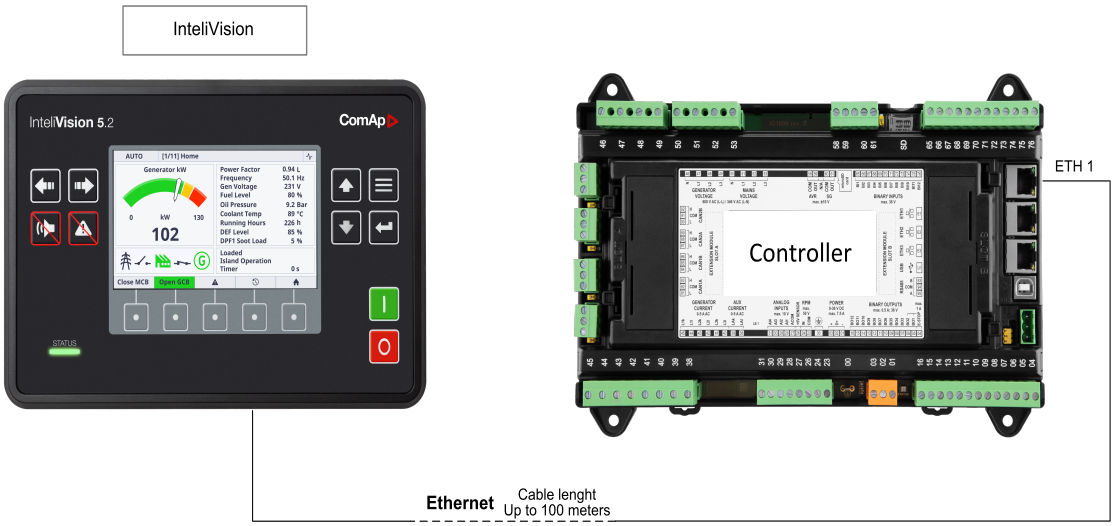


Image 4.51 Connection of InteliVision display to InteliNeo 6000

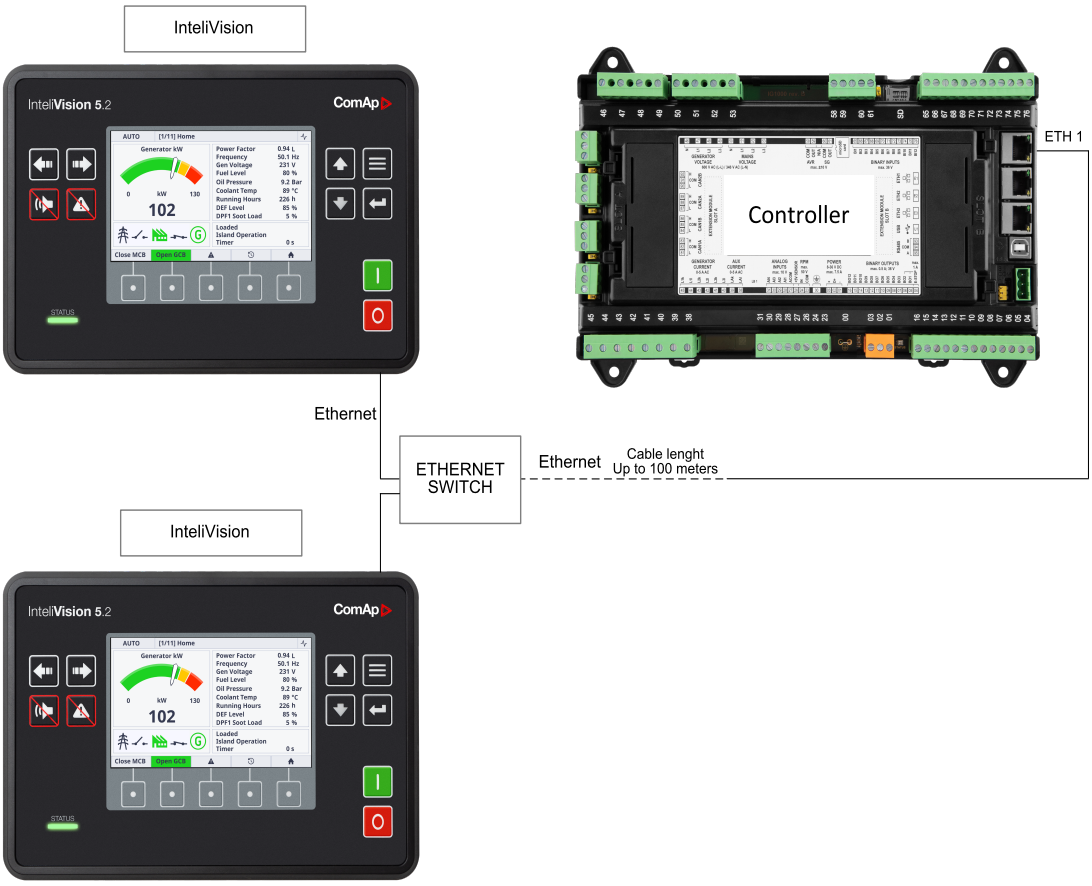


Image 4.52 Multiple connection to a single controller via switch

Note: *The IP address of each device in the same network must vary.*

Note: *InteliVision 5.2 is used for illustrative purposes, the same wiring diagrams apply for all supported displays mentioned in* ***Displays****.*

4.6 Maintenance

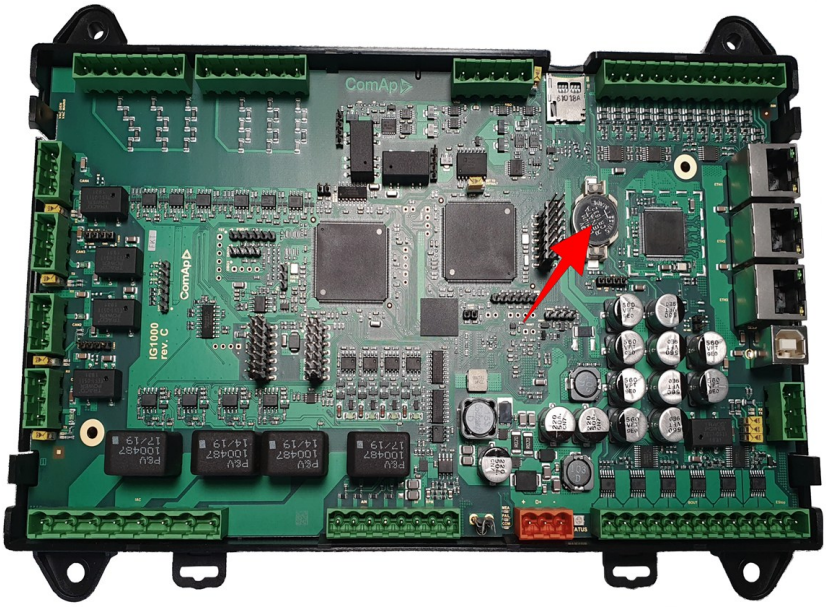
4.6.1 Backup battery replacement

The internal backup battery lifetime is approx. 6 years. If alarm **Wrn RTC Battery Flat** is present, replacement of backup battery is needed. Follow these instructions:

- Connect the controller to a PC and save an archive for backup purposes (not necessary but recommended).
- Disconnect all terminals from the controller and remove the controller from the switchboard.
- Release the rear cover using a flat screwdriver or another suitable tool.

- The battery is located in a holder on the circuit board. Remove the old battery with a small sharp screwdriver and push with a finger the new battery into the holder.

Warning – Risk of fire if battery is replaced with incorrect type or polarity. Dispose of used batteries according to instructions. The CR1632 3V Lithium battery have to be used."



Note: *The picture above is only illustrative and actual battery placement may vary.*

- Put the rear cover back. Use slight pressure to lock the snaps into the housing. Pay attention that the cover is in correct position and not upside down!
- Put back the back cover.
- Power the controller on, adjust date and time and check all setpoints.

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5 Controller setup

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5.1 Operator Guide

5.1.1 InteliVision 5.2 90

Note: *This chapter is relevant only for users who want to use external displays. If you want to operate / monitor / configure your site using the computer with installed PC tool see the chapter* ***PC tools****. See the chapter* ***Displays*** *if you want to use any PC panel display, for example with installed InteliSCADA PC tool. In above mentioned chapters you can find links to Global Guide for each product.*

5.1.1 InteliVision 5.2

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Login to the controller 99
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Alarmlist 109
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Trends 113
Administration 114
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Note: *The images used in the Operator Guide are only illustrative. The screens shown in the images are compatible with the InteliGen 1000 Controller, but the functionality of the IV 5.2 Display such as Connection, Login, Setpoints Settings, Display Settings, etc. remains the same.*

Front panel elements

Front panel of the unit uses hardware buttons for configuring, moving, scrolling, commands and other functions.

Image 5.1 : Front panel overview

Navigation buttons

Arrow buttons on the front panel are mainly used for navigation inside the entire graphical user interface. In addition the arrows left and right are used for changing the controller mode if the actual position is any metering screen.

Arrow left and right

Image 5.2 : Arrow left and right

The buttons are used for :

- Changing the controller mode (only on metering screens)
- Movement between history columns
- Movement in the dialogs

Arrow up and down

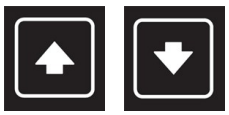


Image 5.3 : Arrow up and down

The buttons are used for :

- Cyclical movement between the metering Screens
- Movement in the dialogs
- Changing the value in the dialogs
- Movement in menus
- Listing on pages

Enter

Image 5.4 : Enter button

The button is used for :

- Confirming the values
- Confirming the selections
- Confirming the listing options

Menu

Image 5.5 : Menu button

The button is used for :

- Escape function
- Step back function
- Cyclical change of the page (from any metering screen)

Function buttons

Function buttons are dedicated for the performing of the concrete function. By pressing the button the controller action or controller command is performed (see below).

Image 5.6 : Function buttons (Start, Stop, Alarm/Horn reset, Horn reset)

- **Start** : starting of the BESS
- **Stop** : stoping of the BESS
- **Alarm/Horn reset** : resets the horn and confirms all the alarms in the alarmlist
- **Horn reset** : resets only the horn

User buttons

Image 5.7 : User button

User button is dedicated for predefined user function.

- Performing the controller command
- Jump to the specific page or metering screen
- special function on the pages

Special and button combination

In this manual the shortcut is a term for the combination of the buttons or long press of the button.

Image 5.8 : Shortcut (jump to the administration)

- **Enter + Menu** : performs the jump to the administration. Enter button has to be pressed first.
- **Long press** of the arrow up or down button
  - in the menus : performs the cyclical listing
  - in the dialog : velocity of the changing value is increased based on special algorithm

Status LED

There is one multicolor (RGB) LED on the front panel of the unit. The specified color and flashing function describes the actual state of the unit.

Image 5.9 : Status LED

- LED intensity is directly connected with the actual setting of the backlight intensity in Administration menu "Settings" accessible by shortcut Enter + Menu
  - the intensity respects the value of the Manual or External brigness control
- The flashing of the status LED and indicative Alarm icon in the top statusbar have the same period
- Meaning of the status LED colors is described below

Priority	LED State	Description
1	Red is flashing	› Active unconfirmed level2 (shutdown) alarm › Inactive unconfirmed level2 (shutdown) alarm › Lost of internal communication line › Controller unit in init state
2	Red lights	› Active confirmed level2 (shutdown) alarm › Display unit in init state › Display unit booting procedure › Lost of communication line with controller unit
3	Cyan lights	› temperature inside the housing exceeded the 85°C (185°F)
4	Yellow lights	› Active unconfirmed level1 (warning) alarm › Inactive unconfirmed level1 (warning) alarm › Active confirmed level1 (warning) alarm › Active unconfirmed fail sensor alarm › Inactive unconfirmed fail sensor alarm › Active confirmed fail sensor alarm
5	Green lights	› unit is running correctly without any errors or alarms

Page Structure

Pages

There are several screens called pages in the graphical user interface (GUI), which are accessible by pressing the Menu button or concrete user button in the bottom status bar. Each page has a different function and different structure. Pages are described in special chapters in this manual.

The actual GUI consists of 6 different pages :

- Setpoints
- Metering screen
- Alarmlist
- History
- Trends
- Administration
  - » Page administration is accessible only by pressing the combination of the Enter and Menu buttons from only Metering screen.

Screens

Each type of controller has special set of screens stored in the controller configuration. The description of the each metering screens is by default predefined by ComAp. Scrolling between the screens is performed using the arrow up and down buttons.

Note: *The metering screens are adjustable using the Screen Editor (in InteliConfig). See chapter Screen Editor for more information. The Screen Editor tool also has its own manual.*

Status bars

Bottom status bar

The bottom status bar is used for the user button functions. There are several status bars in the GUI. Bottom status bar consists of 5 areas (user buttons) dedicated for emitting the command to the controller unit (e.g. MCB and BCB Close/Open), jump to the specified page (e.g. alarmlist, history) or special functions on some pages.

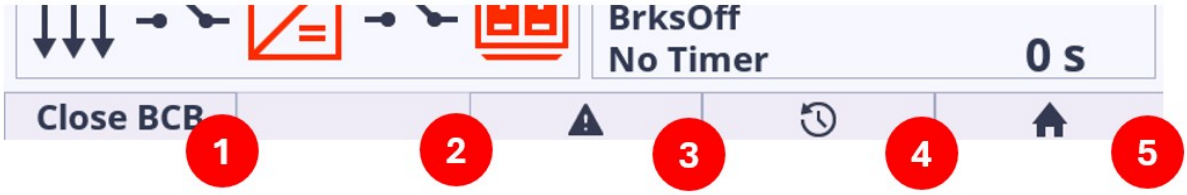


Image 5.10 : Bottom status bar on Home metering screen

1. **User button 1** - MCB Close/Open
2. **User button 2** - BCB
3. **User button 3** - Show Alarm List
4. **User button 4** - Show History
5. **User button 5** - Show Home Screen

Note: *The button press is visually indicated by black frame around the button area. The indication does not mean that requested command is performed, it is only press indication.*

Note: *Concrete status bar views for concrete page are described in specific chapters in this manual.*

Note: *Inactive buttons are visually indicated as grayed button. It means that the button is not available for any reason (e.g. password protected button).*

Top status bar

The top status bar can NOT be adjusted. Information in the top status bar is fixed and controlled by ComAp.

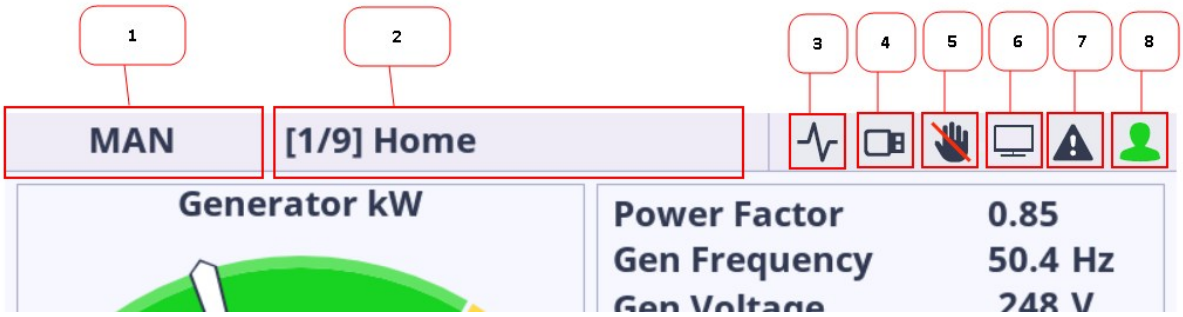


Image 5.11 Top Status Bar description

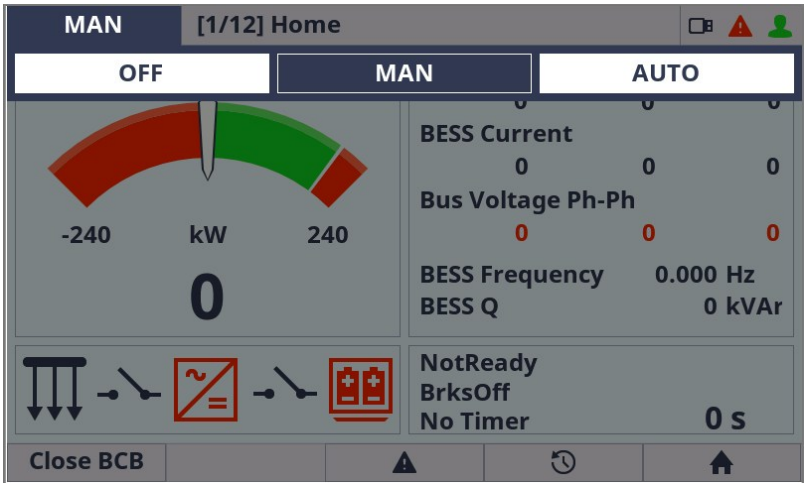


Image 5.12 : Top Status Bar - Mode selector dialog

1. **Mode selector** - Mode selector is dedicated for the controller mode selection. Using arrow left and right the controller mode is changed (only on the metering screens). The choice must be always confirmed by enter button. There is 5s timer for the automatic mode selector dialog cancellation. The mode selector dialog can be also canceled by menu button.
2. **Page title** - Each page and each metering screen has its own title. The first number in square brackets describes the actual metering screen position. The second number describes the total available number of metering screens.
3. **Trending** - The icon is active when the trending is running. Icon is inactive when the trending is stopped.
4. **USB Stick** - The icon is active if the USB stick is plugged in the display unit. Icon is inactive if there is no USB stick plugged in.
5. **Access Lock** - Access lock icon is active if the display is locked for security reasons. Icon is inactive if the controller unit is not locked.
   - InteliNeo 6000 - the function in InteliNeo 6000 is connected to the specific user account. It means only the user with sufficient rights can operate the controller or deactivate access lock function.
     - Icon (- Single Lock) is displayed if the controller is locked and actually logged-in user is the lock owner. User is able to operate the controller or to deactivate the access lock function.
     - Icon (- Double Lock) is displayed if the controller is locked and actually logged-in user is NOT the lock owner. Also the Access Lock function can not be deactivatedbecause of insufficient access rights. See chapter Access Lock for more information.
6. **PC connection** - PC connection icon is not supported in InteliVision 5.2.
7. **Alarm indication** - The alarm icon is flashing red if there is at least one unconfirmed alarm (shutdown or warning) in the alarmlist. The icon lights red if there is at least one confirmed active alarm and no unconfirmed alarm in the alarmlist. The icon is inactive if the alarmlist is empty.
8. **User** - The user icon lights green if the user is logged in to the controller. The icon is inactive if the user is logged out.

StartUp screen

The StartUp screen is defined in firmware and can not be adjusted. The screen is used as a default point in user interface. The main purpose of the screen is to handle all the necessary messages from the display to

the user. If the StartUp screen is displayed it is possible to Import the new display firmware, to see the InteliVision Info screen, to set new communication parameters or to set other display parameters.

StartUp screen is displayed :

- during the booting procedure
- if the connection with controller is not established or interrupted

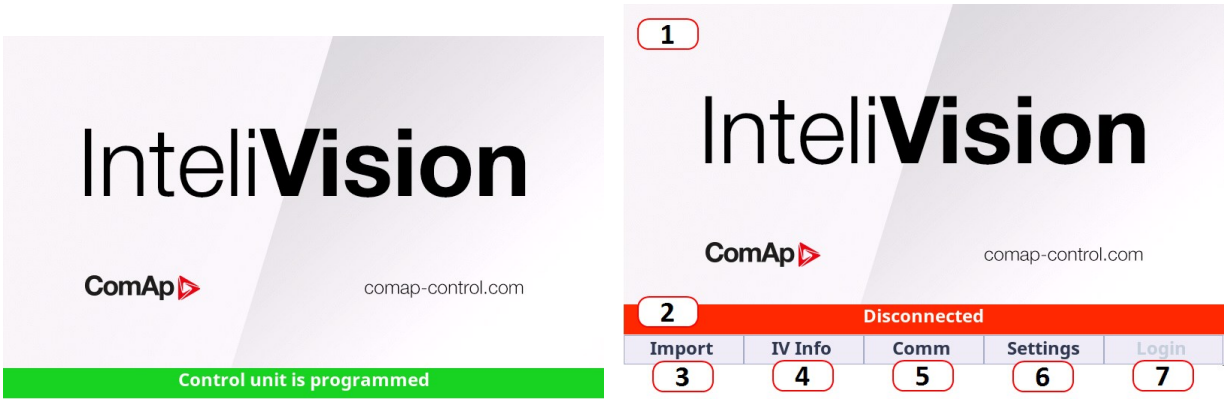


Image 5.13 : StartUp screen

1. **Init logo** - Init screen logo
2. **Status panel with message** - see Messages table below for more info
   - green - if the device is running, initialization, controller programming
   - red - other than running state (communication error, connecting to the controller)
3. **User button 1 - Import** - Firmware Import
4. **User button 2 - IV Info**- InteliVision Info screen
5. **User button 3 - Comm**- Communication settings screen
6. **User button 4 - Settings**- Display settings screen
7. **User button 5 - Login**- Login to the controller
   - Inactive if comm. channel between display and controller is not established
   - Active if comm. channel between display and controller is established

Status panel message table

Message / color	Message description
Running	The device is running without any issue.
Initialize control unit	Booting procedure and handshaking of internal processes.
Control unit is programmed	Connected controller is programmed.
Detecting main CU failed	Internal communication error.
Not compatible application branch in CU	Unsupported display or controller branch. Display and communication bridge are not compatible.

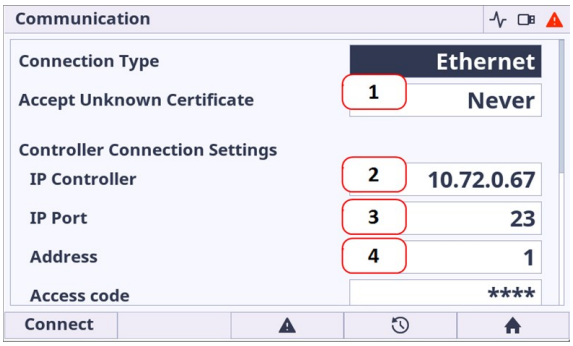
Firmware is corrupted	Display firmware or bootloader is corrupted.
Unsupported configuration format	Display does not support configuration in controller. Configuration reading failed for any reason. Issues with controller configuration. Issues with display memory allocation for controller configuration.
Unsupported screen format	Display does not support screen format in controller configuration controller. Language identicator has not been found in controller configuration
Wrong configuration content	Issues with the content of the controller configuration. Corrupted content of controller configuration.
Disconnected	Controller unit is (has been) disconnected for any reason. Transition state when the contoller unit is programmed.
Connecting	Display tries to establish the secured communiction channel with controller.
Connected	Secured communication channel between display and controller is established.
Controller unreachable	TCP/IP socket can not be created for any reason.
Controller identification timeout	TCP/IP socket was established but the communication inside the socket does not run.
Controller authentication failed	Display unit acquired unknown public key from the controller unit.
Secure connection was not established	Secured connection with controller can not be established.
Wrong Credentials	Attempt to login to the controller is refused. The wrong credentials has been inserted (Username, Passeword, UID or PIN)
Access Blocked	Brute force protection. Controller is temporary blocked because of to many attempt of inccorect login.
Wrong Interface	Attempt for login using UID/PIN on untrasted interface. Only controlller Ethernet 1 port accepts the login using UID and PIN.

Note: *Connecting and connected state are marked red because at that moment the user is not logged in yet. Login procedure is automatic to InteliNeo 6000 controller on StartUp screen (user with access rights 0 is always loged in). Due to this fact the connecting and connected state are the transition states only on StartUp screen.*

Connecting to the controller

The procedure of connecting display to the controller slightly differ based on which Ethernet terminal is used. In case of using **Communication peripherals** will not be required user login for connection and basic operations because the terminal is considered as Trusted. Any other terminal is considered as Untrusted and before actual connection user login is required.

Note: *If display is not used (button is not pressed) for longer period, the user is logged out. This would cause disconnection from the controller if an Untrusted terminal is being used.*

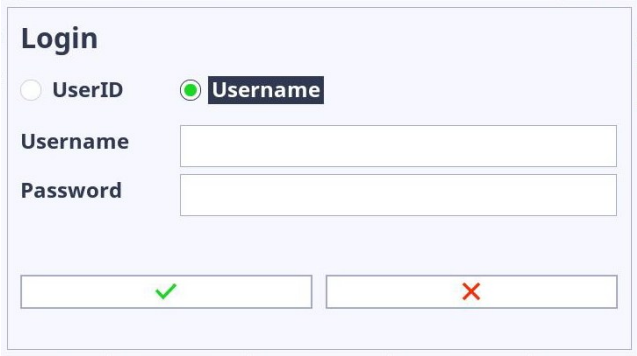


1. **Accept Unknown Certificate** - Connection acceptation of the unknown devices (with unknown public keys) or not supported branches.
   a. Never (by default) - display unit never accepts the unknown devices.
   b. Always - display unit always accepts the unknown devices.
2. **IP Controller** - IP address of the controller unit to be connected.
3. **IP Port** - IP port of the controller unit to be connected. Default IP Port is 23.
4. **Address** - **Terminal Comm Address** of the controller.
5. **IP Mode** - there are two modes :
   a. Automatic - display unit ethernet communication parameters are acquired automatically from the DHCP server (which must exist in the network infrastructure).
   b. Manual (by default) - display unit ethernet communication parameters are configured manually by user.
6. **IP InteliVision** (by default 192.168.1.101) - The IP address of the display. Note that IP InteliVision address and IP Controller address must be in the same network to establish the connection.
7. **IP Subnet Mask** (by default 255.255.255.0) - Mask of the network where the ethernet communication is established.
8. **IP Gateway** (by default 192.168.1.101) - The gateway in network on which the packets are directed.
9. **User button 1 : Connect** - By pressing the button the communication automat is restarted to newly set parameters. Until the button is not pressed the previous communictaion channel is still in progress.

Login to the controller

Login via Untrusted terminal

If an **Untrusted terminal** is being used, the display stays connected to the controller but awaits user login, otherwise the controller does not provide any data. Login with an user to proceed to measurement screens.



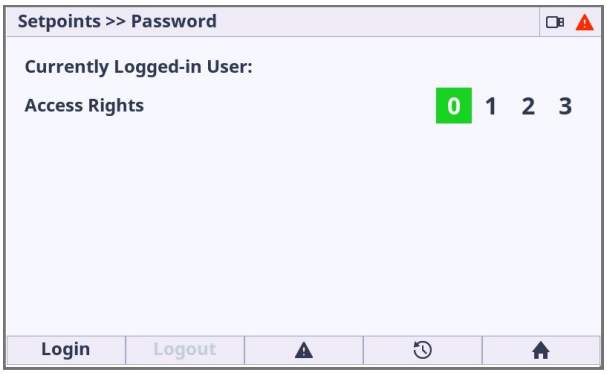
Login via Trusted terminal

If the **Trusted terminal** is being used, the display automatically logs on to the controller with inbuilt user account level 0. The measurement screens are immediately showed and an user login is required only for specific functions which are set in configuration.

The group Password is not setpoint group. This Password item is manually placed to the first group position on the program code level just for this controller unit.

Image 5.14 : Main Setpoints Page

Password item - the item dedicated for the login and logout to the controller.



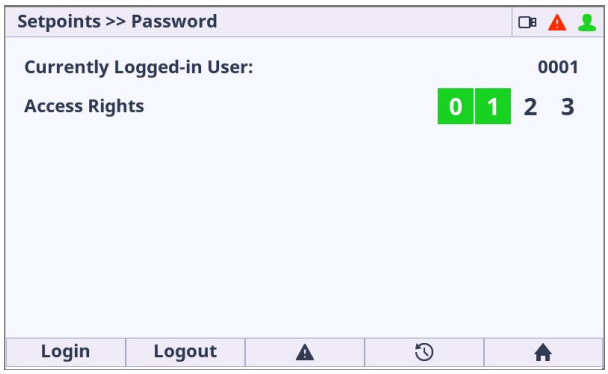
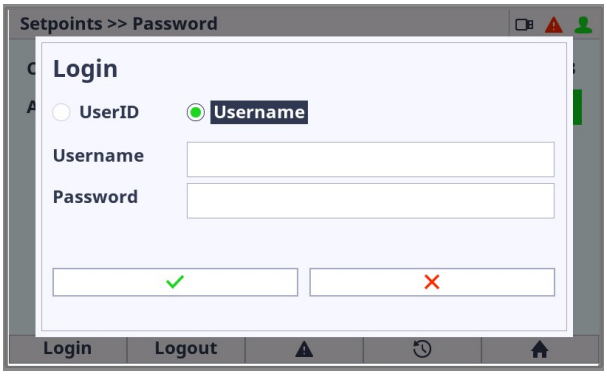


Image 5.15 : Setpoints Password Page



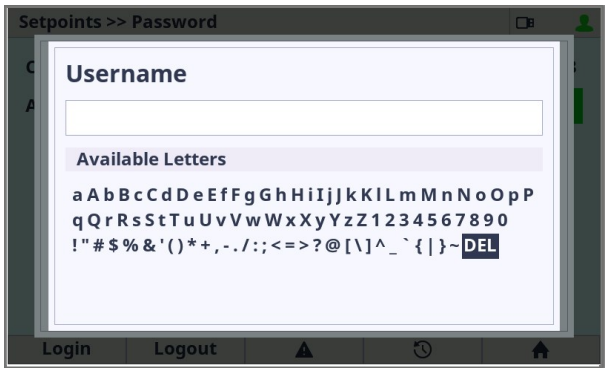


Image 5.16 : Login Dialog

Currently Logged-in User - the information about actually logged in user or his ID if loged using ID and PIN.

Access Rights - Access rights of the actually logged in user

- 0 - user has access rights 0, which means "logged-out" user
- 0,1 - user has access rights 0 + 1 access rights
- 0,1,2 - user has access rights 0 + 1 + 2 access rights
- 0,1,2,3 - user has access rights 0 + 1 + 2 + 3, which means administrator rights

Login and Logout buttons

- Login button calls the login dialog.
- Logout button performs the logout action.

Enter Password

The dialog password is dedicated for password insertion. When the dialog is active the buttons arrow up and down are used for number selection. Enter button confirms the option. Menu button cancels the dialog without saving.

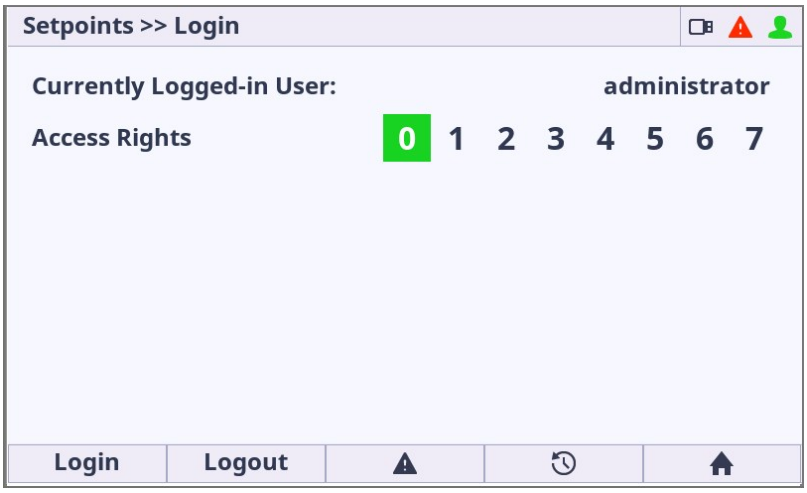


Image 5.17 : Dialog Password overview

Password Change

The dialog password change is dedicated for password change. When the dialog is active the buttons arrow up and down are used for number selection. Enter button confirms the first option and the same password

must be inserted again. Enter button after insertion the second cell performs the password change (in case the password are same). Menu button cancels the dialog without saving.

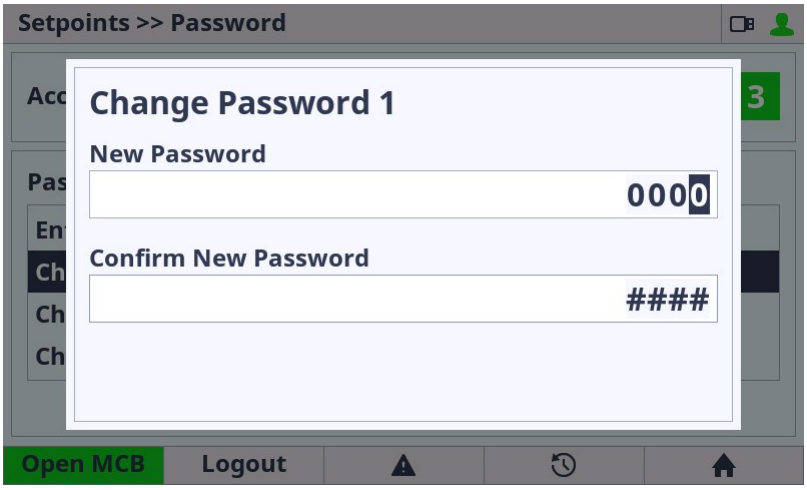


Image 5.18 : Dialog Password Change overview

Note: *The user must be logged in with respective rights to be able to change password for respective rights.*

Setpoints

The setpoint page is intended for setting the controller values. Each type of controller has specific setpoints to be set. The setpoints also depend on the type of application like MPTMMCB and MINT. Availability of the setpoint item also depends on configuration level settings in Administration page. Setpoint is set in 2 steps.

- 1st step - Setpoint group is selected using buttons arrow up and down and confirmed using enter button

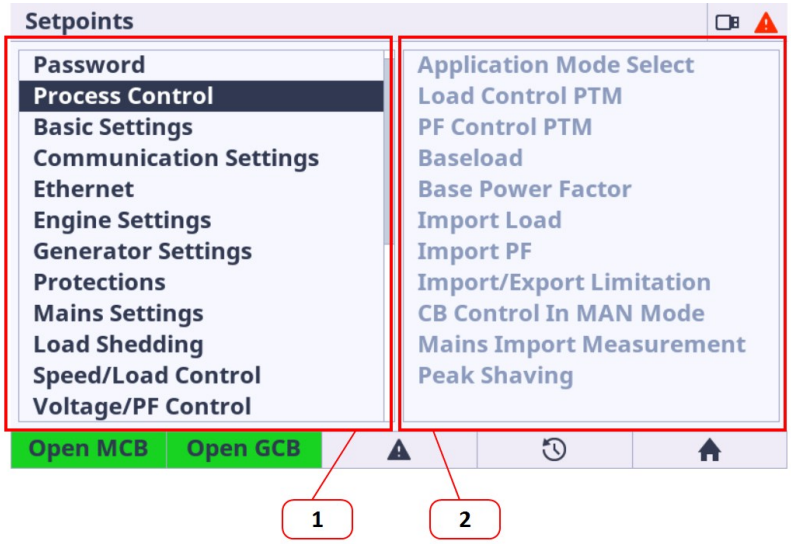


Image 5.19 : Setpoints Page overview

1. **Setpoints group** - the column setpoint group displays the available groups based on the controller, application type and configuration level settings. Respective setpoint group is selected using enter button.
2. **Available setpoints in actually selected group** - each setpoint group contains specific setpoints. The informative column Setpoint name displays the available set of setpoints to be set in each Setpoint group.

This column is only informative and can NOT be set using the arrow left and right. The setpoint setting is done using the 2nd step - see below.

- 2nd step - Setpoint item is selected using the buttons arrow up and down and the dialog for value setting is called using the enter button. The dialogs are described in the chapter Dialogs.

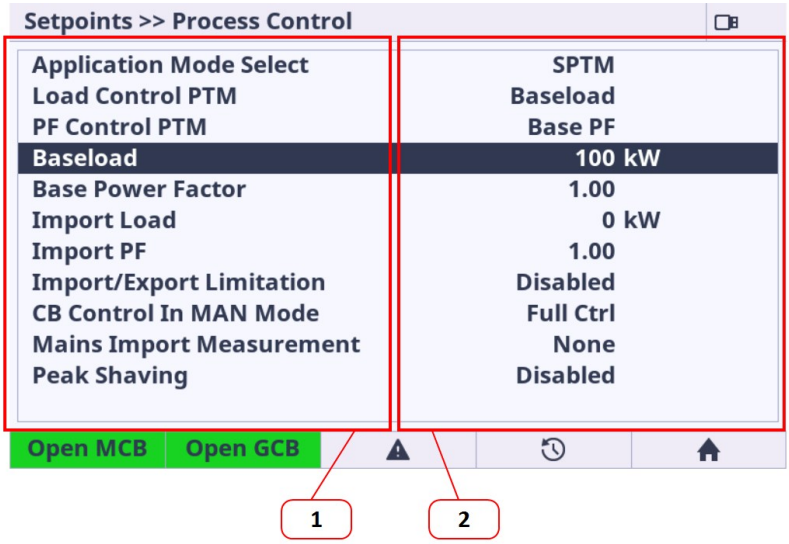


Image 5.20 : Group Setpoints Page

1. **Setpoint name** - Setpoint is set using the enter button. Specific dialog is displayed and the value can be set. There are several types of dialogs (text, numeric, stringlist) and the type of called dialog depends on the setpoint type. The dialogs are described in the chapter Dialogs.
2. **Actual value** - Informative actual value for specific setpoint is displayed. Value range, original value and default value for the selected setpoint are displayed inside the dialog.

Protected Setpoint Indication

If the setpoint is protected by password then the icon (crossed hand) is displayed just behind the setpoint value. The setpoint protection is set using PC Tool InteliConfig.

Force Value Indication

If the setpoint is forced by another setpoint then the icon (double right arrow) is displayed just behind the setpoint value.

- Green Icon - Forcing is active
- Grey Icon - Force Value is set to the specific setpoint and forcing is inactive

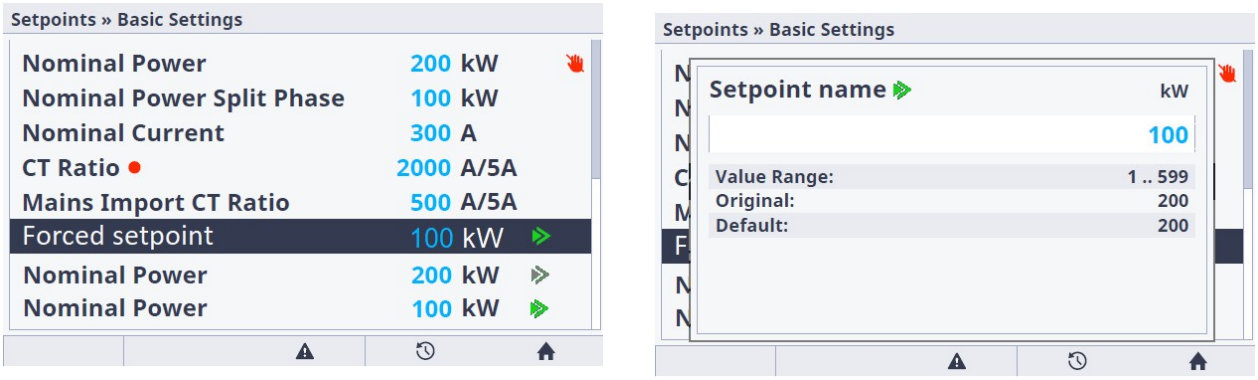


Image 5.21 : Force Value and Protected Setpoint Indication

IMPORTANT: If the controller is locked (Access Lock function is active) then the attempt for setpoint editation is denied and the information dialog is displayed (Controller is Locked). See chapter Administration and Access Lock.

Numeric change

Value

The dialog value is dedicated for number setting. When the dialog is active the buttons arrow up and down are used for number selection. Enter button confirms the option. Menu button cancels the dialog without saving.

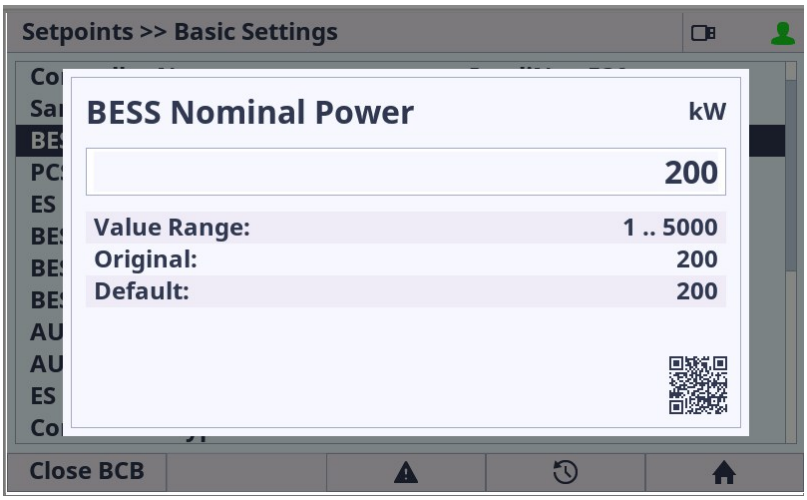


Image 5.22 : Dialog Value overview

Value Extended

The dialog value extended is dedicated for number setting with combination with one or more string value. When the dialog is active the buttons arrow up and down are used for number/item selection. Enter button confirms the option. Menu button cancels the dialog without saving.

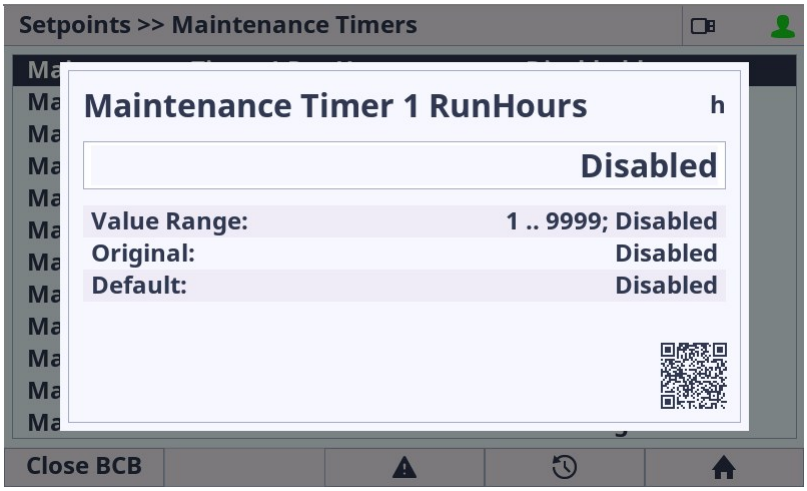


Image 5.23 : Dialog Value Extended overview

IP address

The dialog IP address is dedicated for IP address insertion. When the dialog is active the buttons arrow up and down are used for number selection. Arrows left and right are used for moving between the IP cells. Enter button confirms the option. Menu button cancels the dialog without saving.

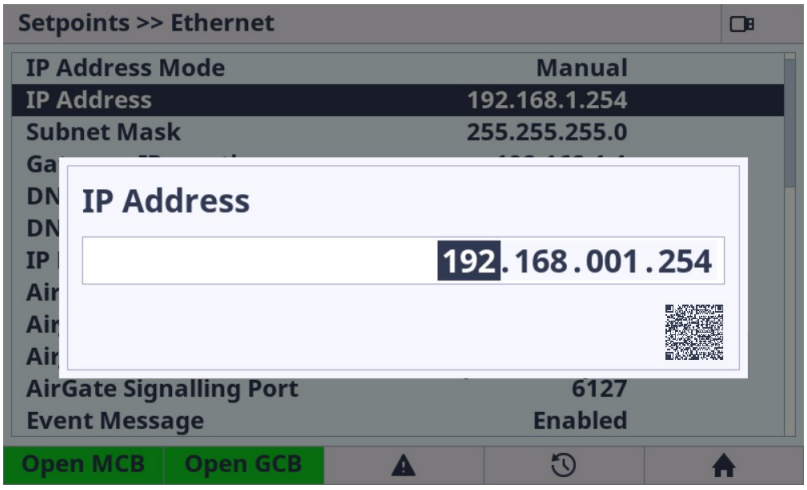


Image 5.24 : Dialog IP address overview

String List Selection

The dialog string list is dedicated for list item selection. When the dialog is active the buttons arrow up and down are used for item selection. Enter button confirms the option. Menu button cancels the dialog without saving.

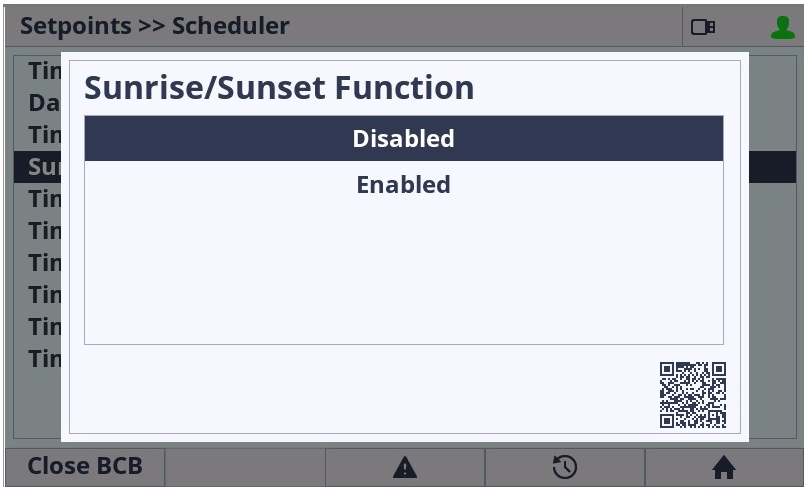


Image 5.25 : Dialog String List overview

Text Edit

The dialog text is dedicated for text inserting or modification. When the dialog is active the buttons arrow up and down are used for letter selection. Arrow up means the selection in left direction, arrow down means the selection in right direction. Arrows right/left are used for moving between the letters to the next/previous letter position in the text field. If actual position is very right letter then the arrow right inserts new letter to the right. Letter DEL deletes actualy selected letter (using left or right arrow). Insert letter (empty letter - just behind the DEL letter) inserts the letter to the actual position (using left or right arrow) Enter button confirms the text modification. Menu button cancels the dialog without saving.

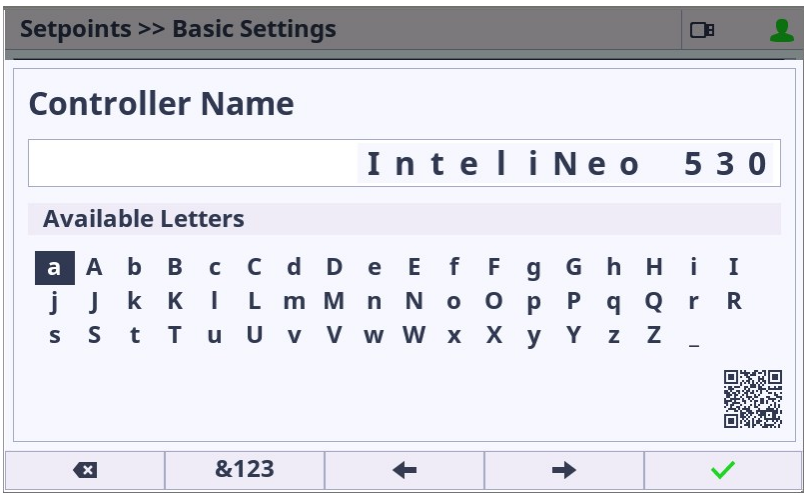


Image 5.26 : Dialog Text overview

Note: *Enter button is used for dialog confirmation and saving the entire text to the configuration and because of this the DEL and INS letter is inserted using the left or right arrow button.*

Time and date edit

Date

The dialog date is dedicated for date setting. When the dialog is active the buttons arrow up and down are used for number selection. Arrows left and right are used for moving between the date cells. Enter button confirms the option. Menu button cancels the dialog without saving.

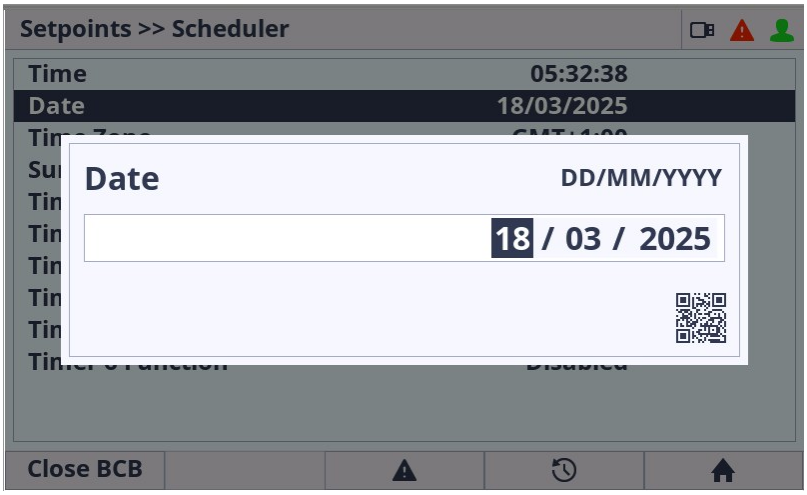


Image 5.27 : Dialog Date overview

Time

The dialog time is dedicated for date setting. When the dialog is active the buttons arrow up and down are used for number selection. Arrows left and right are used for moving between the time cells. Enter button confirms the option. Menu button cancels the dialog without saving.

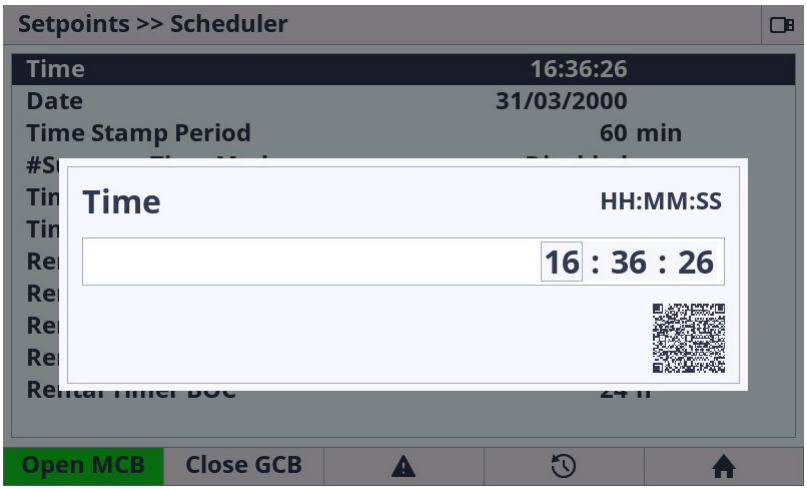


Image 5.28 : Dialog Time overview

Timer settings

The dialog timer is dedicated for timer setting. When the dialog is active the buttons arrow left and right are used for the line option selection. Enter button confirms the actual option in the line and the next option can be performed. Enter button on the last line confirms all the option in dialog and save the timer settings to the controller. Menu button cancels the dialog without saving.

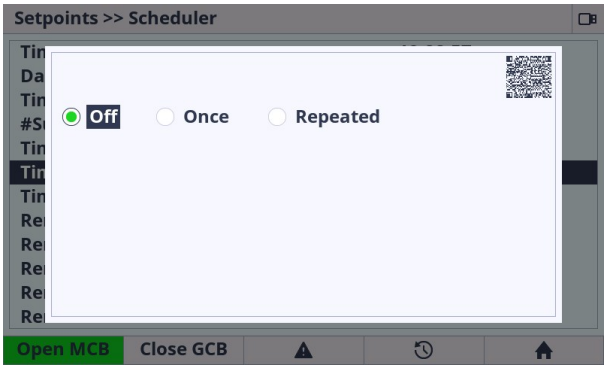


Image 5.29 : Dialog Timer (Off) overview

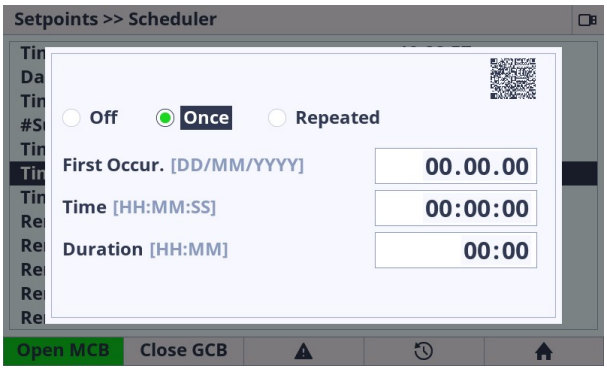
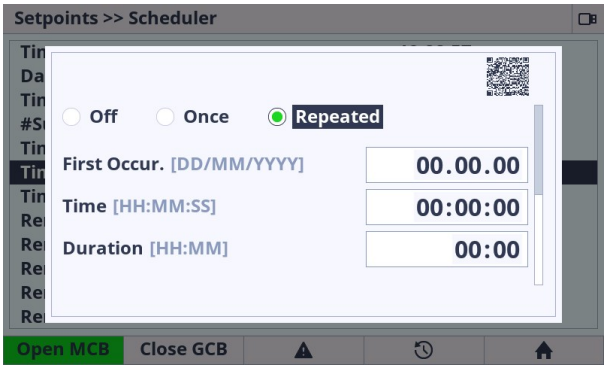
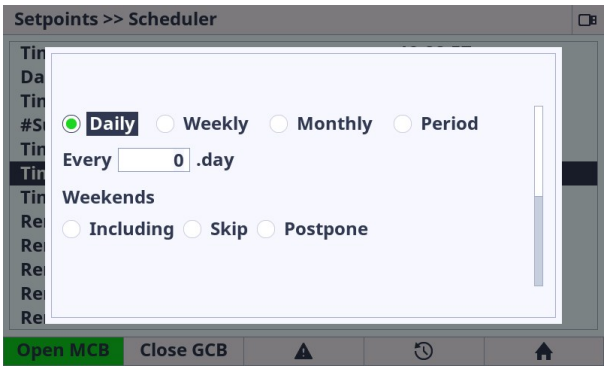
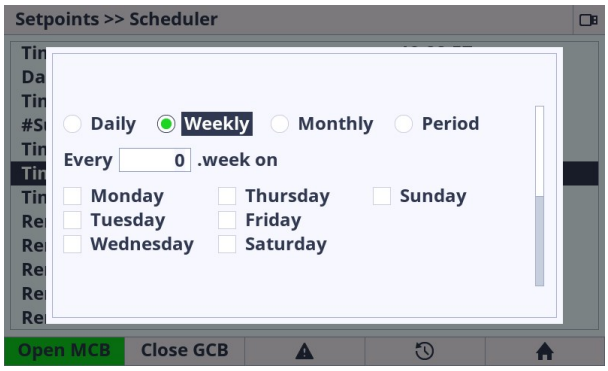


Image 5.30 : Dialog Timer (Once) overview







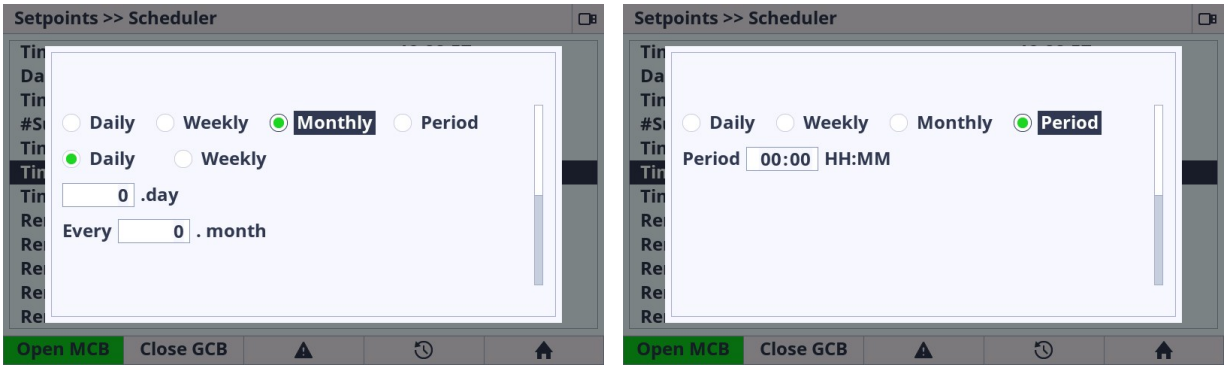


Image 5.31 : Dialog Timer (Repeated) overview

Metering screens

InteliNeo 6000 Controller screens

InteliNeo 6000 metering screens are predefined by ComAp and covers all the application types.

- the movement between the metering screens is done using the arrow up and down buttons in the front panel
- the entire screens and instruments on the screens are dynamically displayed or hidden based on the following state of the controller unit :
  - Application type
  - Wiring controller settings
  - Configured CAN modules
  - ECU list settings

InteliNeo 6000 metering screens

- Home
- Power
- BESS
- Mains
- Bus
- Synchronization
- Power Management
- Analog inputs
- Binary Outputs
- Binary Inputs
- Grid Codes
- Statistics
- Ethernet 1
- Ethernet 2
- Ethernet 3
- Hot Swap Redundancy
- CAN modules
- ECU modules
- Modbus Master Devices
- Virtual modules

Alarmlist

The alarmlist page is intended for displaying the controller alarms. If any of the following type of the controller alarm occurs The alarmlist page is displayed and also the alarm icon in the Top status bar starts flashing RED, even if it is not the shutdown alarm. The Automatic jump to the Alarmlist page is performed only in case the actual GUI position is the Home metering screen. The alarm icon in the top status bar is informative icon where the display unit informs the user that there is any alarm stored in the controller unit. Pressing the User

button 3 opens the alarmlist page. The alarmlist page is displayed until the alarmlist contains at least one unconfirmed alarm.

There are 4 different types of controller alarms :

- **Warning** ***(often also known as 1st level alarm)*** - represented by the YELLOW colour. These types of alarms inform the user that something is wrong and need to be checked and confirmed.
- **Shutdown** ***(often also known as 2nd level alarm)*** - represented by the RED colour. These types of alarms protects the BESS during the wrong state.
- **ECU alarm** - represented by the BLUE colour. This type of alarm comes from the connected external ECU units.

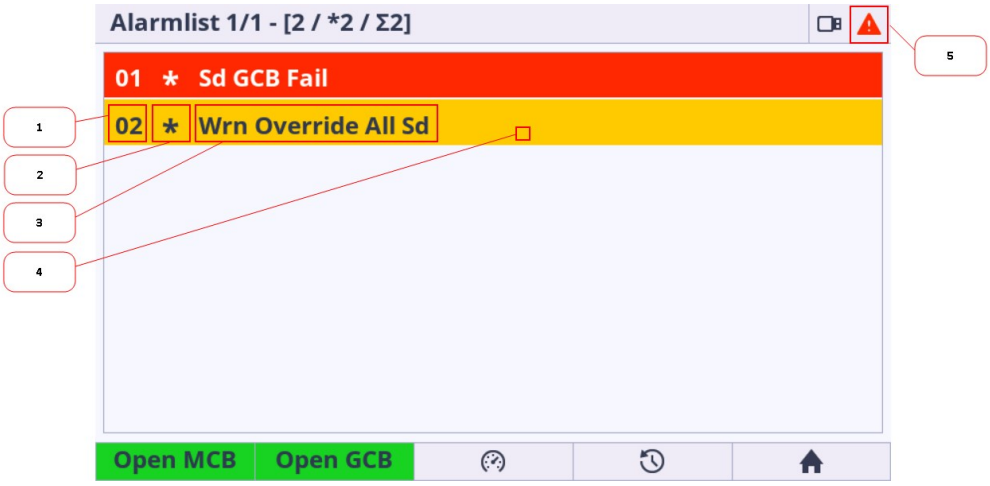


Image 5.32 : Alarmlist Page

1. **Alarm item number** - displays the number of the concrete alarm.
2. **Alarm item star** - describes if the alarm is CONFIRMED or NOT COFIRMED. The confirmation action is performed by the Alarm reset button in the front panel
   a. Star is displayed - alarm is NOT CONFIRMED
   b. Star is not displayed - alarm is CONFIRMED (using alarm reset button)
3. **Alarm description** - The short description of the alarm
4. **Alarm coloring** - There are specified the color and asterix combination
   - level 1 (warning) alarm
     - Active/unconfirmed : *** / yellow background / dark text** (asterix active)
     - Active/confirmed : **yellow background / dark text** (asterix inactive)
     - Inactive/unconfirmed : *** / dark background / yellow text** / asterix active
   - level 2 (shutdown) alarm
     - Active/unconfirmed : *** / red background / white text** (asterix active)
     - Active/confirmed : **red background / white text** (asterix inactive)
     - Inactive/unconfirmed : *** / dark background / red text** (asterix active)
   - ECU alarm
     - Active/unconfirmed : *** / blue background / white text** (asterix active)
     - Active/confirmed : **blue background / white text** (asterix inactive)

- Inactive/unconfirmed : * / dark background / blue text (asterix active)

5. **Topstatus bar Alarmlist icon** - The alarm icon is fashing red if there is at least one unconfirmed alarm (shutdown or warning) in the alarmlist. The icon lights red if there is at least one confirmed active alarm and no unconfirmed alarm in the alarmlist. The icon is inactive if the alarmlist is empty. This is information that something is wrong and need to be checked and resolved.

Note: *The Alarmlist displays maximum 8 alarm items at the same time. If there is more than 8 alarms in the alarmlist it is possible to list in the page to another alarm items by arrow up and down buttons.*

Note: *The alarmlist page is automatically displayed and backlight is turned on if the new alarm appears (only in case the actual GUI position is the Home metering screen).*

IMPORTANT: InteliVision 5.2 displays maximum 16 alarms.

IMPORTANT: Alarm reset button confirms all the unconfirmed alarms stored in controller and resets the horn. Horn reset button resets only the horn.

IMPORTANT: If the actual GUI position is Alarmlist page and there is at least one uncofirmed alarm in the Alarmlist the jump to the home metering screen and backlight timeout are ignored.

History

The history page displays the records of the important moments in the controller history.

There are 2 types of history records :

- **Event records** - are also known as standard history records. This type of record appears in case the controller event has been made. The time stamp history also belongs in the event history. The time record is stored for a specified period of time.
- **System records** - are also known as text history record. These type of records are generated during the user login/off, controller programming or other system actions.

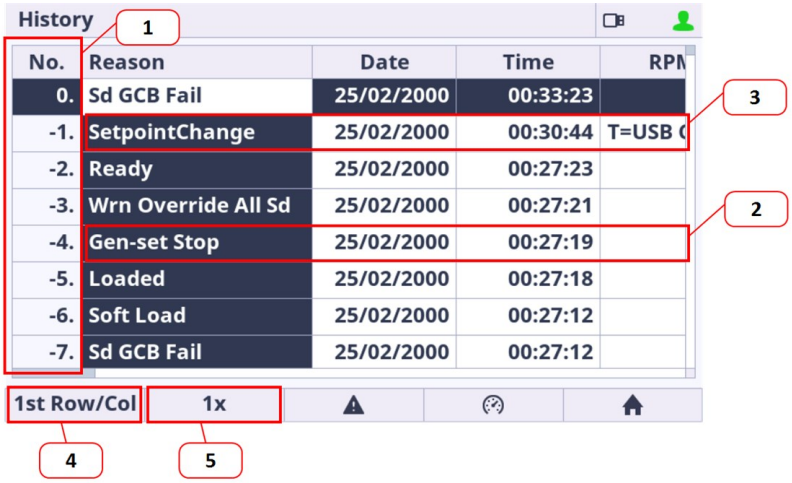


Image 5.33 : History page overview

1. **Fixed column** - has a different shade of colour. Fixed column is always merged and anchored on the left side of the history page.

2. **Event history record** - this type of record appears in case the controller event has been made.The time stamp history also belongs in the event history. The time record is stored for a specified period of time. Pressing the enter button the dialog with detailed information for selected record is displayed.
3. **System history record** - this type of record appears in case the controller system action has been made.The time stamp history also belongs in the event history. The time record is stored for a specified period of time. Pressing the enter button the dialog with detailed information for selected record is displayed.
4. **Jump to first row and column** - the jump to the first row and first column is performed if the button is pressed.
5. **Listing mode** - by pressing this button the listing mode is changed. There are available 3 modes : listing by 1 item, listing by 1 page, listing by 10 page. The mode is useful if the history is full of records. Listing mode is also automatically changed if the listing buttons arrow up and down are pressed for longer time. Original mode is set when the listing buttons are released.

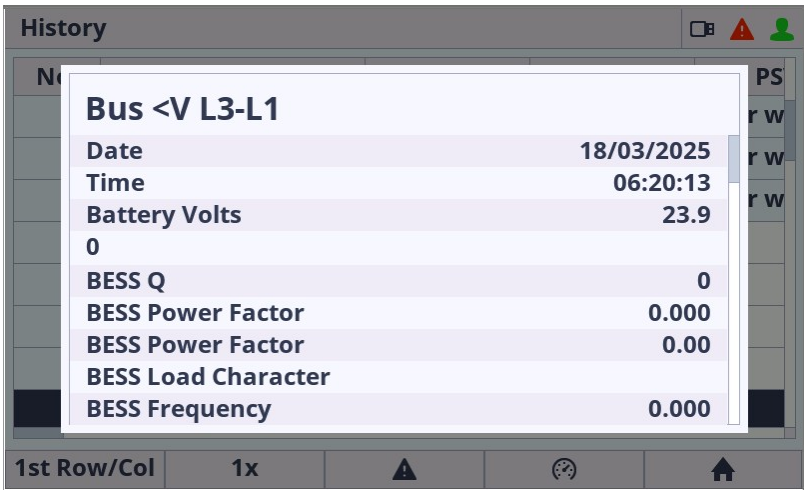


Image 5.34 : History page - Item detail dialog

Note: *Pressing the enter button on the actually selected row the dialog with detailed information for selected record is displayed.*

IMPORTANT: Each controller unit supports the specific number of history records. E.g. controller InteliNeo 6000 supports 1000 history records. Default configuration consists of 33 columns. Maximal column amount is approximately 100 columns based on the type of the observed value.

Trends

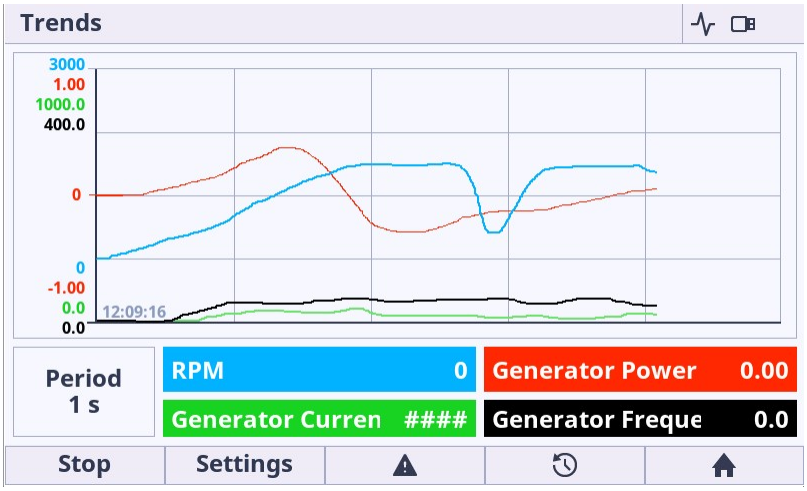


Image 5.35 : Trends page overview

The Trends page is divided on to 3 main blocks :

- **Main Trends Window** is intended to display all trends. The view and chart movement is fully automatic.
- **Channel panel** displays the actual values and sample period.
- **Function buttons** is intended for start, stop and settings of the trends.

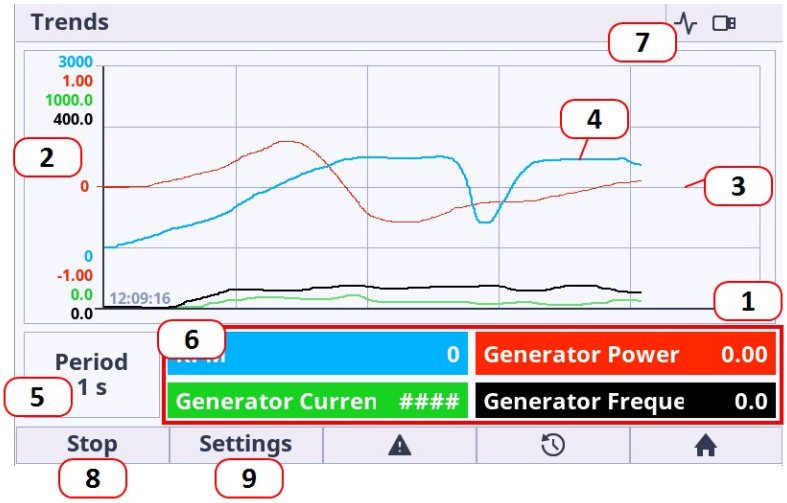


Image 5.36 : Trends page description

1. **X axis** -X axis displays the time stamps. The view of X axis is fully automatic.
2. **Y axis** - If the default range is not suitable for the displaying of the value it can be adjusted in settings option. See below for more information.
3. **Grid** - the grid is displayed behind the trends charts. The grid is fully automatic.
4. **Trend line** - each channel have different colour for better value identification. The color of the trend line match to the Value color in channel panel.
5. **Actual period** - Actual period settings. The period can be adjusted in settings option.
6. **Actual channel value panels** - display the values of the newest (actual) sample.

7. **Trend Icon** (Top Status bar) -if the trends are running the informative icon is shown in the top status bar
8. **Start / Stop button** - the button is dedicated for manual start and stop of the trends. It is possible to setup the automatic start of trending based on the trigger. There are 2 triggers : Return to Home metering screen and the specified bit of the available binary value.
9. **Channel settings button** - There are some settings available for the trends. See more information below.

Administration

Administration menu screen is accessible by using the buttons combination Enter + Menu just only from the metering screens. Enter button has to be pressed first.

Image 5.37 : Shortcut (jump to the administration)

Configuration Level

Image 5.38 : Administration Page - Configuration Level

- **Standard** - Limited amount of settings are available for configuration. The description which settings are available in chapters concerning to controller functions.
- **Advanced** - Set by factory default. All the settings are available for configuration. Be aware that only experiences users should perform the settings of extended functions.

Note: *By default the Advanced settings is selected which means all the setpoints are available by default. To restrict the availability the Standard setting must be performed. The advanced and standard category are set in InteliConfig PC application.*

Note: *Configuration Level screen is accessible using the buttons combination Enter + Menu just only from the metering screens. Enter button has to be pressed first.*

Display settings

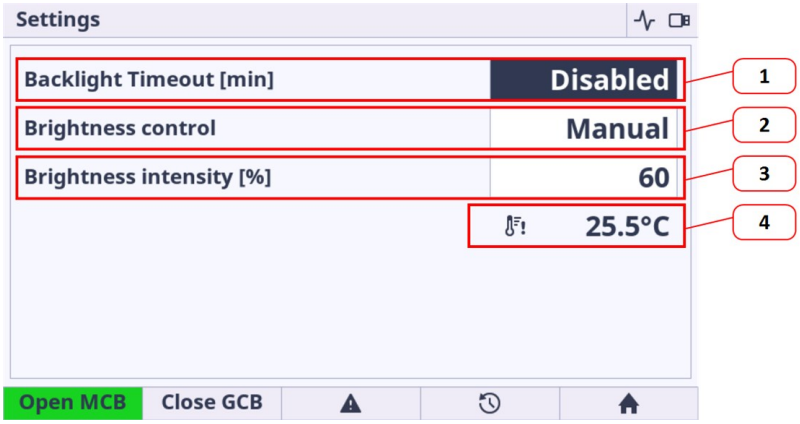


Image 5.39 : Administration Page - Settings

1. **Backlight Time** - if the cell area is pressed the dialog for time settings is displayed. The user is able to set the period from 1 up to 241 minutes. There is also the option to set NO Timeout which means the display unit is backlighted forever. Note that in remote displays like IntelIVision 5.2 the Backlight Timeout option is not mirrored with controller setpoint Backlight Timeout (it is mirrored in Integrated Color Display).
2. **Brightness Control** :
   a. Manual (by default) - the value of the backlight is set manually using the value dialog (point 3)
   b. External - the value of the backlight is controlled by the external resistor or potentiometer. Resistor 5-2400 Ω corresponds to 0-100% backlight. If the resistor value is out of range, the manual option is used.
3. **Brightness intensity** - the value is selected using the value dialog. Note the value is applied immediately during the change of the value.
4. **Internal Temperature information**- gives the actual inside temperature of the unit. There is implemented automatic mechanism for lowering the backlight intensity based the internal derating backlight curve. If the inside temperature exceeds 35 °C the area behind the temperature lights yellow. The yellow color indicates that the display backlight curve is applied and automatically starts derate the backlight intensity. The backlight intensity returns to normal when the temperature is decreased below 35 °C. This feature saves the lifetime of the internal components.

IMPORTANT: It is strongly recommended to use backlight on the standard level max. 60%. Maximal backlight intensity level of 100% is suitable only for application with higher amount of the ambient light. Be aware that higher intensity level means higher surface front glass temperature and lower lifetime.

IMPORTANT: It is strongly recommended to use Backlight Time (timer) set on the reasonable amount of time (approximately 30 minutes) during the normal running BESS phase. It is because of saving lifetime of the display unit. The display unit is still running if the backlight is off. For switching on the LCD backlight the simple pressing any button is necessary.

Note: *Settings screen is accessible using the buttons combination Enter + Menu just only from the metering screens. Enter button has to be pressed first.*

Languages

Image 5.40 : Administration Page - Languages

- **Language settings** - the list of languages stored in the controller configuration is displayed in the list of possible languages.
- The InteliVision 5.2 and Integrated Color Display units support the following languages
  - English
  - Chinese
  - Japanese
- The InteliVision 5.2 and Integrated Color Display units **partially** support the following languages
  - Bulgarian, Taiwan, Czech, German, Greek, Spanish, Finnish, French, Hungarian, Icelandic, Italian, Korean, Dutch - Netherlands, Norwegian, Polish, Roman, Russian, Croatian, Slovak, Swedish, Turkish, Ukrainian, Slovenian, Estonian, Latvian, Lithunian, Vietnamese, Italian, Portuguese, Bosnian
- The InteliVision 5.2 and Integrated Color Display units support the following Unicode standard character sets
  - Basic Latin, Latin-1 Supplement, Latin Extended-A, Latin Extended-B, Latin Extended Additional, Cyrillic, Greek, Greek Extended, Arabic, Arabic Supplement, General Punctuation, Superscripts and Subscripts, Currency Symbols, Arrows, CJK Unified Ideographs, Kanji, Hiragana (full width), Katakana (full width), Hangul Jamo, Thai

IMPORTANT: Even the language is configured in InteliConfig the specific language is unavailable if the language is empty or the language is not supported by the display unit.

Note: *The flag is not displayed if the language is supported but the flag icon does not exist in the integrated color display unit.*

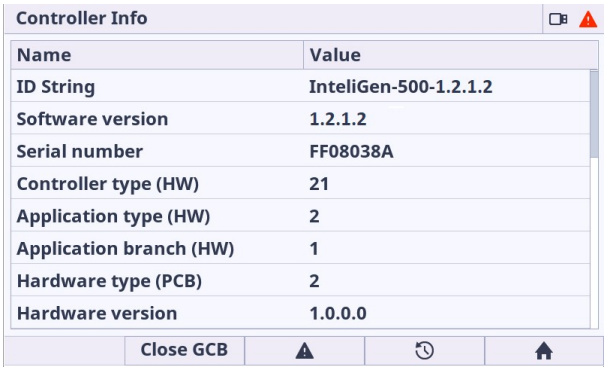
Note: *Languages screen is accessible using the buttons combination Enter + Menu just only from the metering screens. Enter button has to be pressed first.*

Controller Info

Controller Info screen in InteliVision 5.2 is dedicated for important information about the connected controller unit. These information is useful mainly for issues troubleshooting.

Controller info page is divided into 2 main blocks of information :

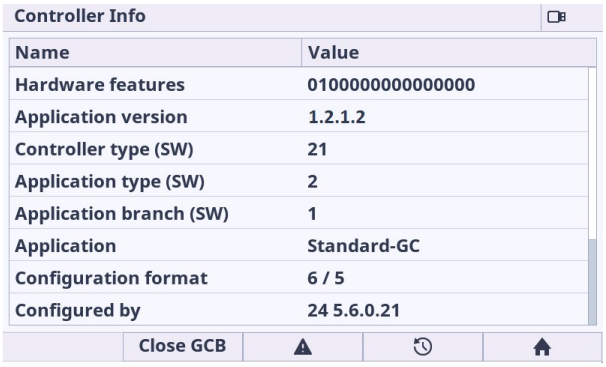
- Controller unit
  - ID String
  - Software Version
  - Serial Number
  - Controller Type (HW)
  - Application Type (HW)
  - Application Branch (HW)
  - Hardware Type (PCB)
  - Hardware Version
  - ID Chip Version
  - Hardware Features
- Configuration
  - Application Version
  - Controller Type (SW)
  - Application Type (SW)
  - Application Branch (SW)
  - Application
  - Configuration Format / Configuration Terminal Format
  - Configured by



Controller Info

Name	Value
ID String	InteliGen-500-1.2.1.2
Software version	1.2.1.2
Serial number	FF08038A
Controller type (HW)	21
Application type (HW)	2
Application branch (HW)	1
Hardware type (PCB)	2
Hardware version	1.0.0.0

Close GCB



Controller Info

Name	Value
Hardware features	0100000000000000
Application version	1.2.1.2
Controller type (SW)	21
Application type (SW)	2
Application branch (SW)	1
Application	Standard-GC
Configuration format	6 / 5
Configured by	24 5.6.0.21

Close GCB

Image 5.41 : Administration Page - Controller Info

Note: *Similar values with similar structure can be displayed using InteliConfig PC tool.*

Note: *Controller Info screen is accessible using the buttons combination Enter + Menu just only from the metering screens. Enter button has to be pressed first.*

IMPORTANT: Integrated Color Display information in Controller Info screen is not available in remote displays.

Modules Info

Modules Info screen is dedicated for important information about the connected CAN and Plug-In modules information. The page Modules Info displays the information from the following type of connected modules :

- Plug-In modules
- CAN peripheral extension modules

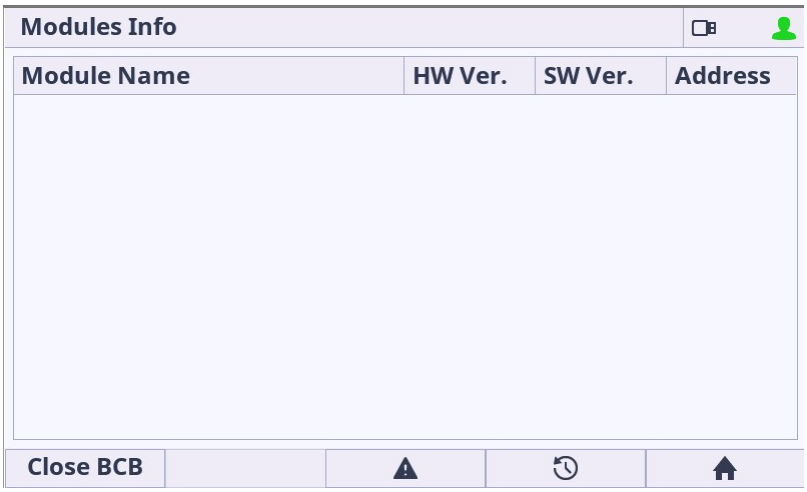


Image 5.42 : Administration Page - Modules Info

Note: *The availability of the connected module depends on the type of controller unit.*

Note: *Modules Info screen is accessible using the buttons combination Enter + Menu just only from the metering screens. Enter button has to be pressed first.*

ECU Modules Info

Electronic Control Unit Modules screen is dedicated for important information about the connected modules information.

The screen ECU Modules displays the information from the following type of connected modules :

- ECU Modules

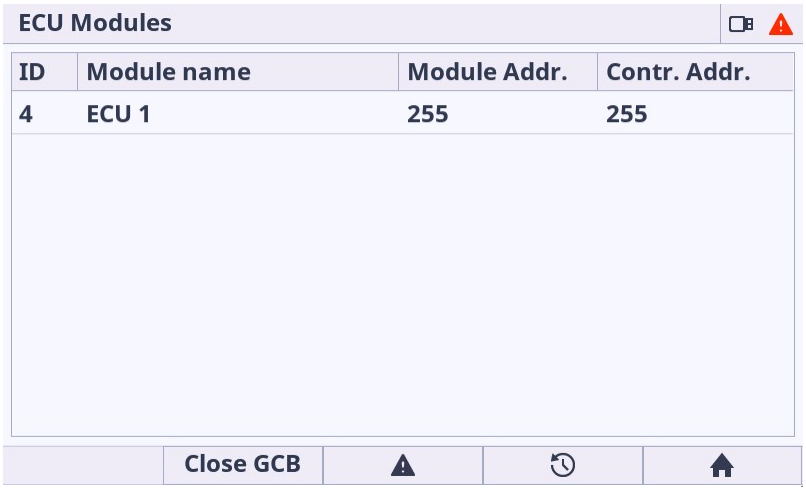


Image 5.43 : Administration Page - ECU Modules

Note: *The availability of the connected ECU module depends on the type of controller unit.*

Note: *ECU Modules screen is accessible using the buttons combination Enter + Menu just only from the metering screens. Enter button has to be pressed first.*

Basic operating modes description

This chapter contains brief information on how the controller behaves in different modes of operation. If you require more information on separate functions of the controller please go to the chapter **Operating Modes**

The InteliNeo6000 has the following controller operation modes: OFF, MAN , and AUT .

OFF mode

- No start of the BESS is possible and starting command cannot be issued.
- No reaction if buttons **START**, **STOP**, **MCB ON/OFF**, **BCB ON/OFF** are pressed.

Note: *When the BESS is running, it is not possible to switch the controller to OFF mode.*

MAN mode

- To start the BESS press **START**.
- When the BESS voltage is within limits, the BESS icon will light green.
- Press **BCB ON/OFF** to close the BCB. If the BESS voltage is out of the limits, controller does not respond to the **BCB ON/OFF** .
  - If controller detects dead bus, immediately closes output.
  - If controller detects voltage on the bus, starts synchronizing.
- When the breaker is closed, the breaker icon will light green.

- To stop the BESS press **STOP**
  - Controller unloads the BESS, opens **BCB CLOSE/OPEN**. Unloading is active only when binary input **MCB FEEDBACK** is closed or other BESS is connected to bus. In other case **BCB CLOSE/OPEN** opens immediately.

AUTO mode

- BESS is controlled based on external signals **UNIVERSAL GENSET START/STOP** or conditions (AMF, Peak shaving, Power management system, etc.).
- When one condition deactivates the BESS, it will not stop if another condition for automatic starts is active.
- Controller does not respond to **BCB ON/OFF**, **MCB ON/OFF**, **STOP**, **START** buttons and corresponding remote InteliScada or Modbus commands.

> **IMPORTANT: If a red alarm is present and the controller is in the AUT mode, the BESS can start by itself after all red alarms become inactive and are acknowledged (fault reset is pressed)! To avoid this situation, adjust the setpoint Fault Reset To Manual to the Enabled position.**

5.2 Controller configuration and PC tools connection

5.2.1 USB 120
5.2.2 Ethernet 121

back to Controller setup

This chapter contains brief introduction into the specifics of firmware and archive upload and connection of various PC tools to the controller. If you require detailed information on each PC tool please use the included Help in those PC tools or download their Global Guides.

5.2.1 USB

You may connect to the controller using the USB Port. In this case standard USB A to B cable should be used - **USB** connection.

Connection using InteliConfig

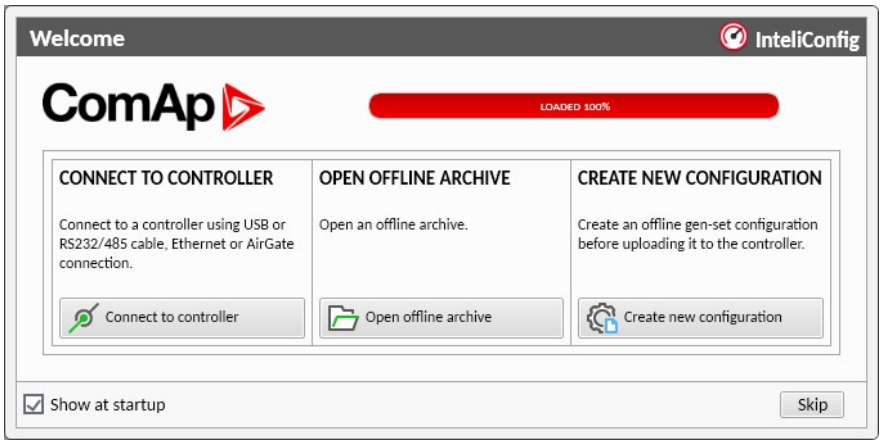


Image 5.44 First screen of InteliConfig - select connect to controller

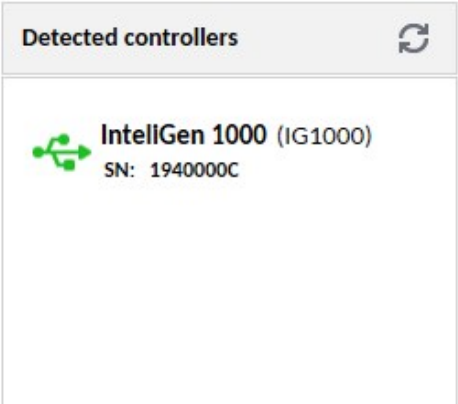


Image 5.45 Second screen of InteliConfig - Select your controller from list of Detected controllers.

Select your controller from the list of Detected controllers. You need to know your contoller's serial number.

Note: *You do not need to be using user account while connecting via USB.*

Connection using WinScope

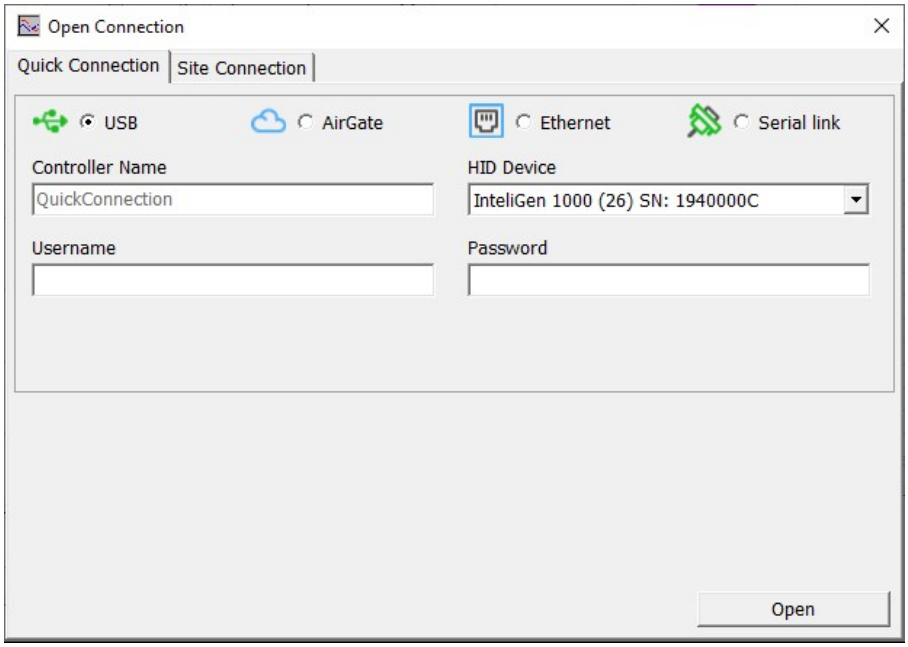


Image 5.46 WinScope screen - Select your controller from list of Detected controllers.

Select your controller from the list of Detected controllers. You need to know your contoller's serial number.

Note: *You do not need to be using user account while using WinScope1000 connected via USB.*

5.2.2 Ethernet

You may connect to the controller using any of the **Ethernet 1**, **Ethernet 2**, or **Ethernet 3** ports, if correct Ethernet Port Configuration settings are applied (**Ethernet port 1**, **Ethernet port 2**, **Ethernet port 3**).

Note: *See **Communication peripherals** to see differences between these peripherals.*

Note: *Go to **Types of interfaces** to see types of ethernet interfaces and possibilities of connections.*

Direct connection

When you use direct connection the controller needs to be reachable directly from the PC you use (i.e. one LAN or WAN without any firewalls and other points that may not allow the connection). The following settings need to be checked in the controller:

- **Direct Connection Port** has to be set to the same value as in the PC tool.
- **IP Address Mode** can be set to AUTOMATIC when there is DHCP service is available. Otherwise it needs to be set to FIXED.
- **IP Address** is either set automatically or it can be adjusted to a specific requested value.
- **Subnet Mask** is either set automatically or it can be adjusted to a specific requested.
- **Gateway IP** can be set here when it is used.

Note: *The connection speed might be significantly limited when you connect the controller directly from the PC and your Ethernet card is setup to Energy-Efficient Ethernet option.*

Connection using InteliConfig

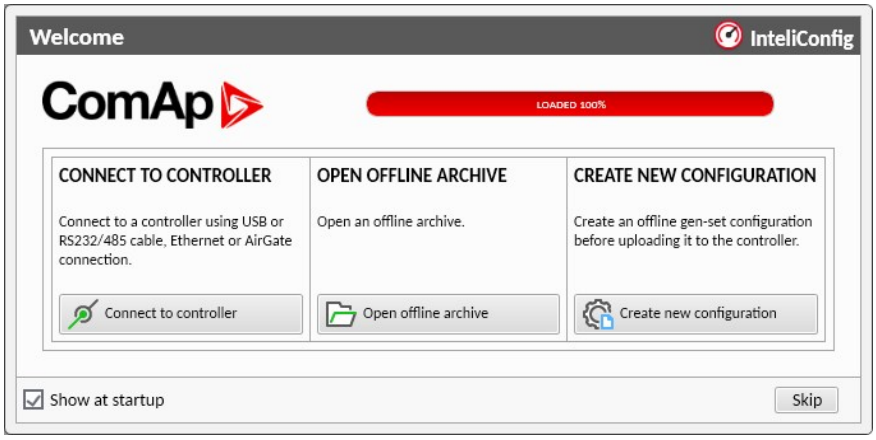


Image 5.47 First screen of InteliConfig - select connect to controller

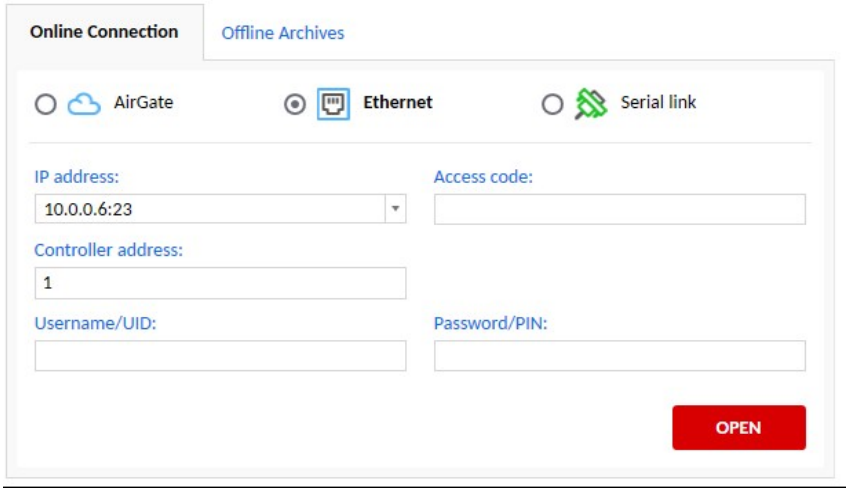


Image 5.48 Second screen of InteliConfig - select Ethernet

Use **IP address** which is stored in proper value (based on selected Ethernet peripheral) and fill **Controller address** - this needs to be same as value of **Terminal Comm Address**.

IMPORTANT: Never fill Access code!

> **IMPORTANT: In case of using Ethernet 2 you need to fill Username and Password of actual user account.**

Image 5.49 Second option of connection via InteliConfig

You can also select controller from "Detected controllers" feature. If this controller is connected via **Ethernet 2** you will be prompted to fill **Username** and **Password** of actual user account.

Connection using WinScope

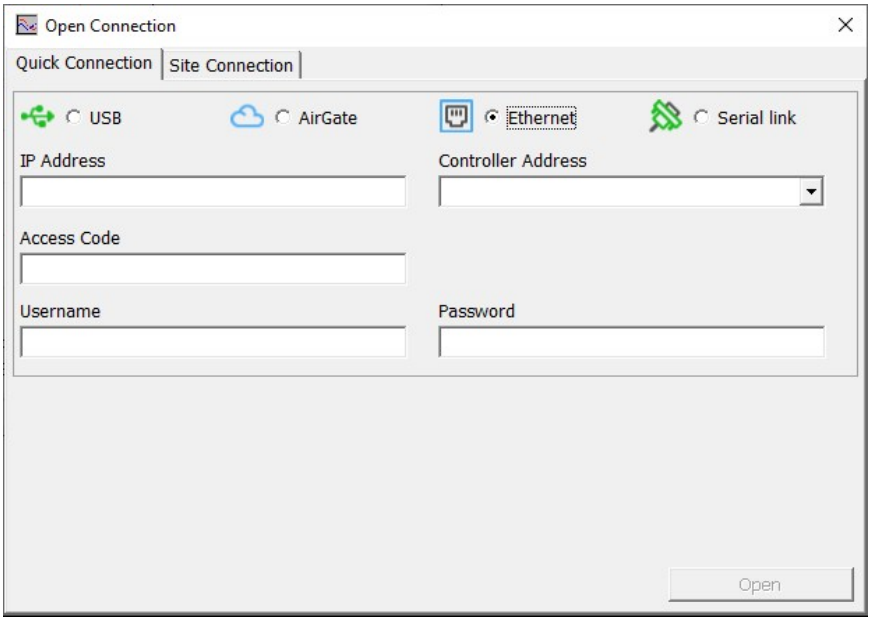


Image 5.50 WinScope screen - select Ethernet

Use **IP address** which is stored in proper value (based on selected Ethernet peripheral) and fill **Controller address** - this needs to be same as value of **Terminal Comm Address**.

> **IMPORTANT: Never fill Access code!**

> **IMPORTANT: In case of using Ethernet 2 you need to fill Username and Password of actual user account.**

AirGate connection

You may connect to the controller using AirGate which works only via **Ethernet 2**. If the AirGate key in the Access Administration is empty the controller will not connect to the AirGate despite the function is enabled. Access Administration is available in Tools of the InteliConfig.

Setpoints and values related to connection via AirGate:

- **AirGate Connection** - has to be **ENABLED**
- **AirGate Address** - manually adjusted address of AirGate server
- **AirGate Port** - manually adjusted port for communication between Controller and AirGate server
- **AirGate Status** - has to be **connected, operable**
- **AirGate ID** - 9 numbers long ID of the controller

IMPORTANT: Controller has to be connected to the Internet.

Connection using InteliConfig

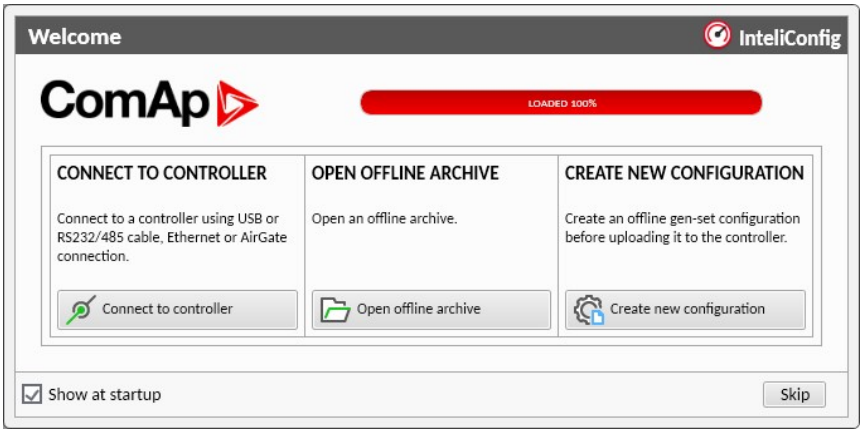


Image 5.51 First screen of InteliConfig - select connect to controller

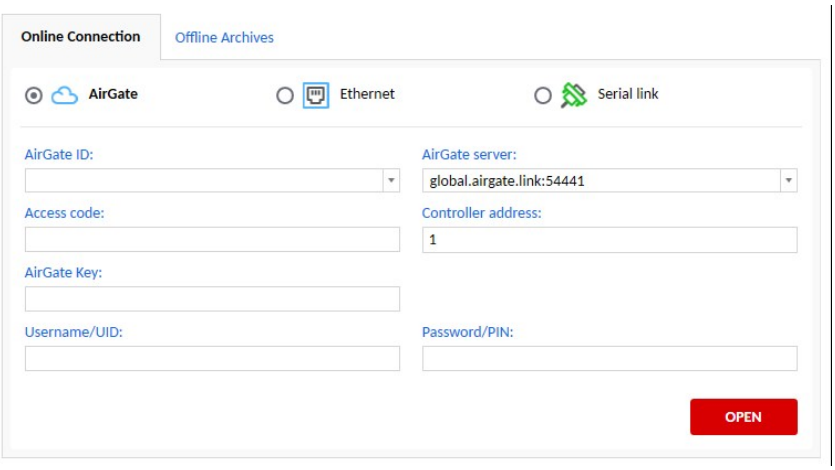
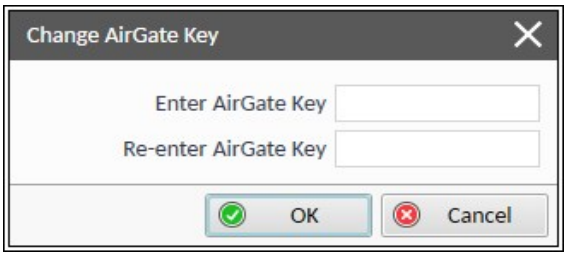


Image 5.52 Second screen of InteliConfig - AirGate

Use **AirGate ID**, **AirGate server** with proper port (54441 for global.airgate.link), **AirGate Key** and **Controller address** - this needs to be same as value of **Terminal Comm Address**. Valid user account - **Username** and **Password** - is required for the connection.

IMPORTANT: Never fill Access code!

Note: *Ask your administrator for **AirGate Key**. Administrator can always change the key via InteliConfig using "Tools -> Access administration -> Change AirGate key"*



Connection using WinScope

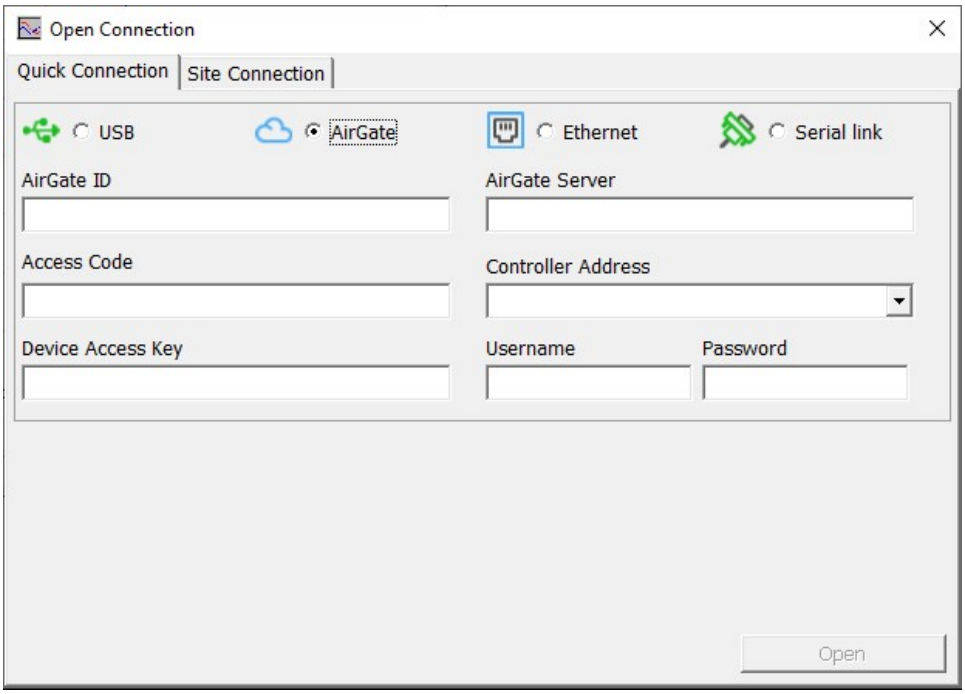


Image 5.53 WinScope1000 screen - select AirGate

Use **AirGate ID**, **AirGate Server** with proper port (54441 for global.airgate.link), **Device Access Key** and **Controller Address** - this needs to be same as value of **Terminal Comm Address**. Valid user account - **Username** and **Password** - is required for the connection.

IMPORTANT: Never fill Access code!

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General functions which are not directly related to the Microgrid application are described in this chapter.

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6.1.1 3V3 Reference Voltage Measurement

The 3V3 reference voltage is critical for the right functionality of analog/digital converters (ADC). If the 3V3 reference is out of the limit (less than 3.2 V or more than 3.4 V) all voltage measurements will be distorted. In this case, the LBO **HW AC VOLTAGE MEASUREMENT ERROR** is activated. It is recommended to use this LBO to activate user protection which will open the BCB and turn off the BESS to prevent any damage to the BESS, load, or Mains.

The input value for the LBO is given by the average of all 3 measured reference voltages which increases the robustness of the protection. The reference voltage should be always fixed and within the limit. Wrong reference voltage might mean the controller unit is going to fail. The LBO **HW AC VOLTAGE MEASUREMENT ERROR** is deactivated immediately after the average value of the reference voltage is back within the limit. If the LBO is still being active, you can try to power off and power on the controller unit. If it doesn't help, it is recommended to contact the technical support.

6.1.2 Access lock

The Access lock function allows any user with Access level 1 and higher to Lock the controller configuration for other users. There access lock can work in 2 modes - the mode is defined by setpoint **Access Lock Mode**. So, only the user who locked the controller will be able to use the controller buttons, change setpoints or write configuration into the locked controller. All LBIs will be still operable, using the PLC the LBO **ACCESS LOCKED** can be used to block any LBIs. The configuration can be unlocked only by the user who locked it or by the administrator. This function can be especially useful if more people are remotely connected to the same controller. The access lock works the same way for configuration via the InteliVision display.

There are 5 types of buttons in the InteliConfig that signalize the actual state of the Access lock.

1. Default state: The controller configuration is unlocked and the user has permission to lock it for other users.
2. The controller configuration is locked by you.
3. The controller configuration is locked by another user and you can unlock it because you are logged in as administrator.
4. The controller configuration is locked by another user and you cannot unlock it.
5. The controller configuration is unlocked and your Access level is too low to lock it.

Configurable Access Lock behavior

The extension of functionality is based on the requirement that the machinery is equipped with more operator stations and the control must have only one of them at any time.

The lock is required for control in Exclusive mode, i.e. user have to activate Access lock with his account to control the controller.

Access Lock release request

Any user with permission to control the lock will be able to send a request to hand over control when the control is locked by another user. The request is automatically deactivated when the lock is unlocked.

The user who is the owner of the locked lock will see on the display that the unlock request is active and the lock icon will change. The icon will also change on the side of the user who sent the request.

In case of emergency, you can use the option to unlock the Access Lock by a user with an administrator role.

The owner of the lock may hand over control to the applicant by confirming the release of the lock.

The release request indication is canceled by unlocking the lock and this occurs in 3 cases:

- The owner of the lock will unlock it
- The administrator will unlock it
- Automatic unlocking if the owner of the lock no longer has any sessions. Applies to setpoint **Automatic Access Lock Release** settings Enabled.

Concurrent sessions limit

You can set the number of concurrent sessions for a logged-in user. It is possible not to limit this number and this option does not apply to the administrator role or implicit user.

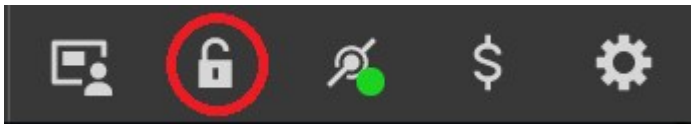
For more details see **User sessions limit**

Access lock activation

The user as several options hot to activate the access lock:

- InteliConfig - **Lock Access** button

- InteliVision 5.2 - **Administration** screen
- InteliSCADA - lock button



- General commands for Access lock can be found in **List of commands and arguments**

6.1.3 Alarm Management

Alarms indicate occurrence of unwanted or critical situations such as unexpected opening of breaker, BESS overvoltage etc. But in certain situations, we use alarms as a way to visualize information that affects current behavior of the controller.

The controller evaluates two levels of alarms. Level 1 – yellow alarm – is a non-critical alarm that is only informative and does not take any action regarding the BESS control. Level 2 – red alarm – represents a critical situation, where an action must be taken to prevent damage of the BESS or technology.

- One alarm of level 1 and one alarm of level 2 can be assigned to each binary input
- Multiple protections can be assigned on each analog input.
- There are also **Controller integrated protections** with **Fixed Protection States**.
- Each alarm is written to the **Alarmlist**.
- Each alarm causes a record to be written into the history log.
- Each alarm activates the Alarm and Horn output.
- Each alarm can cause sending of a SMS message or an email.

Analog input alarm evaluation principle

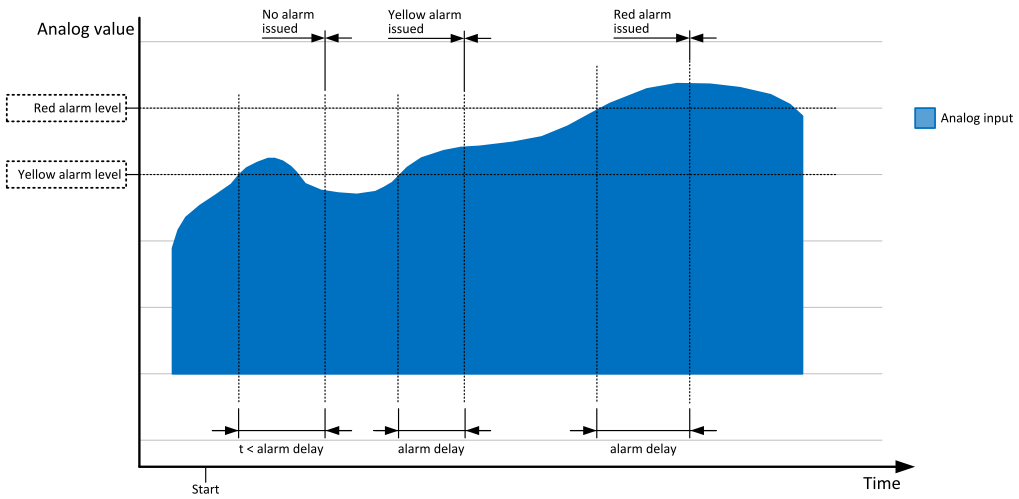


Image 6.1 Analog input alarm evaluation principle

Alarm states

An alarm can have following states:

- Active alarm: the alarm condition persists, alarm delay has elapsed.
- Inactive alarm: the alarm condition has disappeared, but the alarm has not been confirmed.
- Confirmed alarm: the alarm condition persists, but the alarm has already been confirmed.

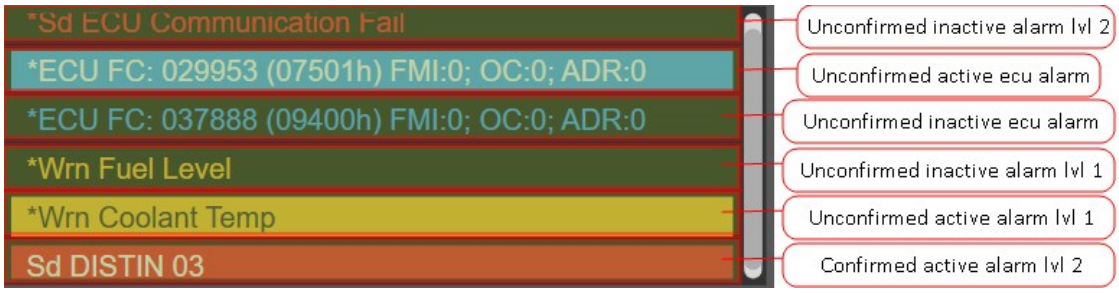


Image 6.2 Alarm List

Visual interpretation of alarm is decided by terminal side. Commonly for active alarms whole row background is colored (yellow/red/blue). Inactive alarms have transparent background color and text is colored (yellow/red/blue)

Alarm types

The controller recognize 3 basic types of the alarm. Each type of alarm is paired with specific types of **Protection types**.

Alarm Level 1

The level 1 alarm indicates that a value or parameter is out of normal limits, but has still not reached critical level. This alarm does not cause any actions regarding the BESS control. For whole list see **Alarms level 1**

Alarm Level 2

The level 2 level alarm indicates that a critical level of the respective value or parameter has been reached. For whole list see **Alarms level 2**

Note: *It is not possible to start the BESS if any red level protection is active or not confirmed.*

> **IMPORTANT: The BESS can start by itself after acknowledging the alarms if there is no longer an active red alarm and the controller is in AUTO mode!**

Sensor fail detection (FIs)

If the measured resistance on an analog input exceeds the valid range, a sensor fail will be detected and a sensor fail message will appear in the **Alarmlist**. The valid range is defined by the most-left (RL) and most-right (RH) points of the sensor characteristic ±12.5% from RH-RL.

Note: *Sometimes there can be problem with lower limit of valid range which can be counted as negative number. In this case the lower limit is set as one half of the RL point of the sensor curve characteristic.*

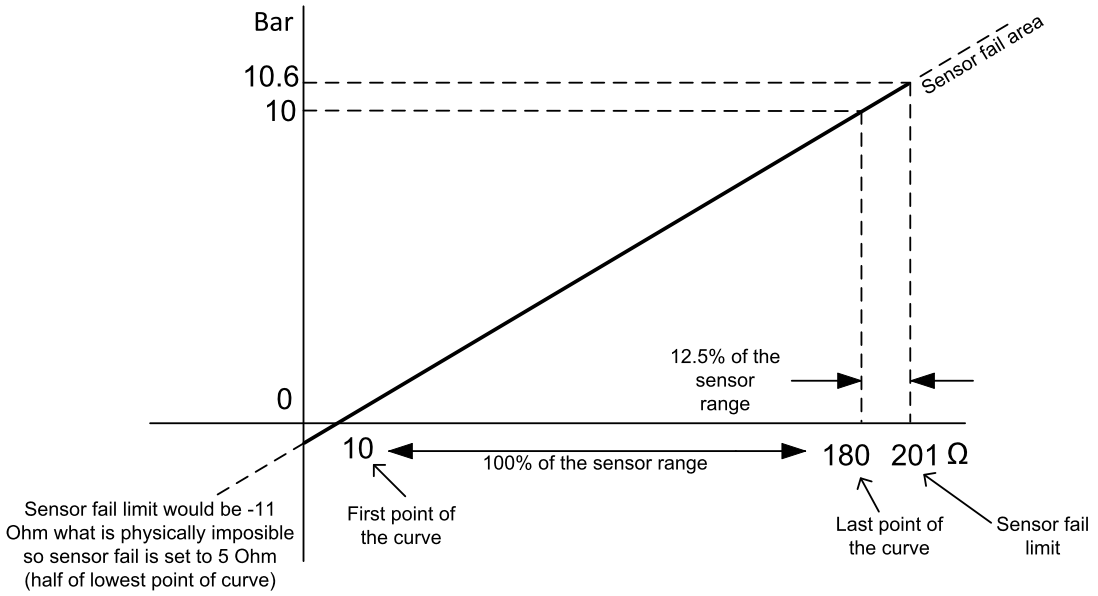


Image 6.3 Sensor fail detection principle

If the measured resistance on an analog input exceeds the valid range, a sensor fail will be detected and a sensor fail message will appear in the **Alarmlist**. The valid range is defined by the most-left (RL) and most-right (RH) points of the sensor characteristic ±12.5% from RH-RL.

Remote alarm messaging

The controller can sends emails at the moment when a new alarm appears in the **Alarmlist** or new event is written in **Event History**. The message will contain a copy of the **Alarmlist** or reasons from **Event History**. To enable this function, adjust setpoints **Sd Message**, **Wrn Message**, or **PVBO Message** to ON. Also enter a valid email address to the setpoints, **E-mail Address 1**, **E-mail Address 2**, **E-mail Address 3**, or **E-mail Address 4**.

The list of all supported terminals shows the table below:

Terminal	Event message	Alarm messages (Subgroup: Messages Settings)
RS485	NO	NO
USB	NO	NO
Ethernet	YES	YES

Alarmlist

Alarmlist is a container of active and inactive alarms. It will appear automatically on the controller display, if a new alarm occurs, or can be displayed manually from the display menu.

Active alarms are shown as inverted, not yet confirmed alarms are marked with asterisk before them.

Alarmlist contains three types of alarms:

- Controller built-in alarms
- User configured alarms
- ECU alarms

Controller integrated protections

An alarm message in the alarmlist begins with a prefix, which represents the alarm type (e.g. Wrn, AI, Hst, ALI...). Then the alarm name follows. In some cases the prefix can be omitted.

User configured protections

An alarm message in the alarmlist begins with a prefix, which represents the protection type (e.g. Wrn, AI, Hst, ALI). Protection type and alarm name are selected by user during the **Configuration of protections in InteliConfig**. Then the alarm name follows.

ECU alarms

The ECU alarms are received from the Electronic Control Unit. The alarms are represented by the Diagnostic Trouble Code, which contains information about the subsystem where the alarm occurred, the alarm type and the alarm occurrence counter.

The most common fault codes are translated into text form. Other fault codes are displayed as a numeric code and the ECU fault codes list must be used to determine the reason.

6.1.4 Breaker Control

The following power switches are controlled by the controller:

- The BESS Circuit Breaker or contactor – BCB
- The PV Circuit Breaker or contactor – PVCB (breaker for renewables)
- The Mains Circuit Breaker or contactor – MCB (see the chapter **MCB special requirements**)
- The Neutral Contactor Breaker - NCB (see the chapter **Neutral Contactor Breaker**)

The PVCB breaker can only be closed to an energized bus, meaning there must be healthy AC voltage on the bus. The moment of closing the BCB breaker depends on the setpoint of the **Starting Sequence BCB Control**.

It is possible to use either a motorized circuit breaker or contactor. Below is a list of available control outputs that should fit all types of contactors or breakers. The following rules must be kept to when designing the wiring of power switches:

- The control outputs must be configured and wiring of the power switches must be provided in such a way, that the controller has full control over the breakers – i.e. the controller can open and close the breaker at any time.
- The breaker must respond within max. 2 seconds to a close and open command. Special attention should be paid to opening of motorized circuit breakers, as it could take more than 2 seconds on some types. In such cases it is necessary to use an undervoltage coil for fast opening.
- After opening the breaker, there is internal delay for another closing of breaker. Delay is 6 seconds - 5 seconds for OFF coil and 1 second for UV coil. After these 6 seconds, breaker can be closed again. For opening of breaker there is no delay.

Breaker control outputs

Close/Open	An output for control of a contactor. Its state represents the breaker position requested by the controller. The breaker must react within 2 seconds to a close or open command, otherwise an alarm is issued.
ON coil	An output giving a 2 second pulse in the moment the breaker has to be closed. The output is intended for control of close coils of circuit breakers.
OFF coil	An output giving a pulse in the moment the breaker has to be opened. The pulse lasts until the feedback deactivates, but at least for 2 seconds. The output is intended for control of open coils of circuit breakers.
UV coil	The BCB UV coil output is active the whole time the BESS is running. The MCB and PVCB UV coil output is active when the controller is switched on. The output is deactivated for at least 2 seconds in the moment the breaker has to be switched off. The output is intended for cont rol of undervoltage coils of circuit breakers.

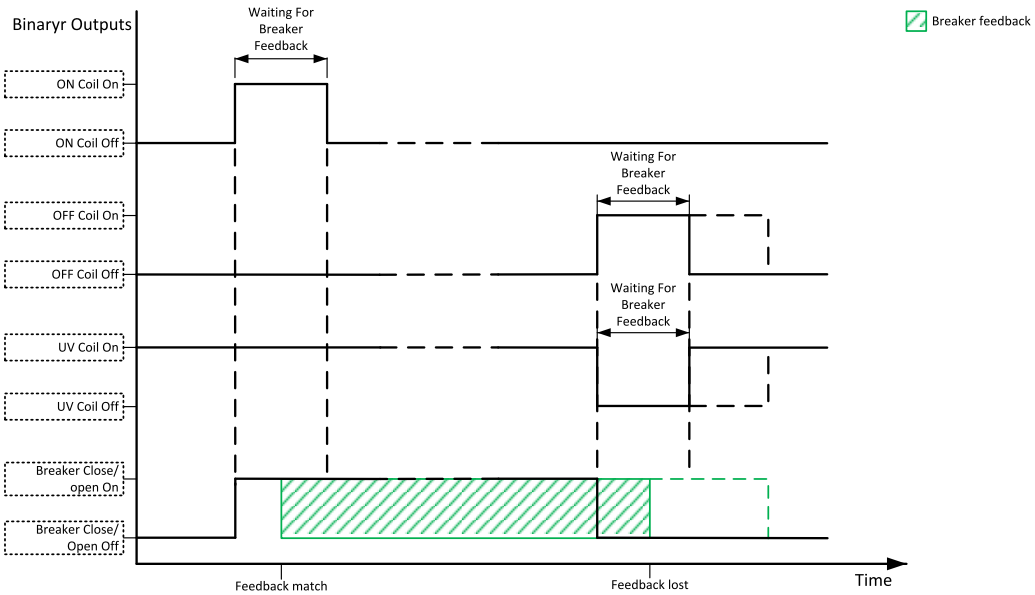


Image 6.4 Breaker control outputs

MCB special requirements

- If a contactor is used on the MCB position, it is recommended that the wiring be provided in such a way that the contactor will be normally closed and will open if the logical binary output **MCB Close/Open** closes. This behavior is called "negative logic" and can be adjusted by the setpoint **MCB Logic**. The negative logic will prevent accidental opening of the MCB when the controller is switched off.

Breaker fail detection

Breaker fail detection is based on binary output breaker close/open comparing with binary input breaker feedback. If breaker feedback is not configured and breaker control mode is internal, the alarm will be activated always because the change of the breaker close/open will not be followed by breaker feedback.

There is an exception for the MCB breaker. If the breaker feedback indicates the MCB has unexpectedly opened without any command given by the breaker close/open signal from ComAp controller, the controller will accept it

and following behavior will depend on Mains condition. The MCB breaker stay opened if Mains fails or is closed if Mains is healthy.

There are three different alarm types, see following diagrams.

- When binary output breaker close/open is in steady state and breaker feedback is changed the breaker fail is detected immediately without delay and alarm **Stp BCB Fail** is issued. The alarm is issued also after 500 ms when there is mismatch of LBI **BCB FEEDBACK** and LBI **BCB FEEDBACK NEGATIVE** . Except opening of MCB.

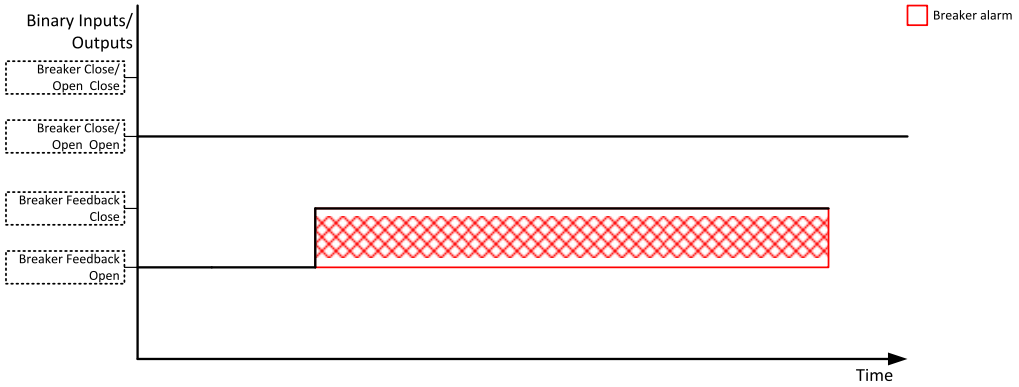


Image 6.5 Breaker fail - breaker close/open in steady position - open

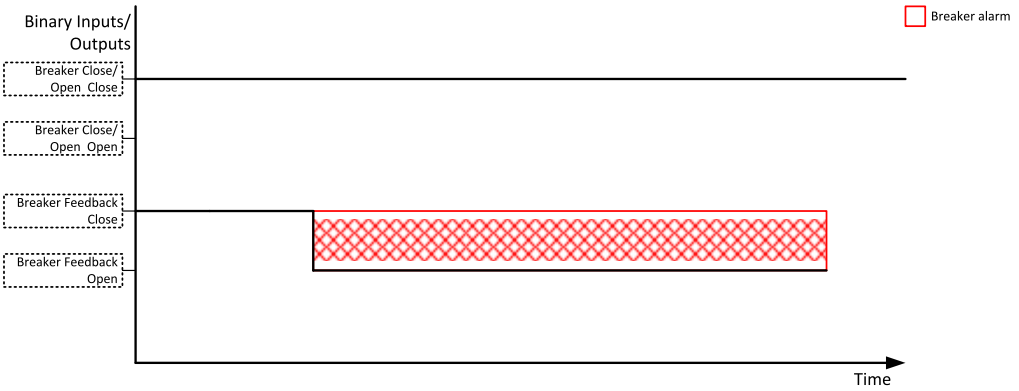


Image 6.6 Breaker fail - breaker close/open in steady position - close

- When binary output breaker close/open is opened, there is 2 seconds waiting time for feedback If feedback doesn't match, the alarm **Sd BCB Fail To Open**is issued.

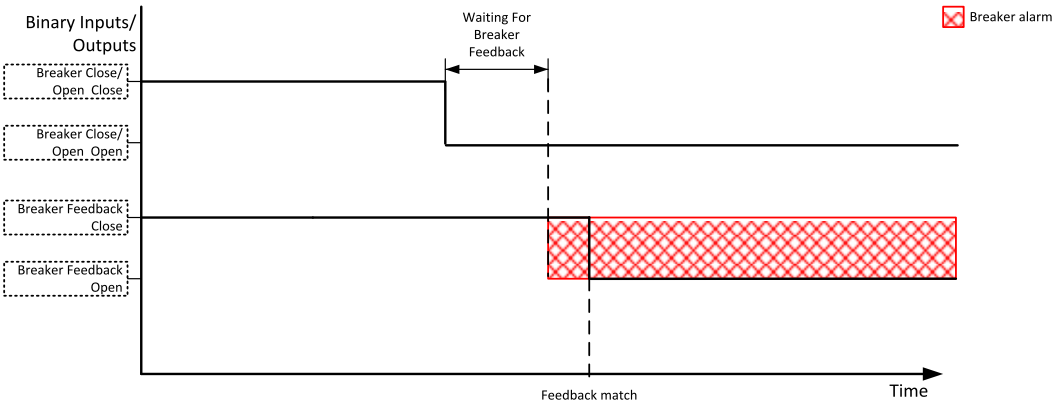


Image 6.7 Breaker fail - breaker close/open opens

- When binary output breaker close/open is closed there is 2 seconds waiting time for feedback. If the feedback doesn't match the output, close/open is opened and closed again after delay defined by setpoint **Delay Between Closing Attempts**. If feedback doesn't match after second try and 2 seconds delay elapsed, the alarm **Sd BCB Fail To Close** is issued.

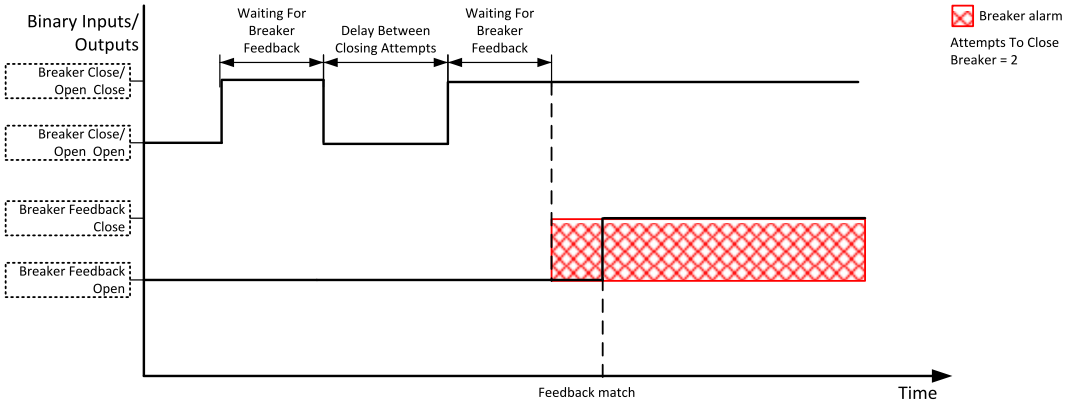


Image 6.8 Breaker fail - breaker close/open closes

Note: *In case of using both feedbacks (standard and negative), both of them have to be in correct position, otherwise breaker fail is issued after 500 ms.*

Neutral Contactor Breaker

Note: *This chapter is common for Gen-sets and BESS.*

The neutral contactor is used to connect the neutral wire (N) with the protective wire (PE) in a TN-S system. This connection is used to ground the parasitic capacities and inductions and at one moment there can be only one connection like this in the whole electric circuit. So, once the Site is connected to the Mains, the Site NCB must be opened because the Mains has its own grounding.

For the MINT application there are two possible ways how to use the NCB. The first option is having a NCB for **each** unit in the system, the second option is having one **common** NCB for all units in the system. The setpoint **#Neutral Contactor Control** is used to choose if **EACH** or **COMMON** behavior of the NCB will be used.

For the MPTM application the NCB works like there is one **common** NCB for whole MPTM system.

Note: *The information mentioned in the breaker control outputs and fail detection chapters above are not related to the NCB breaker. The NCB has only one avialable output (Close/Open) and only basic NCB fail detection without repeated command for breaker closing.*

EACH

The **EACH** option should be used if each BESS has its own neutral contactor. The **NCB CLOSE/OPEN** output on each BESS is given by an internal algorithm, which ensures, that always exactly one Gen-set connected to the bus with the lowest CAN address has the neutral contactor closed.

- **Four-pole MCB, MGCB, and GCBs, BCBs have to be used in this case** - all running Gen-sets or BESSes that are not connected to the bus have their own NCB closed.
- The output is always opened while the Gen-set or BESS are not running.
- The output is always opened while the MCB + MGCB (only for MGCB application) + GCB, BCB are closed (Gen-set or BESS is running parallel to Mains).

- The output is closed while the Gen-set or BESS is running and at least one BESS Ph-Ph voltage exceeds 85% of the nominal voltage. It opens when the BESS voltage in all phases drops below 50% of the nominal voltage.

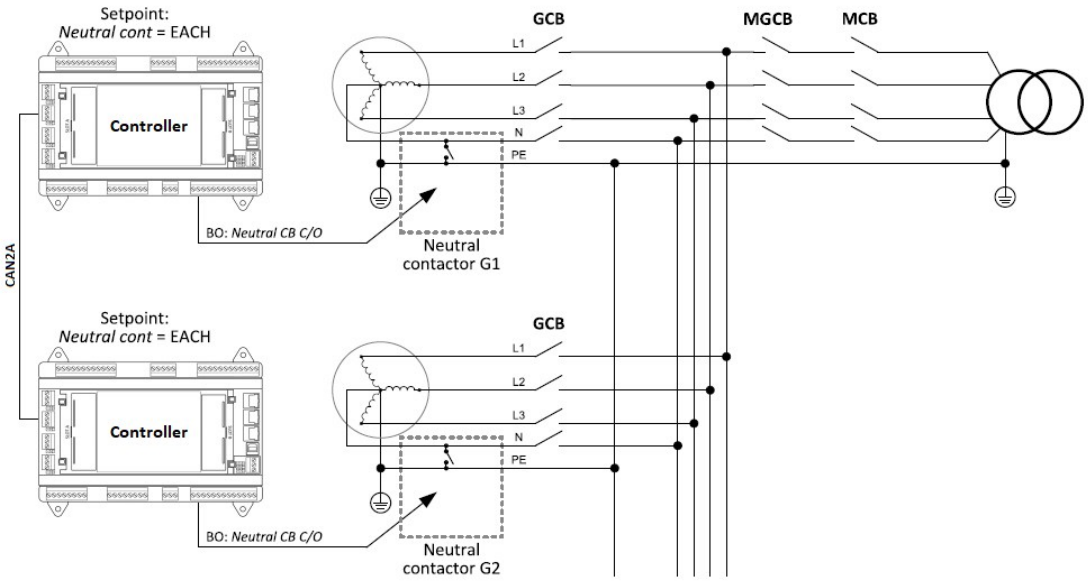


Image 6.9 NCB wired for each Gen-set

COMMON

The **COMMON** option should be used if there is only one common neutral contactor for the whole site. The **NCB CLOSE/OPEN** outputs from all controllers are combined together and the combined signal is used to control the breaker. If at least one Gen-set in the site is running and has a proper voltage, the neutral contactor is closed.

- **Four-pole MCB, MGCB, and three-pole GCBs, BCBs have to be used in this case** - all running Gen-set or BESS with open GCB, BCB (not connected to the bus) must be connected to the common neutral contactor.
- The output is always opened while the Gen-set or BESS is not running.
- The output is always opened while the MCB + MGCB (only for MGCB application) are closed.
- The output is closed while the Gen-set or BESS is running and at least one BESS Ph-Ph voltage exceeds 85% of the nominal voltage. It opens when the BESS voltage in all phases drops below 50% of the nominal voltage.

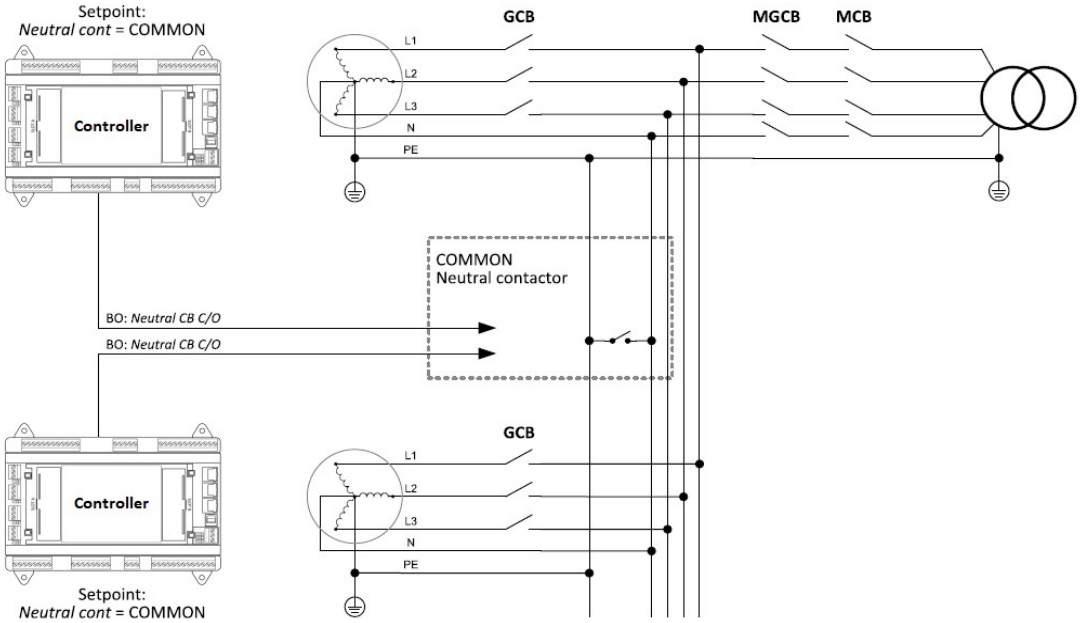


Image 6.10 One common NCB wired for all Gen-sets

Note: *LBI* ***NCB FEEDBACK*** *and LBO* ***NCB CLOSE/OPEN*** *has to be configured for proper functionality.*

Note: *For both option the MGCB is taken in account only if there is any extra breaker between GCB and the MCB.*

6.1.5 Neutral Contactor Breaker

Operation without BCB and PVCB

Some BESS designs do not have a BCB (BESS Circuit Breaker) installed, or the InteliNeo controller does not directly control the breaker. For this situation, use the setpoint **BCB Type** = Fuse/Disc. The controller does not control the BCB, and it considers the BCB to be always closed, thus accepting a permanently active signal from the LBI **BCB FEEDBACK**. This input must be configured and permanently active, indicating that the path between the PCS output and the common bus is indeed closed.

> **IMPORTANT: When Fuse/Disc. is selected, the Precharge Type must be set to Starting Sequence BCB Control = Start with Closed BCB, or a configuration warning will be given. Additionally, forward synchronization will not be possible.**

A similar principle can be applied to the control of PVCB. InteliNeo can integrate a PV system without the need for installing a PVCB. More details here **Operation of the PV without PVCB**.

6.1.6 CAN Bus Log

This function is used to log communication between the CU, ECU, and I/O modules on the CAN line. These logs can be shared with our technical support and used for solving specific problems. The CAN Bus Log uses **Communication peripherals** which should be physicality connected to the observed CAN. The **Communication peripherals** will works as another device on the CAN line and it is necessary to do wiring in accordance with rules for wiring the CAN line.

> **IMPORTANT: The bus must be wired in linear form with termination resistors at both ends. No nodes are allowed except on the controller terminals.**

> **IMPORTANT: The CAN bus log works only if CAN Intercontroller Communication Redundancy is not used.**

To activate the CAN bus log function, go to the Tools in InteliConfig and press the button CAN Bus Log to open the settings. You need to log in as at least a level 2 user. In the settings, you will choose the Output directory in your PC, the Logging option (CAN for modules + communication speed or type of the Intercontroller CAN), and press Start. The Logging status will be changed from Logging is stopped to Logging is running.

6.1.7 CAN Intercontroller Communication

CAN Intercontroller Communication is used for sharing information (data needed for regulations, power management, shared signals, etc.) between ComAp controllers via CAN interface.

This communication is present on CAN2A. In case of using **CAN Intercontroller Communication Redundancy**, then the redundant communication is present on CAN2B .

The communication can run in different modes. Select your required mode by setpoint **CAN ICC Mode**. The mode is changed only during powering up of the controller and actual mode is stored in value **CAN Intercontroller Comm Mode**. In case that there is a mismatch between the setpoint and the value, alarm **ALI CAN Mode Inconsistency** is activated. Restart the controller to change the communication mode to the selected mode and to get rid of the alarm.

For easy detection of empty CAN you can set **CAN Intercontroller Empty Check** to Enabled. **Wrn CAN2 Empty** is activated every time when controller doesn't see any other controller connected via CAN2A and CAN2B (if the redundancy is used).

> **IMPORTANT: Options 64C CAN FD or 32C CAN FD or 8C CAN FD are compatible only with controllers which support the CAN FD communication. Set correct mode by setpoint CAN ICC Mode otherwise controller will not communicate with each other.**

- Relevant setpoints
  - **CAN Controller Address**
  - **CAN ICC Mode**
- Usage
  - **Power Management**
  - **Power Management**
  - **Power Management**
  - **Power Management**
  - **MINT - Load Sharing, Var Sharing, and Shared signals**

CAN Intercontroller Communication Redundancy

> **IMPORTANT: This is a premium function which requires SW Key in order to be used!**

This function duplicates whole Intercontroller communication, which is on **CAN2A** and sends it via **Communication peripherals**.

The same wiring principles apply to **Communication peripherals** as to **CAN2A** (see **CAN bus wiring**).

Step by step guide

Note: *Following steps have to be done for each controller in the system.*

1. Insert the **SW Key** for CAN Intercontroller Redundancy
2. Restart the controller
3. Check the value **SW Key Feature List - CAN Intercontroller Redundancy** has to be enabled
4. Switch the setpoint **CAN Intercontroller Comm Redund** to Enabled
5. Restartthe controller
6. Check that the value **CAN Intercontroller Comm Redundancy** is Enabled

In case of mismatch between the value **CAN Intercontroller Comm Redundancy** and the setpoint **CAN Intercontroller Comm Redund**, alarm **ALI Wrn Redundant CAN Error** is raised.

In case of inconsistency of data on CAN2A and CAN2B line, alarm **Wrn Redundant CAN data mismatch** is activated

In case of attempt to use this function without of valid SW Key alarm **Wrn SW Key CAN Redundancy Error** is activated. See chapter **SW Key Features** for more information.

Note: *It is also possible to use CAN Intercontroller Communication Redundancy if there is a ComAp controller in the system, wich does not support this feature (e.g. IM1010 + IG1000 + IGS-NT generation controller). The redundancy will work (for the IG1000 and IM1010 controllers), but there will be **Wrn Redundant CAN data mismatch** alarm active (because of the IGS-NT controller which doesn't support the redundancy).*

6.1.8 CAN1 ECU/IO Modules Splitting

This function allows the user to change the behavior of CAN1 communication terminals.

In default configuration:

- **CAN1A** terminal is used for communication with ECU and IO Modules.
- **CAN1B** terminal is used for **Hot Swap Redundancy**

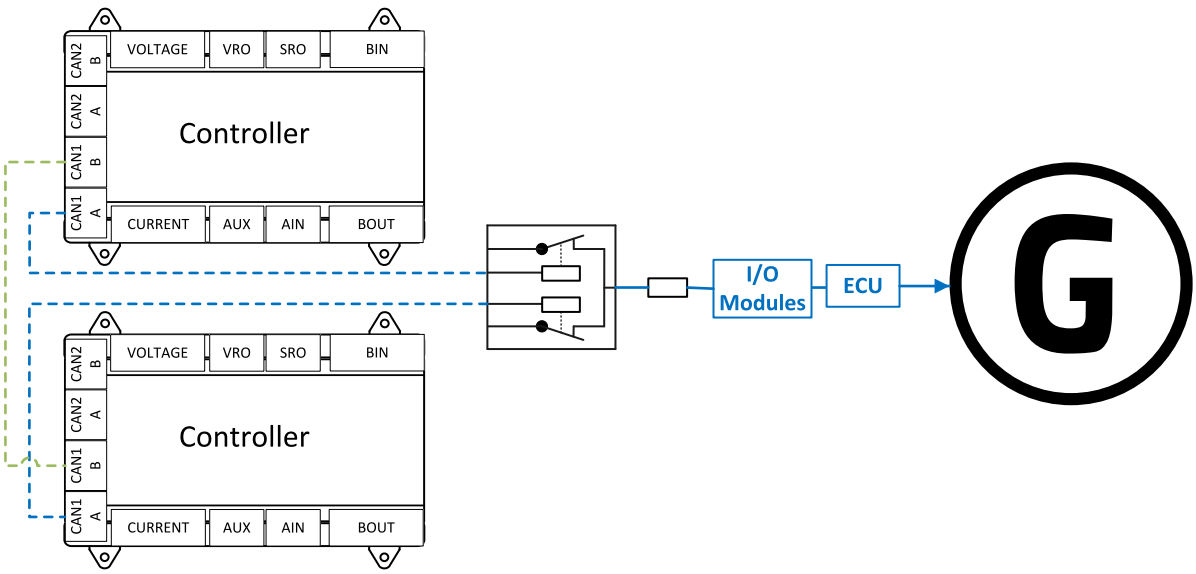


Image 6.11 Hot Swap Redundancy connection

If the setpoint **CAN1 ECU/IOModules Split** is enabled, the behavior of CAN1A terminal is changed:

- **CAN1A** terminal can be used only for communication with ECU
- **CAN1B** terminal can be used only for communication with IO Modules

IMPORTANT: In case that CAN1 ECU/IOModules Split is enabled, the Hot Swap Redundancy is disabled (and vice versa).

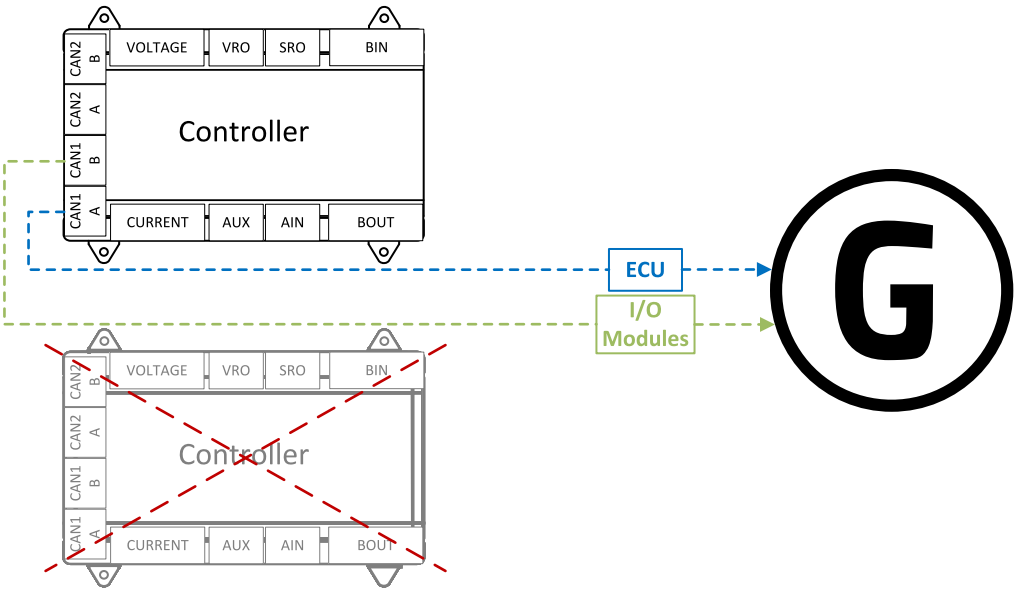


Image 6.12 CAN1 ECU/IO Modules Split connection

Note: *The splitting of CAN1 enables to prevent overloading the bus line.*

6.1.9 Configuration Lock

The Configuration lock function allows the user to lock the the Controller Configuration by the password and encrypt the PLC data. The Controller Configuration can be locked by the checkbox Configuration Lock inside of the Controller Configuration next to the button Consistency check. Once the checkbox is hit, the user will be asked for the password, after this step all PLC data will be encrypted. Once the user will try access to the locked Controller Configuration, the InteliConfig will automatically ask the user for the password. If the correct password is submitted the Controller Configuration will be unlocked and PLC data decrypt. Without correct password the user cannot open the Controller Configuration and see configuration in it.

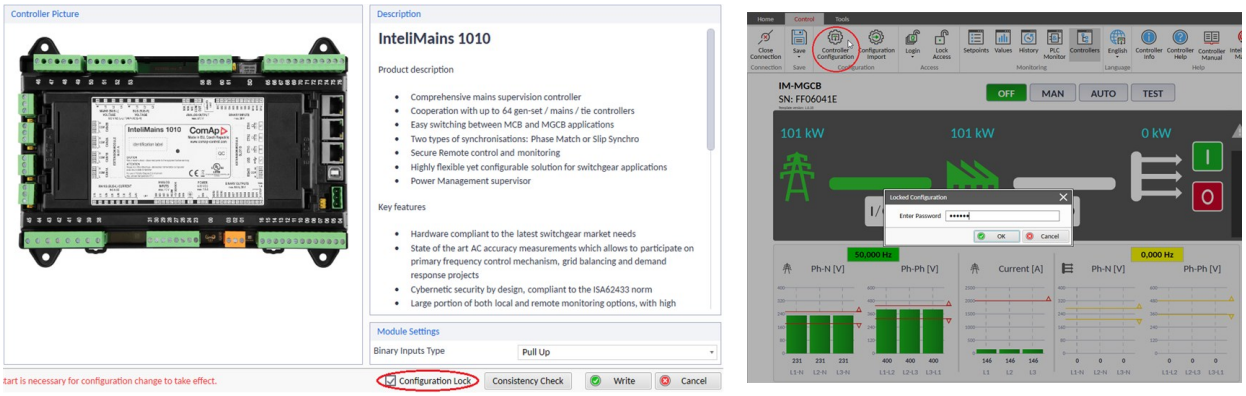


Image 6.13 Configuration lock

6.1.10 Configuration Override

There may appear a situation, when controller reprogramming is not possible for some reason. The typical example is a situation, when the controller is configured to be always in Remote AUT mode. So, the controller cannot be switched to OFF mode to change the configuration. To enable controller configuration change in these cases, the InteliNeo 6000 is offering a DIP switch located under the front cover of the controller. If the switch is enabled the controller configuration is forced to the invalid state so it is possible to upgrade the controller's FW or import new configuration. The older controllers are using the boot jumper to do the same thing and it is called "Boot Jumper Programming" or "Unsuccessful Controller Programming".

Process of configuration overriding

- Remove front cover of InteliNeo 6000
- Enable the DIP switch
- Restart the controller
- Connect to the controller via InteliConfig
- Log-in as level 3 user
- Go to the Control and Import new configuration (button Configuration Import)
- Disable the DIP switch
- Restart the controller

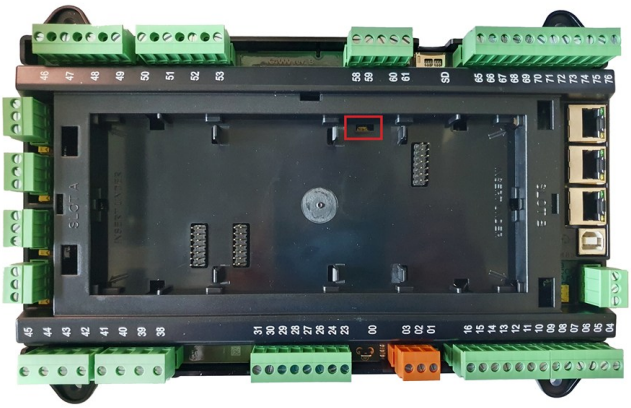


Image 6.14 Location of the DIP switch for Configuration override

6.1.11 Control Groups

Note: *This chapter is relevant for all ComAp controllers working in Multiple Island-Parallel operation.*

The physical group of the controllers (i.e. the site) can be separated into smaller logical groups, which can work independently even if they are interconnected by the CAN2 bus. The logical groups are intended to reflect the real topology of the site when the site is divided into smaller groups separated from each other by bus-tie breakers. If the bus-tie breakers are closed the sub-groups have to work as one large group (system) and if the bus-tie breakers are open, the sub-groups have to work independently.

- The group which the particular controller belongs to is adjusted by the **Control Group**. Use the default setting 1 with all controllers, if there is no bus-tie breaker.
- The information which groups are currently linked together is being distributed via the CAN. Each controller can provide information about one BTB breaker. The breaker position is detected by the input function *GroupLink* (i.e. this input is to be connected to the breaker feedback).
- The two groups which are connected together by the BTB, are defined with parameters **Group Link L** and **Group Link R**.
- Controller sends via **CAN2A** (**Communication peripherals**) bus information that controllers from groups *Group Link L* and *Group Link R* are linked together.
- If external BTB is used (there is no CAN communication between external BTB and other controllers) or in case of redudant information about BTB position is required , the *Group link* function in any ComAp controller can be used. If the LBI **GROUP LINK** is activated the controller will send information to all controllers on CAN that the groups defined by setpoints **Group Link L** and **Group Link R** are connected together.
- A history record is written into every controller that is affected by the group link whenever the BTB is closed / opened (control groups are linked / unlinked).

Note: *The "group link" function is independent on the group, where the controller itself belongs to. The controller can provide "group link" information about any two groups and it may not belong to any of the groups.*

- All controllers in linked groups cooperate with each other and perform Power Management, Load sharing and VAr sharing together. The mentioned functions are performed independently in each group, when the groups are separated.

Example: 4 controllers separated by a BTB breaker into two groups of 2. The BTB position is detected by the controllers 2 and 3. The reason, why there are 2 controllers used for detection of the BTB position, is to have a redundant source of the group link information, if the primary source (controller) is switched off.

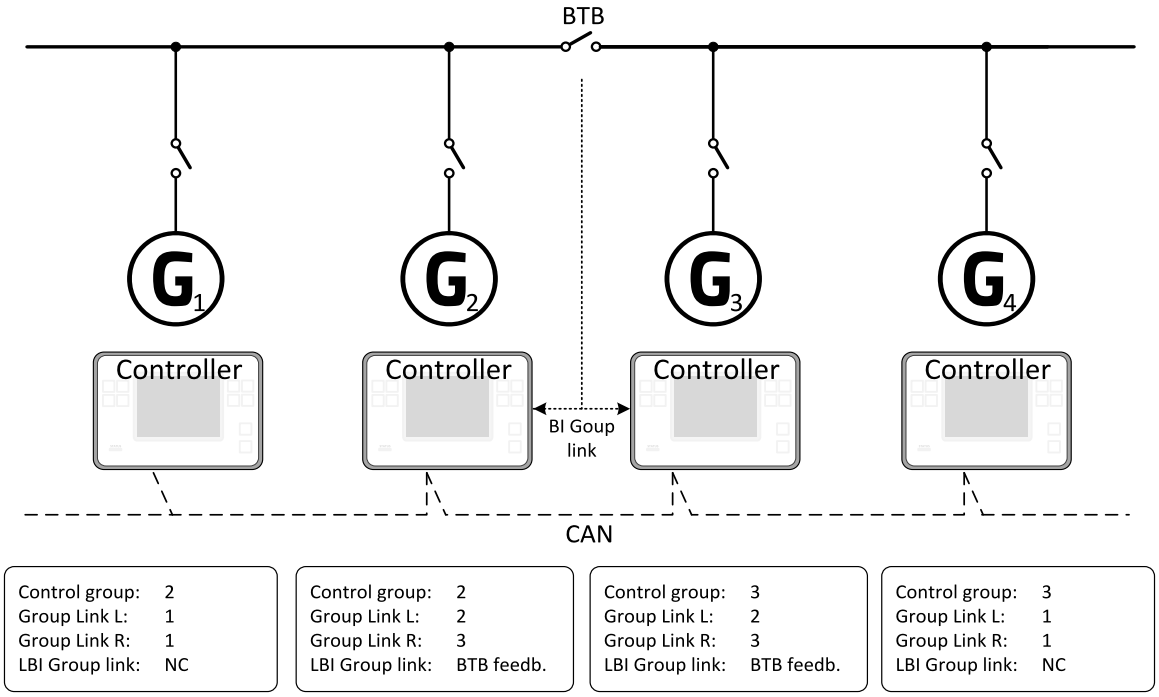


Image 6.15 Example of control groups

Once the BTB breaker is closed, the control groups 2 and 3 become new group 2+3. Power management, Load sharing and VAr sharing are performed within newly established group 2+3. Merging of the groups may result in a BESS/BESS stopping, if power management evaluates that available Actual Reserve is high enough to stop a BESS/BESS.

6.1.12 Crash Dump

Crash dump is new functionality which allows controller to collect and store important information related to controller's failure before the controller is restarted. These information are stored in controller's nonvolatile memory for later evaluation and easier solution of a problem.

Collecting crash dump

To collect Crash Dump from the controller, you need to connect to the controller using InteliConfig either via **USB** or **Ethernet**.

- Log in as user with administrator rights.
- In top right corner click wrench icon and select "Collect logs".
- InteliConfig begins to collect Crash Dump data from the controller and also adds its own crash logs. User is informed about the ongoing process in InteliConfig, before prompt to save *.zip file appears.

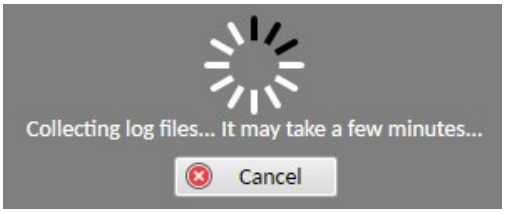


Image 6.16 Crash Dump Collection

Note: *It is recommended to use connection via Ethernet to reduce time required for data collection.*

IMPORTANT: This action may take significantly long period.

Contacting TSUP with crash dump

After collection of Crash Dump, you shall contact TSUP. To help resolve your issue:

- Send description of the issue from your side of view
- Send approximated time of the event
- Send Crash Dump data collected in *.zip file

6.1.13 Distributed Power Management Signals

Note: *This chapter is relevant for all ComAp controllers working in Multiple Island-Parallel operation.*

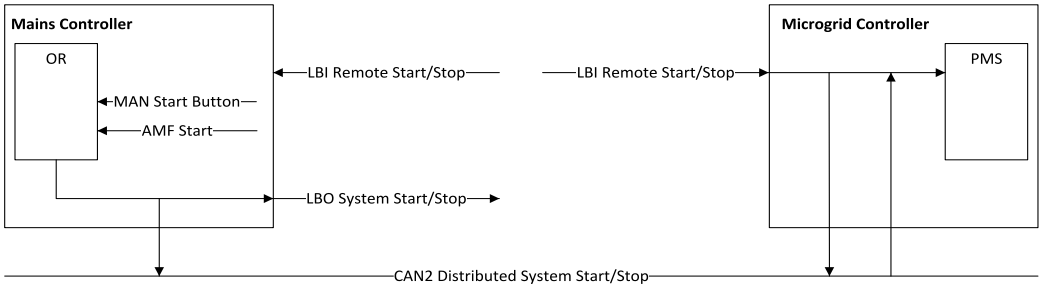
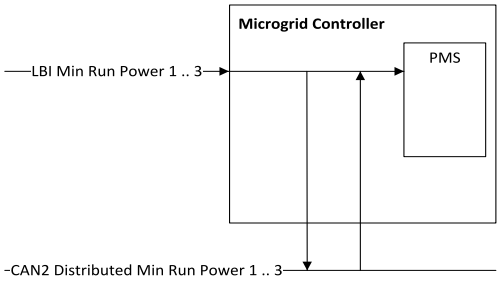
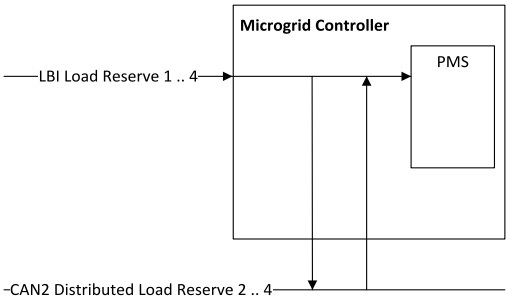
Note: *In case the InteliNeo6000 cooperates with controllers which **CAN ICC Mode** doesn't support **64C CAN FD**, the maximum units in power management is 32.*

Signals which are considered to be visible the same way for every controller on CAN. Synchronization of these signals is the internal part of the Power management function.

Basic principle:

- For every signal, there is a LBI with the same function as the signal.
- If the LBI is not configured on any input (physical binary, virtual in PLC etc.), its value is taken from CAN and the value is not being shared back on CAN.
- If the LBI is configured, its value is taken from the input and the value is shared on CAN.
  - The relevant function is activated only by the state of the signal, which is configured on LBI. That means that function cannot be activated by the state of relevant CAN signal.
- In case of the collision, there is a predefined behavior. If any controller with configured LBI receives a logical "1", it then activates the signal on CAN.
- Distributed Power Management Signals are shared only in the scope of logical **Control Groups**. If you merge Control Groups together (**GROUP LINK**), signals are applied in both groups.
- The BTB controller is used to connect the groups together. When the Bus Tie Breaker is closed the BTB informs appropriate controllers that their groups has been connected.

Distributed signal	Description for Mains controller	Description for the BESS/Microgrid controller (MINT application)
System Start/Stop	> LBI UNIVERSAL GENSET START/STOP is the request to start the group (part of the system). It is shared to LBO System Start/Stop and distributed trough **CAN2A** or **Communication peripherals** to the controllers in the same group.	> Accepted only in controllers belonging to the same logical group. > Accepted only in controllers where the Distributed signal is not configured. > If the Distributed signal is configured to any binary input (physical or virtual), the signal is automatically shared to other controllers via **CAN2A** or **Communication peripherals** as CAN Distributed signal. > If distributed signal is shared on **CAN2A** or **Communication peripherals** by more sources, it is accepted from any of them.
Min Run Power 1, 2, 3	N/A	
Load Reserve 1, 2, 3, 4		
MCB Feedback	> The Mains controller set this signal on whenever there is a closed path between the Mains and the Load side. > The signal is shared only inside the logical group (or interconnected logical groups).	> Accepted only in controllers belonging to the same logical group as the source Mains Controller only. > Accepted only in controllers where the Distributed signal is not configured.

Distributed signal	Scheme for Mains + Gen-set/Microgrid controllers
System Start/Stop	
Min Run Power 1, 2, 3	
Load Res 1, 2, 3, 4	

Sharing of multiple Logical Binary Input (LBI) functions is critical for power management system operation, because several power management functionality require simultaneous activation of LBI functions in controllers, which are involved in power management operation. It can be done either automatically using **CAN2A** (**Communication peripherals**) bus link between controllers or using dedicated LBI functions.

These LBI functions are shared automatically:

- System Start/Stop
- Min Run Power Act
- Load Res Active
- MCB Feedback

The following rules applies to the automatic sharing of the selected signals between Mains / Gen-set / Microgrid controllers.

1. LBI state is automatically shared via **CAN2A** (**Communication peripherals**) bus, if corresponding LBI function is not configured in a controller.

> **Example:** Logical input Remote Start/Stop is configured with a controller. State of the signal is automatically transmitted to other controllers via **CAN2A** (**Communication peripherals**) bus as System Start/Stop.

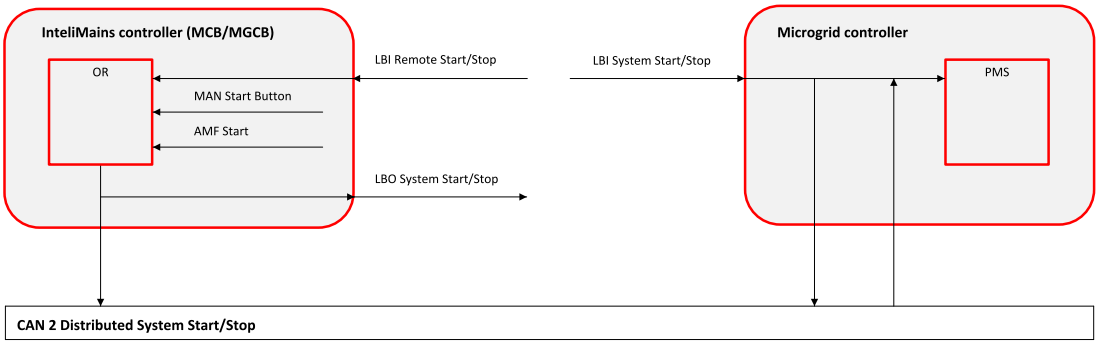


Image 6.17 Distributed signals case 1

2. LBI state received from **CAN2A** (**Communication peripherals**) bus is automatically used, if corresponding LBI function is not configured in a controller.

> **Example:** LBI Remote Start/Stop is not configured with a controller, but automatically shared System Start/Stop is received from **CAN2A** (**Communication peripherals**) bus. Controller follows state of the shared LBI signal then.

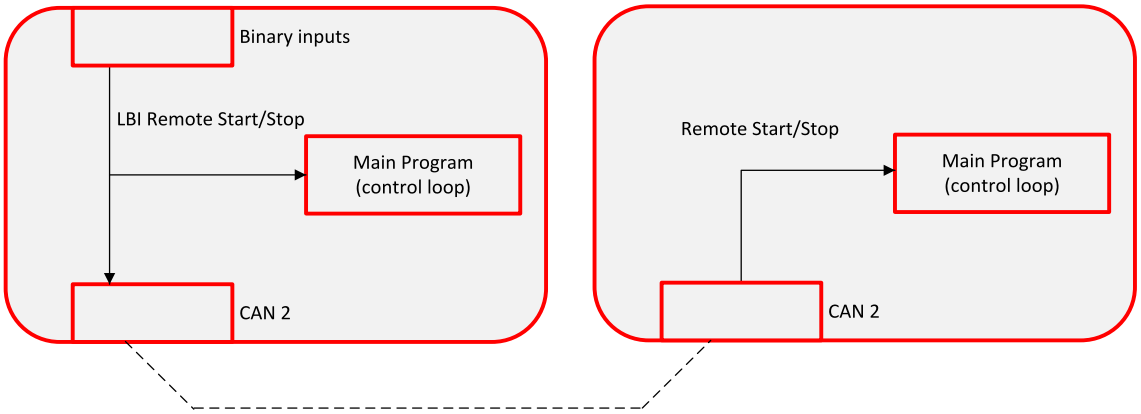


Image 6.18 Distributed signals case 1&2

3. LBI state received from **CAN2A** (**Communication peripherals**) bus is not used, if corresponding LBI function is configured in a controller.

> **Example:** LBI Remote Start/Stop is configured with a controller. Controller follows only state of signal linked with the Remote Start/Stop function. The function is not activated by a shared System Start/Stop signal.

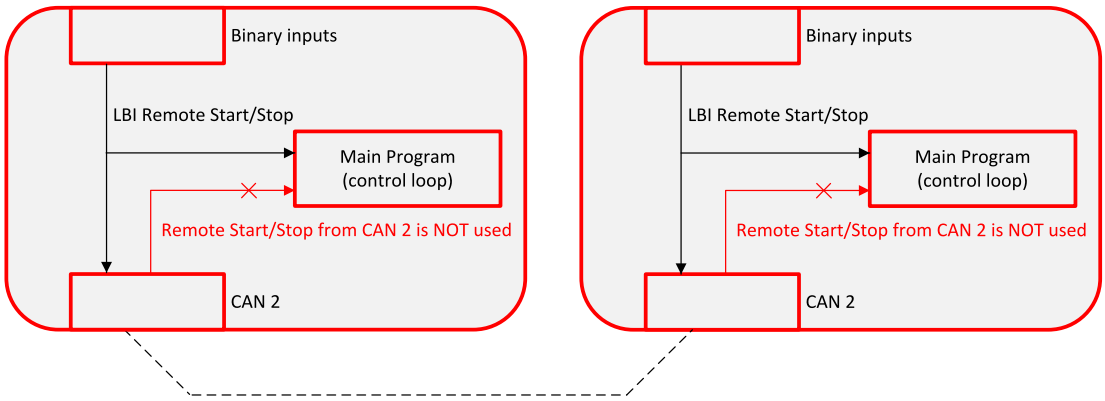


Image 6.19 Distributed signals case 3

4. LBI function state transmitted via **CAN2A** (**Communication peripherals**) bus is used only by controllers, which are in the same group as controller, which is source of the shared signal. Signal coming from controller in a different group is accepted only if the “source controller” group is linked with the “receiving controller” group.

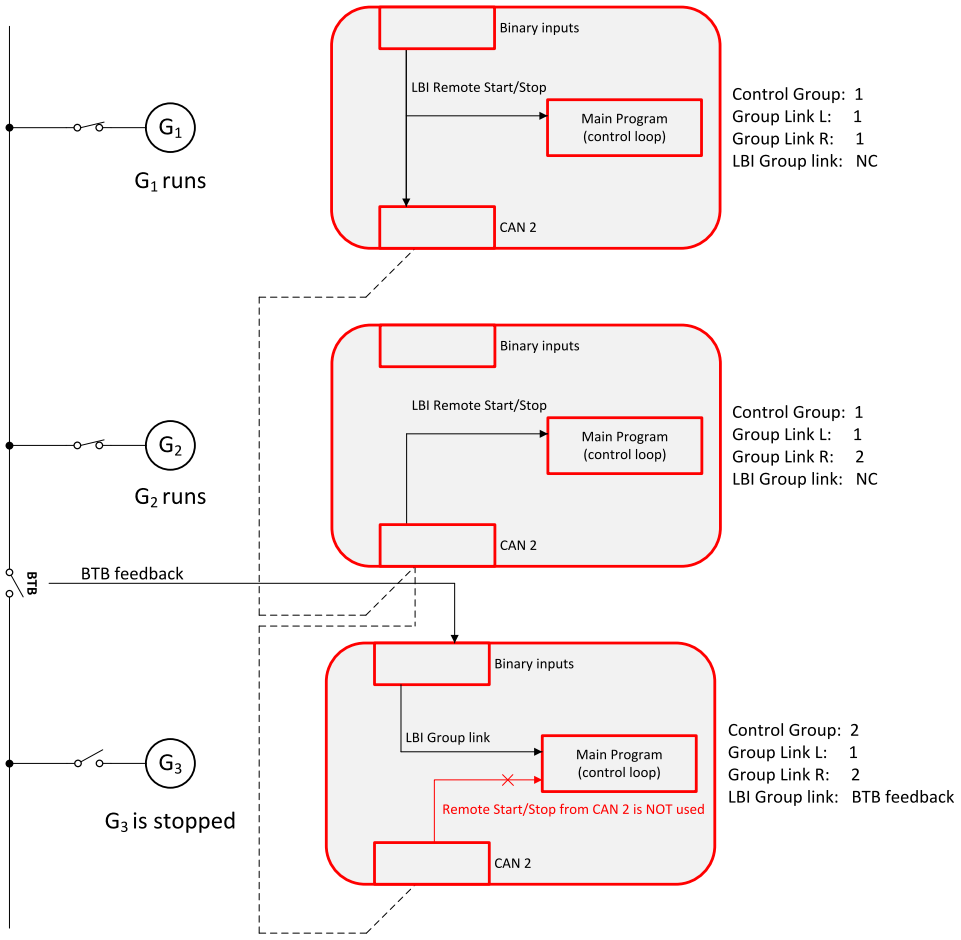


Image 6.20 Distributed signals case 4

5. LBI function can be configured with multiple controllers, which transmit through **CAN2A** (**Communication peripherals**) bus state of the function. Or function applies to the function evaluation in controllers, in which the function is not configured. It means that function is activated by shared signal coming from any controller (rule 4. applies).

6.1.14 E-STOP

The E-Stop is mainly used for emergency stop of the BESS but it is also used as power supply for binary outputs 1 and 2. These binary outputs are designated for some essential functions and they are internally wired as "safe". It means, that their deactivation is directly binded with the dedicated Input ㉓ **E-STOP** (not evaluated as the LBI in the controller). These outputs are fully configurable and in the default configuration are used for the BESS Run Request.

- The emergency stop circuit must be secured.
- No accidental activation on the PCB can disable the operation of the emergency stop.
- The power supply of the associated binary outputs (BOUT1 and BOUT2) is supplied by the ㉓ **E-STOP** input, not by the + battery voltage.

> **IMPORTANT: If the E-stop is powered on and the Power Supply terminal is disconnected the controller's logic will fail and binary outputs BO1 and BO2 can be unexpectedly activated. The E-stop should be powered off / disconnected before disconnection of the Power Terminal.**

Note: *All the binary outpus are configured in the same way, only difference is that binary outputs BO1 and BO2 can be activated only while E-Stop is powered up with* ***Battery Voltage****.*

The CU is measuring actual input voltage of the E-STOP which activation level depends on the actual controller supply voltage (battery voltage). The E-STOP is activated if input voltage drops below approximately 60 % of the Controller supply voltage.

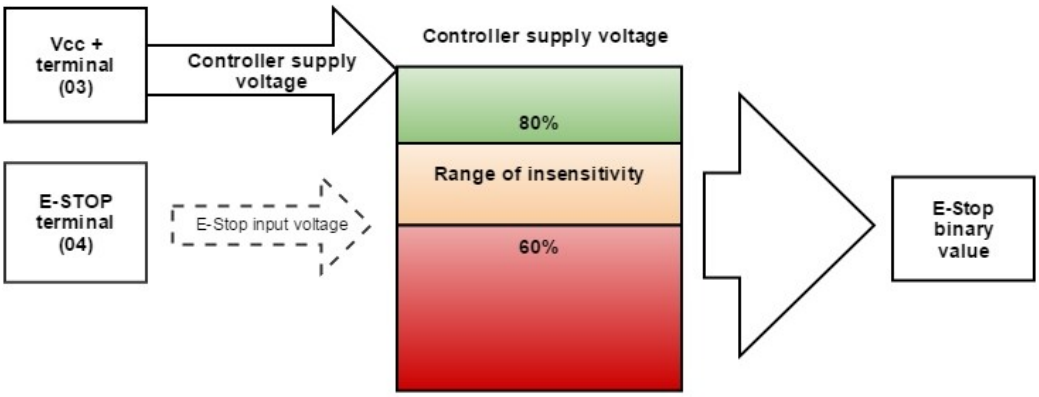


Image 6.21 SW principle of E-STOP

- If the input voltage of E-stop is higher than high comparison level (for ex. higher than 80% of the supply voltage), then E-stop is not activated.
- If the input voltage of E-stop is lower than low comparison level (for ex. lower than 60% of the supply voltage), then E-stop is activated.
- If the input voltage of E-stop is located somewhere between low and high comparison levels (for ex. between 60 and 80 %of the supply voltage, then E-stop binary value will stay on its previous state (means E-stop binary value will not change).

For wiring information **see E-Stop on page 74**.

6.1.15 Event History

The history log is an area in the controller's non-volatile memory that records "snapshots" of the system at moments when important events occur. The history log is important especially for diagnostics of failures and problems. When the history file is full, the oldest records are removed.

Each record has the same structure and contains:

- The event which caused the record (e.g. Overfrequency alarm, undervoltage alarm, MCB closed, BCB closed, etc.).
- The date and time when it was recorded.
- All important data values like frequency, kW, voltages, etc. from the moment that the event occurred.
- The number of events is fixed to 1000 lines.
- Values are recorded based on actual column selected, on special events values are recorded in text form.
  - Special events:
    - When the user logs in
    - Modifying a setpoint
    - Fault Reset
    - Horn Reset
    - Start/Stop

Configurable history

It is possible to configure the columns (values) which will be displayed in the History window. The configuration can be found in the Controller Configuration → Others → History. See the picture below.

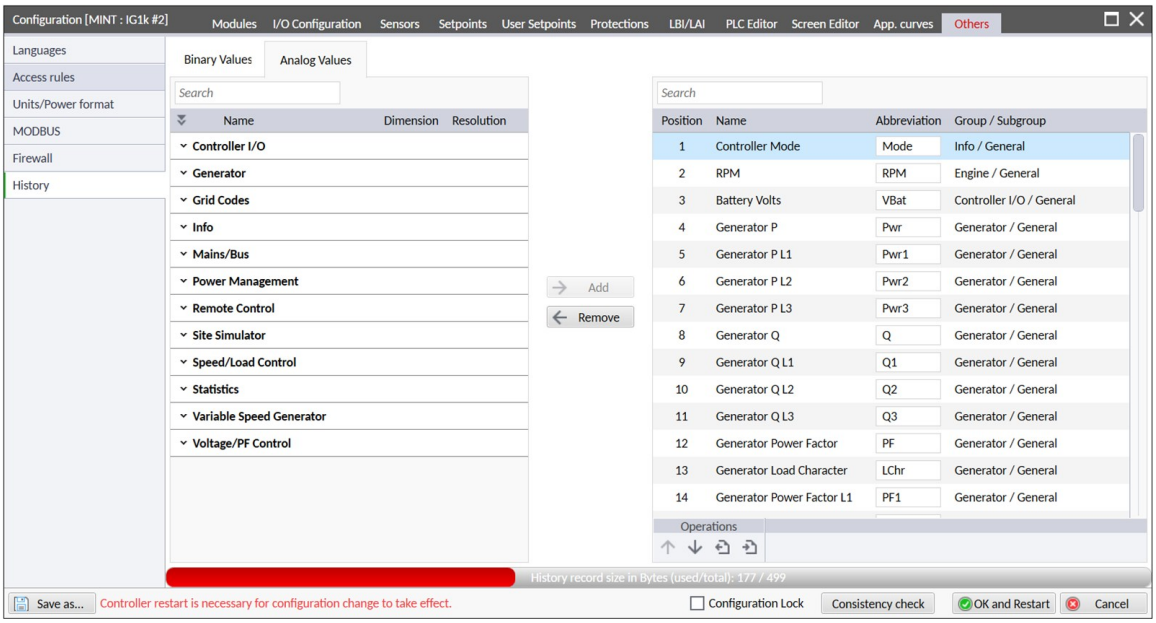


Image 6.22 Configurable history

In the left part of the configuration window there are all available binary and analog values (columns) which can be configured to history event log. In the right side of the configuration window there is a table with all already configured columns. By buttons Add and Remove in the middle of the configuration window or by

double click on value in the left / right part of the configuration, it is possible to add / remove any analog or binary value to / from the history event log.

Under the table with already configured values there are buttons for the operations. By the buttons Move up and Move down it is possible to change the position of the history columns so you can sort all columns according to your priorities. Next to these buttons there are buttons for export and import data so you can import history columns configuration from another controller. And it is also possible to change the abbreviation for each history column. In the down part of the configuration window there is a progress bar which shows how much memory for history events is used. For one history record maximum 499 Bytes can be used.

In the next chapter are shown history columns used in the default archive.

Premortem history

The fast history running in background is mirrored into the controller history records when a second level alarm occurs. Premortem history contains the same values in the history as the configuration done by configuration tool. When any new alarm appears for the second time, only the new history records are added into the controller history log. Premortem History is filled in to internal buffer (16kB) and number of premortem records depends on how many history columns is configured.

> **Example:** Example: for default History columns it can be up to 85 premortem records, for maximal History columns can be saved in to buffer at least 32 records.

The time of the premortem history is adjustable by a setpoint **Premortem History Period**

6.1.16 Exercise Timers

Mode Once 154
Mode Daily 155
Mode Weekly 156
Monthly mode 157
Mode Short period 159

The exercise (general-purpose) timers in controller are intended for scheduling of any operations such as e.g. periodic tests of the BESS, scheduled transfer of the Load to the BESS prior to an expected disconnection of the Mains etc. These timers can be also used in the PLC.

The function of each timer can be changed by respective Timer Function setpoint. The functions which are supposed to change the Controller Mode requires controller running in AUTO mode. The following timer functions are available:

- Disabled - The Timer is disabled.
- Manual On - The Timer is disabled but his binary output is activated (can be used for testing purposes).
- No Func - There is no any other function, only binary output of the Timer is activated once the condition is fulfilled.
- Mode OFF - The binary output of the Timer is internally connected to the Remote OFF binary input.

The activation condition of each Timer is configured via respective Timer Setup setpoint.

Each Timer has its LBO Exercise Timer which is closed regardless of chosen timer function once the Timer is activated. If the CU is switched off when the Timer should be activated, the Timer will be activated immediately after the CU is switched on if the Timer condition is still fulfilled. The LBO is activated always when the Timer should be activated e.g. even when controller is in different mode than AUTO.

See the list of related setpoints and LBOs below.

Related setpoints for choosing of the timer function:

- **Timer 1 Function**
- **Timer 2 Function**
- **Timer 3 Function**
- **Timer 4 Function**
- **Timer 5 Function**
- **Timer 6 Function**
- **Timer 7 Function**
- **Timer 8 Function**
- **Timer 9 Function**
- **Timer 10 Function**
- **Timer 11 Function**
- **Timer 12 Function**
- **.. Timer 30 Function**

Related setpoints for the timer setup:

- **Timer 1 Setup**
- **Timer 2 Setup**
- **Timer 3 Setup**
- **Timer 4 Setup**
- **Timer 5 Setup**
- **Timer 6 Setup**
- **Timer 7 Setup**
- **Timer 8 Setup**
- **Timer 9 Setup**
- **Timer 10 Setup**
- **Timer 11 Function**
- **Timer 12 Setup**
- **.. Timer 30 Setup**

Related LBOs:

- **Exercise Timer 1**
- **Exercise Timer 2**
- **Exercise Timer 3**
- **Exercise Timer 4**
- **Exercise Timer 5**
- **Exercise Timer 6**
- **Exercise Timer 7**
- **Exercise Timer 9**
- **Exercise Timer 7**
- **Exercise Timer 9**
- **Exercise Timer 9**
- **Exercise Timer 10**
- **Exercise Timer 11**
- **Exercise Timer 12**
- **.. Exercise Timer 30**

Related Values:

- **Exercise Timer 1**
- **Exercise Timer 2**
- **Exercise Timer 3**
- **Exercise Timer 4**
- **Exercise Timer 5**
- **Exercise Timer 6**
- **Exercise Timer 7**
- **Exercise Timer 9**
- **Exercise Timer 9**
- **Exercise Timer 10**
- **Exercise Timer 11**
- **Exercise Timer 12**
- **.. Exercise Timer 30**

Note: *This manual shows step by step guide only for Timer 1 setup because the procedure is same for the all timers.*

Available modes of each timer:

Once	This is a single shot mode. The timer will be activated only once at preset date/time for preset duration.
Daily	The timer is activated every "x-th" day. The day period "x" is adjustable. Weekends can be excluded. E.g. the timer can be adjusted to every 2nd day excluding Saturdays and Sundays.
Weekly	The timer is activated every "x-th" week on selected weekdays. The week period "x" is adjustable. E.g. the timer can be adjusted to every 2nd week on Monday and Friday.
Monthly	The timer is activated every "x-th" month on the selected day. The requested day can be selected either as "y-th" day in the month or as "y-th" weekday in the month. E.g. the timer can be adjusted to every 1st month on 1st Tuesday.
Short period	The timer is repeated with adjusted period (hh:mm). The timer duration is included in the period.

Mode Once

Set-up via InteliConfig

To set-up timer via InteliConfig go to the setpoint ribbon, setpoint group scheduler and setpoint **Timer 1 Setup**.

Note: *Setpoint **Timer 1 Setup** is visible only if setpoint **Timer 1 Function** has any other value than disabled.*

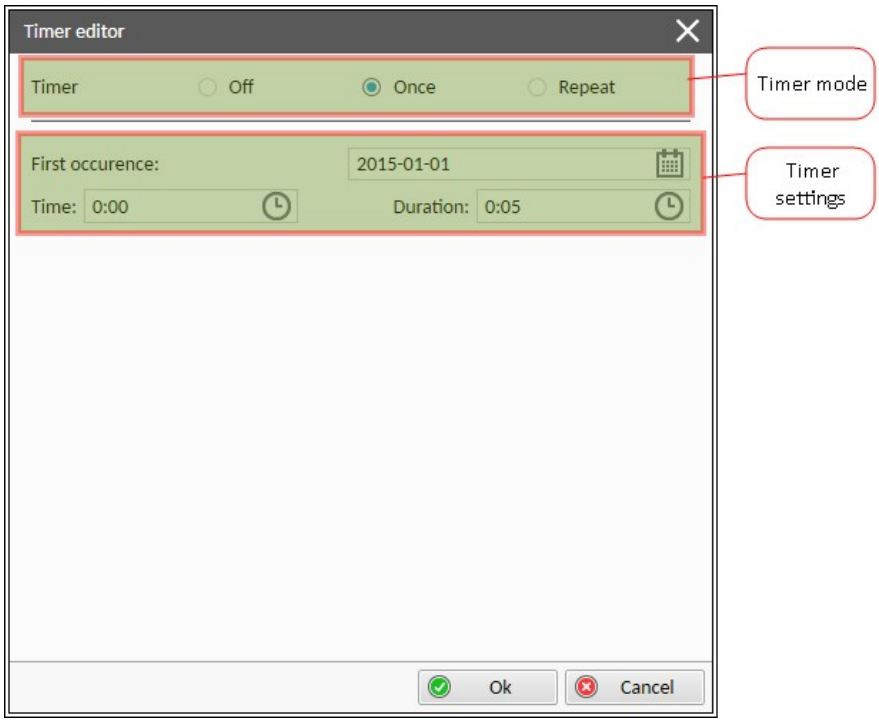


Image 6.23 Mode Once - InteliConfig

In timer mode select Once. In timer settings adjust date and time of occurrence of timer. Also adjust the duration of timer.

Set-up via external display

Navigate to the Scheduler setpoint group. Select the function of timer via **Timer 1 Function** setpoint. Then go to **Timer 1 Setup** and press enter button.

> ***Note:*** *Use left and right arrow to move in a single row. Use up and down arrow to adjust time or date. Use enter button for confirmation.*

back to Exercise Timers

Mode Daily

Set-up via InteliConfig

To set-up timer via InteliConfig go to the setpoint ribbon, setpoint group scheduler and setpoint **Timer 1 Setup**

> ***Note:*** *Setpoint **Timer 1 Setup** is visible only if setpoint **Timer 1 Function** has any other value than disabled.*

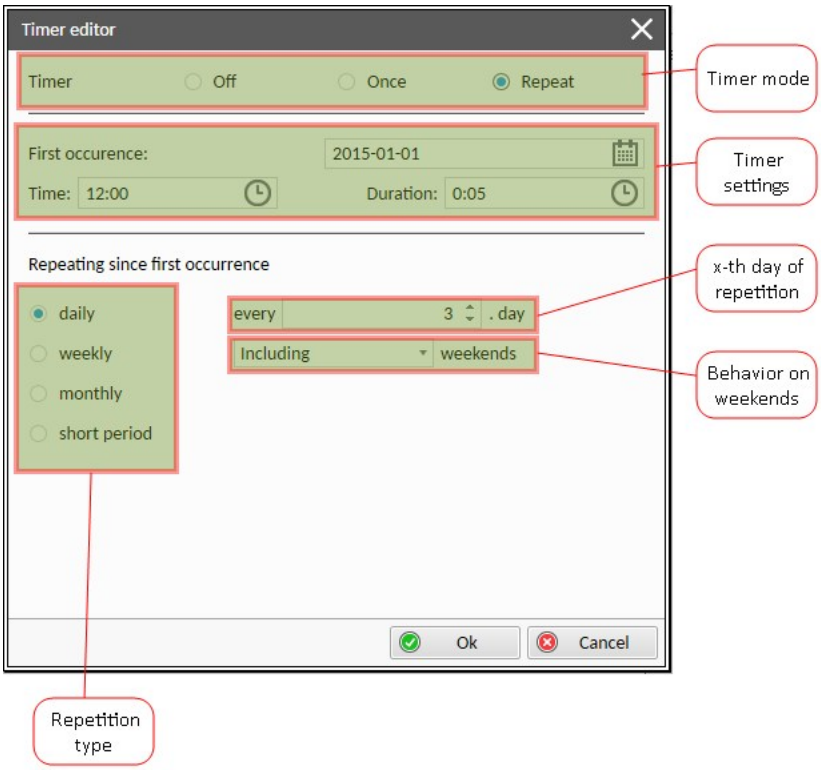


Image 6.24 Daily mode - InteliConfig

In timer mode select Repeat. In repetition type select Daily. In timer settings adjust date and time of first occurrence of timer. Also adjust the duration of each occurrence of timer. Than select the x-th day of repetition and behavior of timer on weekends.

> **Example:** On image example first start of timer will be 2015-01-01 at 12:00. Duration will be 5 minutes. Timer will be again activated every 3rd day at 12:00 for 5 minutes including weekends.

Set-up via external display

Navigate to the Scheduler setpoint group. Select the function of timer via **Timer 1 Function** setpoint. Then go to **Timer 1 Setup** and press enter button.

Select mode Repeat and confirm it. After that, you will set the first occurrence date, time of occurrence and duration. Select Daily occurrence, set amount of days between occurrences and decide which behavior shall be applied during weekends.

> ***Note:*** *Use left and right arrow to move in a single row. Use up and down arrow to adjust time or date. Use enter button for confirmation.*

back to Exercise Timers

Mode Weekly

Set-up via InteliConfig

To set-up timer via InteliConfig go to the setpoint ribbon, setpoint group scheduler and setpoint **Timer 1 Setup**.

> ***Note:*** *Setpoint **Timer 1 Setup** is visible only if setpoint **Timer 1 Function** has any other value than disabled.*

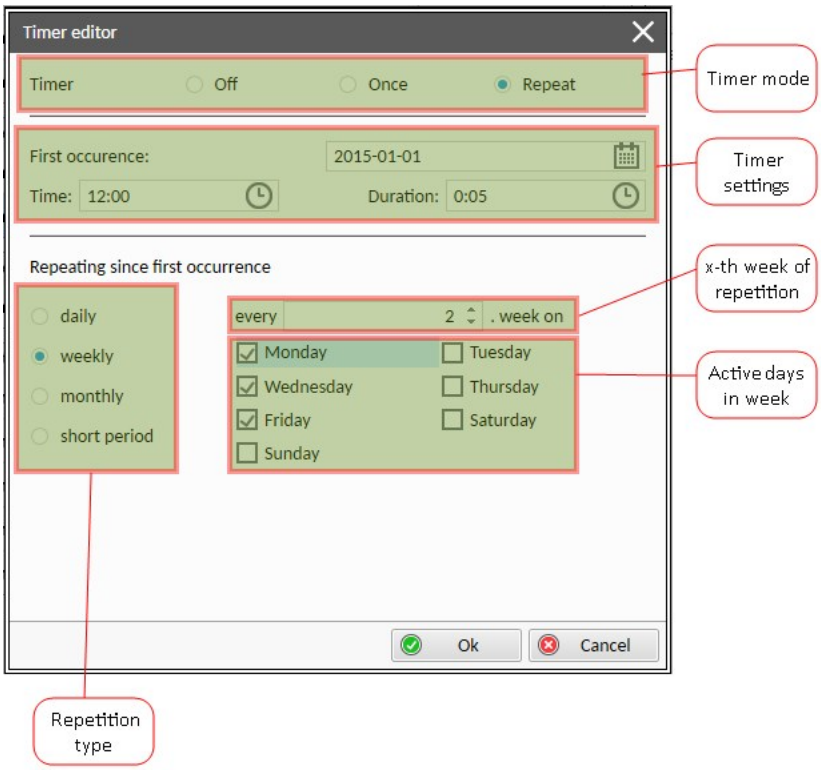


Image 6.25 Mode Weekly - InteliConfig

In timer mode select Repeat. In repetition type select Weekly. In timer settings adjust date and time of first occurrence of timer. Also adjust the duration of each occurrence of timer. Than select the x-th week of repetition and days when timer should be active.

> **Example:** On image example first start of timer will be 2015-01-12 at 12:00. Duration will be 5 minutes. Timer will be again activated every 2nd week on Monday, Wednesday and Friday at 12:00 for 5 minutes.

Set-up via external display

Navigate to the Scheduler setpoint group. Select the function of timer via **Timer 1 Function** setpoint. Then go to **Timer 1 Setup** and press enter button. Select mode Repeat and confirm it. After that, you will set the first occurrence date, time of occurrence and duration. Select Weekly occurrence, set amount of weeks between occurrences and select days which will be timer triggered (use arrows left, right for activating/deactivating of day and arrow up, down for moving to another day).

Note: *Use left and right arrow to move in a single row. Use up and down arrow to adjust time or date. Use enter button for confirmation.*

back to Exercise Timers

Monthly mode

Set-up via InteliConfig

To set-up timer via InteliConfig go to the setpoint ribbon, setpoint group scheduler and setpoint **Timer 1 Setup**.

Note: *Setpoint **Timer 1 Setup** is visible only if setpoint **Timer 1 Function** has any other value than disabled.*

There are two types of monthly repetition. First of them is based on repeating one day in month.

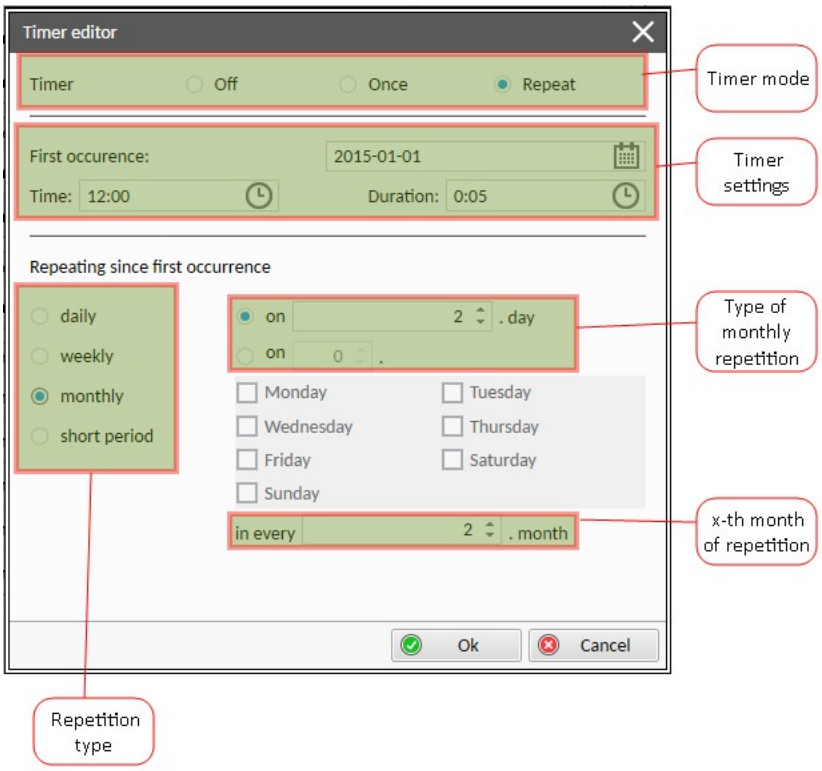


Image 6.26 Mode Monthly - InteliConfig

In timer mode select Repeat. In repetition type select Monthly. In timer settings adjust date and time of first occurrence of timer. Also adjust the duration of each occurrence of timer. Than select the type of monthly repetition and the x-th day of repetition. Than select the x-th month of repetition.

> **Example:** On image example first start of timer will be 2015-01-02 at 12:00. Duration will be 5 minutes. Timer will be again activated every 2nd day in 2nd month at 12:00 for 5 minutes.

Second type of monthly repetition is based on repeating days in week in month.

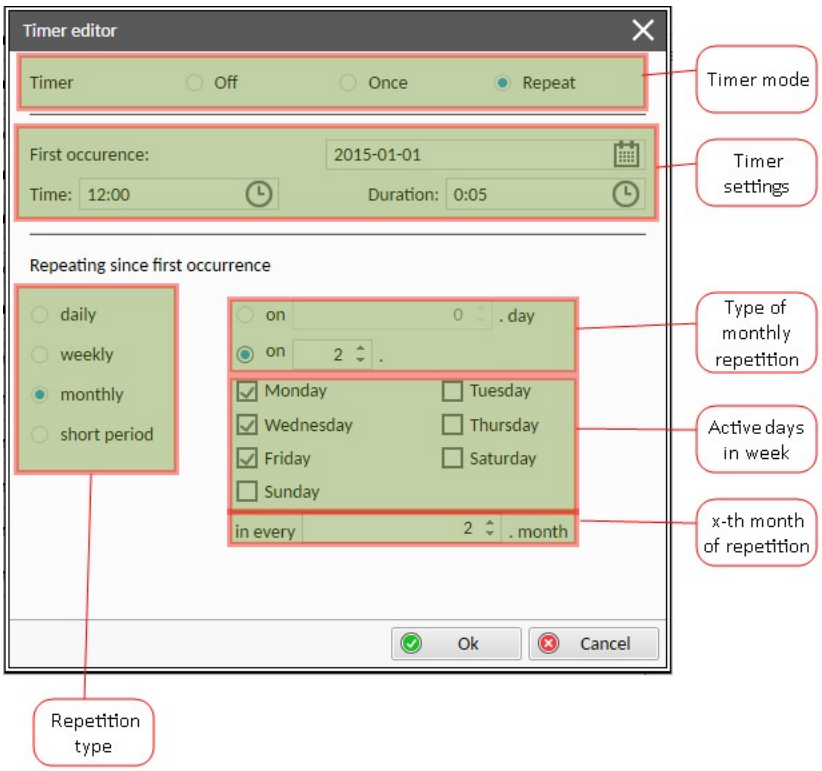


Image 6.27 Mode Monthly - InteliConfig

In timer mode select Repeat. In repetition type select Monthly. In timer settings adjust date and time of first occurrence of timer. Also adjust the duration of each occurrence of timer. Than select the type of monthly repetition, the x-th week of repetition and days in week. Than select the x-th month of repetition.

> **Example:** On image example first start of timer will be 2015-01-05 at 12:00. Duration will be 5 minutes. Timer will be again activated every 2nd week in 2nd month on Monday, Wednesday and Friday at 12:00 for 5 minutes.

Set-up via external display

There are two types of monthly repetition. First of them is based on repeating one day in month.

Navigate to the Scheduler setpoint group. Select the function of timer via **Timer 1 Function** setpoint. Then go to **Timer 1 Setup** and press enter button. Select mode Repeat and confirm it. After that, you will set the first occurrence date, time of occurrence and duration. Select Monthly occurrence, then Daily and choose which day in a month will be timer triggered. Set amount of months between occurrences and confirm the selection

Second type of monthly repetition is based on repeating days in week in month.

Navigate to the Scheduler setpoint group. Select the function of timer via **Timer 1 Function** setpoint. Than go to **Timer 1 Setup** and press enter button. Select mode Repeat and confirm it. After that, you will set the first occurrence date, time of occurrence and duration. Select Monthly occurrence, then Weekly and choose which week and week days in a month will be timer triggered. Set amount of months between occurrences and confirm the selection

Note: *Select mode Repeat and confirm it. After that, you will set the first occurrence date, time of occurrence and duration.*

back to Exercise Timers

Mode Short period

Set-up via InteliConfig

To set-up timer via InteliConfig go to the setpoint ribbon, setpoint group scheduler and setpoint **Timer 1 Setup**.

Note: *Setpoint **Timer 1 Setup** is visible only if setpoint **Timer 1 Function** has any other value than disabled.*

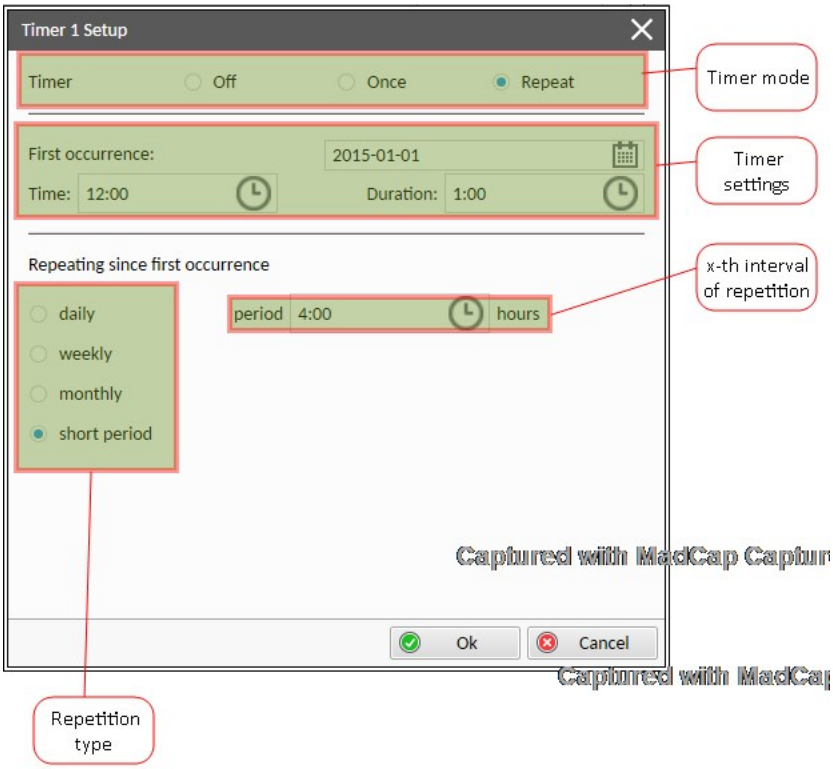


Image 6.28 Mode Short period - InteliConfig

In timer mode select Repeat. In repetition type select Short period. In timer settings adjust date and time of first occurrence of timer. Also adjust the duration of each occurrence of timer. Than select the interval of repetition (shorter than 1 day).

> **Example:** On image example first start of timer will be 2015-01-01 at 12:00. Duration will be 1 hours. Timer will be again activated every 4th hour for 1 hour.

Set-up via external display

Navigate to the Scheduler setpoint group. Select the function of timer via **Timer 1 Function** setpoint. Then go to **Timer 1 Setup** and press enter button. Select mode Repeat and confirm it. After that, you will set the first occurrence date, time of occurrence and duration. Select Period occurrence, then set period of repetition (shorter than 1 day).

Note: *Select mode Repeat and confirm it. After that, you will set the first occurrence date, time of occurrence and duration.*

back to Exercise Timers

6.1.17 Firewall

The firewall function allows to restrict the access to the controller application services (ComAp/TCP server, MODBUS/TCP server etc.), to the specific computers, or networks using **Communication peripherals** and **Ethernet 2** ports. The firewall can be enabled by the setpoint IP Firewall in the **Group: ETH Interface 1 - Trusted** and **Group: ETH Interface 2 - Untrusted**. The firewall settings is made in the InteliConfig: Control → Controller Configuration → Others → Firewall.

> **Example:**
> **Adress:** 192.168.1.0
> **Netmask:** 255.255.255.0
> **Port:** 23
> Any computer with IP address from the network range 192.168.1.0 - 192.168.1.255 can connect to ComAp/TCP server (= connect to the controller with InteliConfig via Ethernet).

> **Example:**
> **Adress:** 192.168.1.100
> **Netmask:** 255.255.255.255
> **Port:** 502
> Only the single computer with IP address 192.168.1.100 can connect to MODBUS/TCP server

> **IMPORTANT: When enabling the firewall, If the rules are not set up properly and the connection is made remotely, loss of connection can happen.**

6.1.18 Forced Value

This function allows forcing of preconfigured value into selected setpoints via activation of LBI. Each LBI can force only one value into one setpoint. There are 32 LBIs - **Forced Value Input 01** ... **Forced Value Input 32**. You can see current states of all LBIs in value **Forced Value Status**. Setpoints for which is Forced Value already configured are marked with gray arrow in InteliConfig and on display.

Note: *LBIs can be renamed during configuration. We suggest you to rename them based on used function.*

IMPORTANT: You cannot change value of setpoint which has active Forced Value function.

Force Value Indication

If the setpoint is forced by another setpoint then the icon (double right arrow) is displayed just behind the setpoint value.

- Green Icon - Forcing is active
- Grey Icon - Force Value is set to the specific setpoint and forcing is inactive

InteliVision 5.2

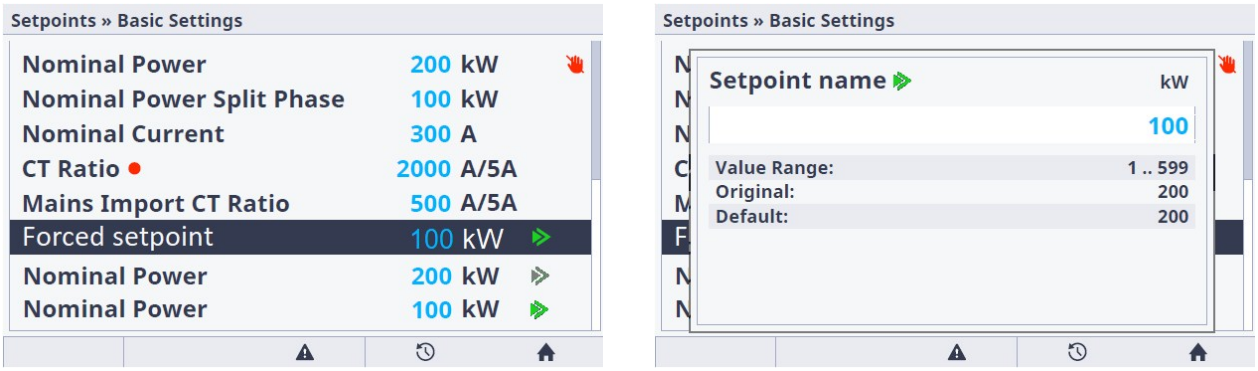


Image 6.29 : Force Value and Protected Setpoint Indication

InteliConfig

Image 6.30 : Force Value Indication in InteliConfig

Note: *Setpoints that are currently being forced their arrow turns to green color and they also have the option for writing of different value manually disabled.*

Forced Value Priority

- One setpoint can have multiple configured Forced Values which are ordered from highest to lowest priority (1 .. 32). In case of conflict highest priority value, which is valid, is used.
- In case that Forced Value is out of setpoint's range, value is capped by either maximal or minimal limit or respective setpoint.

- In case that Forced Value is invalid (see **Invalid flag**), another active Forced Value is used based on priority order. If there is not any other active (or configured) Forced Value which could be used, the setpoint keeps it's value.

If the setpoint is forced by another setpoint then the icon (double right arrow) is displayed just behind the setpoint value.

- Green Icon - Forcing is active
- Grey Icon - Force Value is set to the specific setpoint and forcing is inactive

InteliVision 5.2

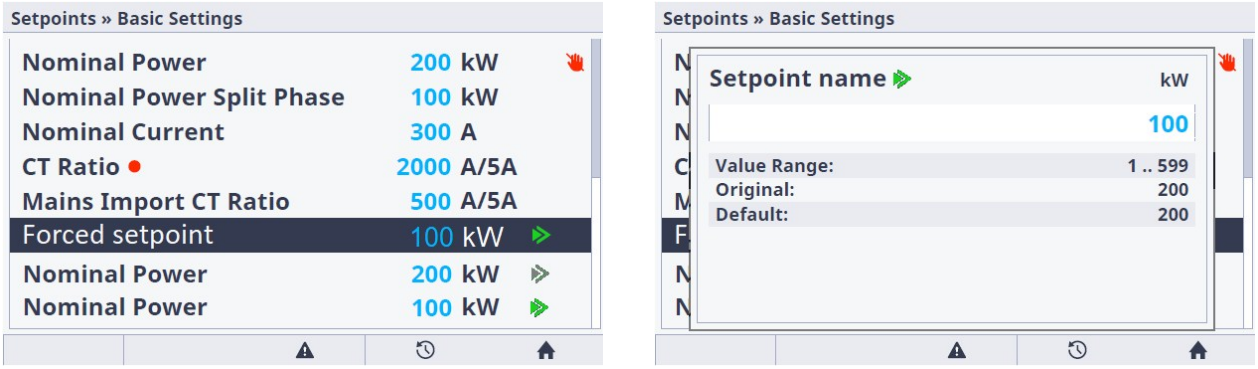


Image 6.31 : Force Value and Protected Setpoint Indication in IV 5.2

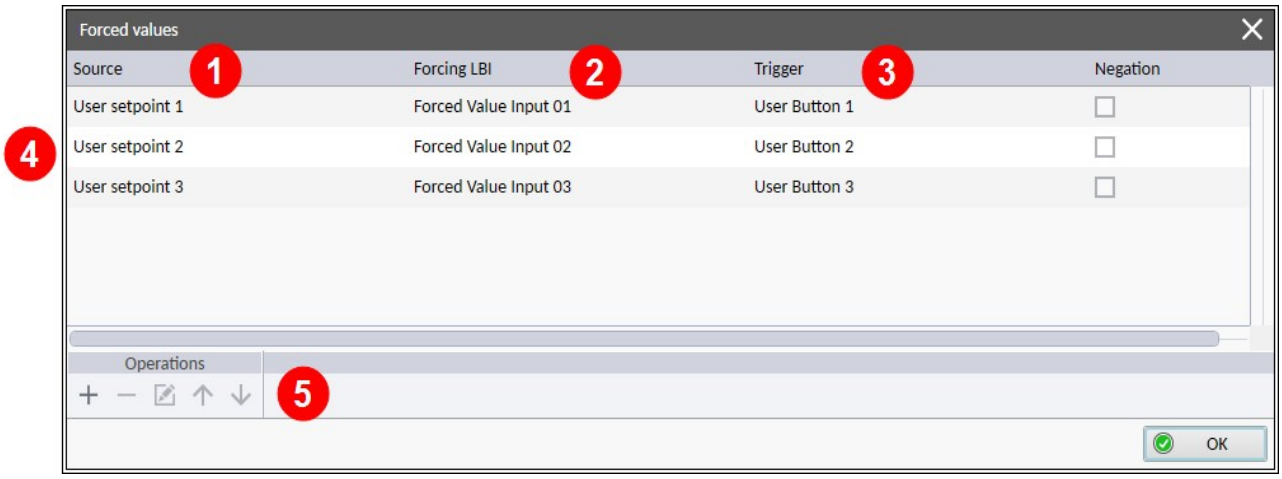
InteliConfig

Image 6.32 : Force Value Indication in Inteli Config

Note: *Setpoints that are currently being forced their arrow turns to green color and they also have the option for writing of different value manually disabled.*

Configuration of Forced Value

Forced Value can be configured only via InteliConfig during standard configuration of the controller and only for selected setpoints. Setpoints to which Forced Value can apply are marked with flag button. Clicking that button opens pop-up window containing all already configured Forced Values conditions. Priority of configured Forced Values is given by order and is descendent - first row has highest priority.



1	Source from which is setpoint going to be forced. Source has to have same resolution and dimension as target setpoint.
2	Name of LBI which activates the Forced Value ***Note:*** *This can be also changed in Controller Configuration - Functions*
3	Used trigger which is connected wit Forcing LBI.
4	List of already configured Forced Values for specific setpoint. First row has highest priorit.
5	Options for adding, removing and editing Forced Values and options for changing order.

6.1.19 Formats of Power Factor

In InteliNeo there are supported these formats of Power Factor.

There are three power factor formats:

ComAp1 format: power factor value in the range <0,000 ; 2,000>

- value in the interval <0,000; 1,000) denotes the lagging (L) power factor
- value in the interval (1,000; 2,000> denotes the leading (C) power factor
- value 1,000 denotes the resistive (R) power factor

Most often used in parameters (inputs) of PF request like Setpoint **#System Power Factor** or LAI **PF CONTROL: ANEXT BASE PF**.

ComAp2 format: power factor value in the range <0,000; 1,000> + additional load character value {'L', 'R', 'C'} = 8 bit character

- value in the interval <0,000; 1,000) + 'L' character denotes the lagging (L) power factor
- value in the interval <0,000; 1,000) + 'C' denotes the leading (C) power factor
- value 1,000 + 'R' character denotes the resistive (R) power factor

R = 82 ASCII / L = 76 ASCII / C = 67 ASCII

Most often used in values of Actual Power Factor of sources e.g. **BESS Power Factor**.

EEI format: power factor value in the range <-1,000 ; 1,000>

- value in the interval <-1,000; 0,000) denotes the lagging (L) power factor
- value in the interval (0,000; 1,000> denotes the leading (C) power factor
- value 0,000 denotes the resistive (R) power factor

This format is commonly use by PV invereters as format for PF request. This format is used also for value **PV Power Factor Request**.

The following figure explains the relations between all three PF formats.

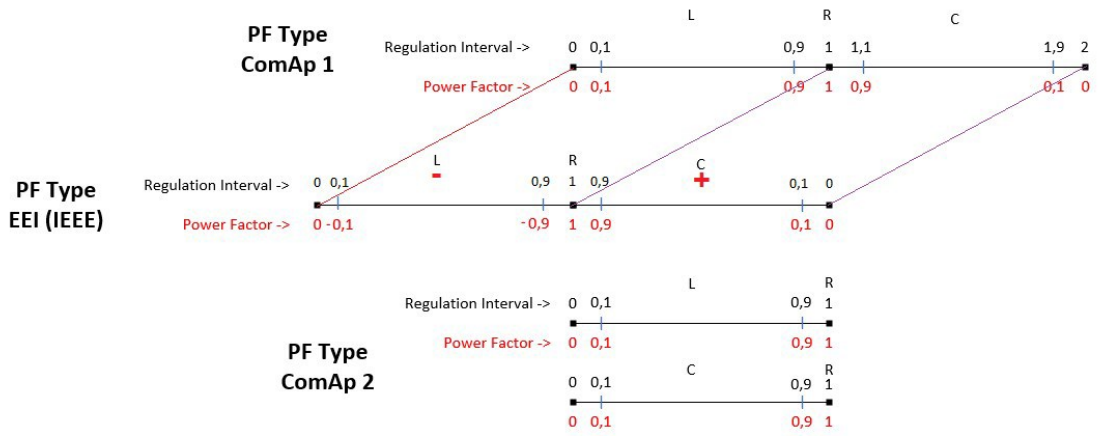


Image 6.33 Power factor formats ranges

Note: *ComAp PLC includes the PLC block which can be used for conversion of Power Factor formats. See* ***PLC - Programmable Logic Controller****.*

6.1.20 Hot Swap Redundancy

Essential signals and wiring diagram 165
Hot Swap – step by step 168

IMPORTANT: This is a premium function which requires SW Key in order to be used!

Hot Swap Redundancy is a feature designed to increase the reliability of the control system. Its principle is based on the fact that the control system consists of two pair controllers, "MASTER" and "BACKUP". The BACKUP controller is ready to take over the control of the BESS anytime when MASTER controller fails.

Assumptions: We assume that both pair controllers have the same information about the controlled system that they obtain through their inputs and communication lines. This information is supplemented by so-called synchronization data, which the MASTER controller sends via the Hot Swap Synchronization Line. The second fundamental assumption is that both controllers have the same configuration in terms of control functions.

Detection of failure of the pair controller and speed of the transition: The BACKUP controller evaluates the competence of the MASTER controller via a heartbeat signal. Due to its high frequency BACKUP is able to detect MASTER failure quickly enough to be able to respond in a way that the entire system does not register the transition to BACKUP at all. This usually happens approximately in 3 ms. The LBO Hot Swap Heart Beat of MASTER controller must be interconnected with the LBI Hot Swap Heart Beat Detect of the pair BACKUP controller and vice versa. So, both controllers monitor each other and they are ready to respond accordingly.

Essential signals and wiring diagram

Note: *This is a set of recommendations to ensure maximum reliability of the Hot Swap system. The actual configuration may vary from case to case.*

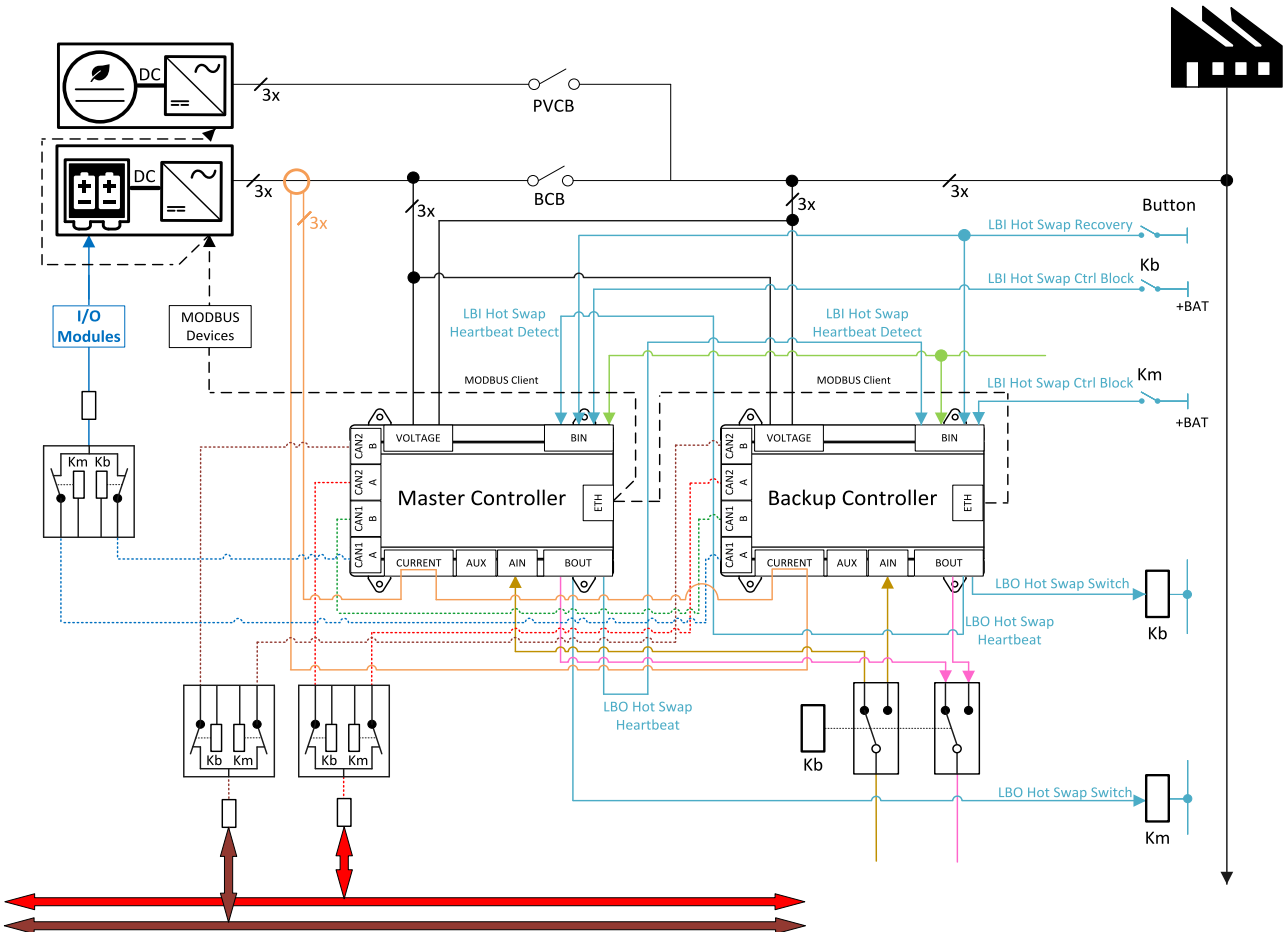


Image 6.34 Wiring diagram and recommended connection

- **Polarity of binary inputs:** The polarity of the Hot Swap Heartbeat pulse signal requires that the controller binary inputs has to be set to the "Pull Down" configuration.

Hot Swap Heartbeat and other control signals

- **Hot Swap Heartbeat** - The LBO **HOT SWAP HEARTBEAT** of MASTER controller must be interconnected with the LBI **HOT SWAP HEARTBEAT DETECT** of the pair BACKUP controller and vice versa.
- **Hot Swap Switch** - The function of Hot Swap necessarily requires the configuration of the LBO **HOT SWAP SWITCH** signal on the armature of relay Km / Kb , which ensures turn over or disconnection of technology inputs / outputs and communication lines. It is possible to use multiple pole relays and combine more control signals together or use a number of independent relays powered by a common physical output of the controller. Then it is necessary to keep the maximum permissible load of one output, or to divide the LBO **HOT SWAP SWITCH** function among several physical binary outputs. Alternatively use one central Hot Swap Switch relay designed to supply all other control relays.
- **The Hot Swap functionality necessarily requires** the configuration of the LBI **HOT SWAP CTRL BLOCK** input on both paired controllers. The input is to be handled by the LBO **HOT SWAP SWITCH** signal of the pair controller and ensures the switching of the controller that has been evaluated as defective to a state where it cannot effect the technology control.

Interconnection of inputs and outputs of Hot Swap pair controllers

- Configuration of inputs to polarity "Pull Down" in combination, where inputs and outputs of controllers are interconnected further requires galvanic separation with optocouplers or connection of anti-series diodes to controller outputs. For more information see **Binary Inputs** and **Binary Outputs**.

Powering

- We recommend a 24V power supply system for the Hot Swap system. The MASTER and BACKUP controllers should be powered from an independent source.

Binary inputs

- The binary inputs (with the exception of the control binary inputs of the Hot Swap function) always lead to both pair controllers at the same time, in the same position without the need of separation by relays. It is recommended to separate the inputs by diodes to avoid wrong input activation when one controller is switched off - **see Binary Inputs on page 72**.
- The binary inputs must be set to "Pull Down" polarity on both controllers.

Binary outputs

- It is strongly recommend to connect the binary outputs controlling the technology via a pair of relays with a disconnecting function. This ensures that a controller that is defective cannot disturb the operation of the application under any circumstances.

Analog inputs

- The analog inputs must be connected via paired relays with a switching function. The exception is the configuration where the analog inputs are set as voltage 0-10 V.

Analog outputs

- The analog outputs controlling the technology, namely AOUT1 and AOUT2, must be connected via a pair of relays with a switching function.

Communication lines

- Technological lines CAN1A (ECU and I/O modules), CAN2A (Intercontroller Communication), CAN2B (Rendundant Intercontroller Communication). These lines are recommended to be connected to both pair controllers via relays with disconnecting function.
- The ETHERNET 3 (technology line with function Modbus Client) is connected to both controllers in the classic way at the same time. The IP address of the pair controllers on this line must be different. In the case of using the hotswap function, it will happen that when the master controller fails, backup controller will start taking care of the device on the modbus. Hotswap function is only possible if the Modbus master is connected via Ethernet (TCP). Both controllers read the same values via modbus, but only one writes. At the moment of switching to backup controller, the roles of writing and controlling are changed.
- Terminal lines ETHERNET 1, ETHERNET 2 are connected to both controllers in the classic way at the same time.
- RS485 (Modbus Server/Master communication) is connected to both controllers in the classic way at the same time. Both pair controllers has different device address on this line. In case of connection via RS485 there is no possibility to use hotswap. It is not possible to read from two devices and write at the same time.

Note: *In complex applications (e.g. InteliMains performing the Load Control of the system) where Hot Swap recovery during the run of the gensets is required, it is recommended to wire essential signals (e.g. LBI Remote Start/Stop) physically. Synchronization of CAN2A/CAN2B lines after the recovery is not as fast as using physical signals.*

Hot Swap Synchronisation Line

- MASTER AND BACKUP has to be interconnected via so called Hot Swap Synchronisation Line. Actually it is point to point interconnecting of CAN1B communication ports via this synchronization is performed. Even in the event of a failure of this line, BACKUP is ready to take control of the system, but a completely smooth transition can no longer be guaranteed.

Display

- The Hot Swap system does not support a common display for both paired controllers. Each controller is equipped with its own display.

Fault Reset

- The Fault Reset button signal is propagated from the controller which is currently in active role to the controller which is currently in listening mode via the Hot Swap Synchronisation Line.

Alternative configuration with disconnection of the MASTER controller from the power supply:

- Wiring and configuration described above is recommended however it may follow the specific requirements of the installation. Instead of using disconnecting relays, it is also possible to disconnect the MASTER controller completely from the power supply. However, the shutdown of the MASTER controller is then bit slower and there is a higher risk of unwanted intervention of the faulty MASTER controller in the control process. In this case, it is not possible to perform a system recovery without a hard reset of both

controllers at one time. We do not recommend this connection, however, the above recommended connection can be extended by disconnecting the MASTER controller from the power supply.

back to Hot Swap Redundancy

Hot Swap – step by step

If we have a ready HW configuration according to the diagram, we can proceed to put the Hot Swap function into operation. In this chapter, we will walk you through all the steps to run up the Hot Swap system and explain how to solve several problems that you could be heading.

The configuration and commissioning of the Hot Swap system:

1. **SW key**
   a. The Hot Swap function is conditioned by software licence - SW Key. The apropriate SW Key must be inserted to the setpoint **SW Key**.
2. **Base configuration**
   a. Check that the signals LBO **Hot Swap Heartbeat** and LBI **Hot Swap Heartbeat Detect** are properly configured – crosswired between MASTER and BACKUP.
   b. It is also necessary to configure the LBO **Hot Swap Switch** signal and the LBI **Hot Swap Ctrl Block** signal to the corresponding binary output / input - again crosswired between MASTER and BACKUP.
   c. These signals can be configured for any binary output and binary input of the controller (they must not be configured on peripheral or virtual modules). The binary inputs must be configured in "Pull Down" mode. This polarity must then be taken into account when designing the entire control system. Failure to comply with this configuration causes that the Hot Swap function is not working and it is Disabled.
   d. If any mandatory LBI or LBO is not correctly configured the alarm **Wrn Hot Swap Configuration Incorrect** is activated.
3. **Setting of the setpoints**
   a. Set the setpoint **Hot Swap Redundancy** = Master on the controller that is to perform the MASTER role, and set this setpoint = Backup on the controller in the BACKUP role. MASTER and BACKUP share the same address, set the setpoint **CAN Controller Address** in the same way. Pay attention, changing the settings of all the above setpoints will not take effect until both controllers are power cycled. Verify the configuration and settings by setting the system to the "default state", ie the MASTER controls the system, the BACKUP is ready to take over the control.
   b. In case of using two sets of I/O modules (modules redundancy), set the setpoint **Hot Swap Redundancy** = Master + Modules Redundancy for MASTER controller and Backup + Modules Redundancy for BACKUP controller. The rest stays the same as above.
4. **From the point of view of the control system**
   We want the hot swap system to behave as one device - one control system. For this reason, we set the CAN Address on the Intercontroller CAN line Setpoint **CAN Controller Address** on the MASTER and on the BACKUP controller identically. This ensures a smooth transition in terms of Load / Var sharing, Powermanagement and virtual peripheries. On the contrary, from the point of view of monitoring, it is necessary to distinguish both devices from each other. The address for Monitoring via RS485 is set using the setpoint **Terminal Comm Address**. This communication line is therefore permanently connected to both controllers and it is not necessary to switch it over the pair controllers.
5. **Resetting the Hot Swap System to the default state**
   It is possible to reset the system by power-cycling of both controllers. Disconnect the power supply from

both pair controllers, first connect the power supply to the MASTER controller, then connect the power supply to the BACKUP controller. If the base configuration is OK, the alarmilist on the MASTER or BACKUP should not contain any alarm related to Hot Swap. Check the value **Hot Swap Redundancy Status**, to confirm that the Hot Swap system is in the default state. The basic check of the default state can be easily performed by changing the Controller Mode on MASTER controller. Controller mode can be changed only from the MASTER controller. BACKUP then only reflects this state and it is not possible to change its Controller Mode directly.

6. **Hot Swap Recovery**
   If the **Wrn Master Controller Failed** or **Wrn Backup Controller Failed** alarm is present in the Alarmlist of one of the controllers, it means that the pair controller was not detected correctly according to the Hot Swap Heartbeat signal. The cause is probably a faulty configuration or wrong wiring. Check the wiring and configuration of the LBO **Hot Swap Heartbeat** and LBI **Hot Swap Heartbeat Detect** signals. If everything is OK, reset the Hot Swap system. This can be achieved without the need to restart both controllers using the LBI **Hot Swap Recovery**. The LBI responds to the edge, so a pulse needs to be applied to inputs of the both controllers at one time.
7. **Performing the Hot Swap function**
   If the Hot Swap system is in the default state, we will perform a Hot Swap function test. Interrupt the Hot Swap Heart Beat signal leading from the MASTER to BACKUP. The alarm **Wrn Master Controller Failed** appears in the alarm list of the BACKUP controller and BACKUP actively takes over the control of the system. In all consequences it means that:
   a. BACKUP activates the LBO **Hot Swap Switch**, which controls all relays according to the diagram. The MASTER is disconnected from all critical lines and signals and the other signals (Analog inputs and Analog Outputs) are switched to the BACKUP controller. At the same time, with this signal, the Master controller is switched to the so-called Listening Mode using its LBI **Hot Swap Ctrl Block**. This mode ensures that the MASTER will be silenced on the CAN communication lines and thus will not collide with the data that is already being sent by BACKUP for this purpose.
   b. At this point, BACKUP switches from listening mode to Talking Mode, thus representing the Hot Swap system on CAN communication lines.
   c. Have a look at value Hot Swap Redundancy Status. The individual signals now correspond to a situation where the system has successfully entered a state where BACKUP is in the role of who controls the system.

   Note: *In case of using two sets of I/O modules (modules redundancy): Failure of one of the Master's CAN modules causes the Hot Swap – the Backup controller takes over the control of the system.*
   Failure of one of the Backup's CAN modules causes: Master considers Backup to be dead (therefore the Backup is no longer available for the Hot Swap function).

8. **Smooth transition to Backup**
   When the BESS is running or is loaded while the MASTER controller fails, then the BACKUP should take over the control of the BESS smoothly without any bumbs on the frequency, voltage and power values, even in dynamic states such as loading, unloading or ongoing synchronization. BACKUP will ensure a smooth transition in the following aspects:
   a. ECU communication
   b. Serving of CAN peripheral modules
   c. Serving of virtual peripheries - Distributed and Shared signals
   d. Communication on Intercontroller line - Load Sharing / Var Sharing
9. **Hot Swap Synchronization Line**
   The states of the state automat, Controller Mode, and controller outputs are synchronized via the Hot

Swap Synchronization Line between MASTER and BACKUP controller. In case of synchronization failure on the Hot Swap Synchronisation Line, BACKUP loses data needed for the smooth transition. If this happens, BACKUP is internally switched to Emergency Manual mode, where it is still able to take over control of the system, but a smooth transition can not be guaranteed. The failure of the Hot Swap Synchronisation Line is accompanied by the following alarms:

a. **Wrn Hot Swap Data Synchro Fail** - takes place on both the MASTER and the BACKUP controller in the event of a communication failure on this line. This status is also indicated in the Hot Swap Redundancy Status value.

b. **Wrn Backup Not Ready** - This status is indicated by MASTER in the alarm list and in the value Hot Swap Redundancy Status. This means that BACKUP has an announced 2nd level alarm, while MASTER does not have such an alarm. Thus, BACKUP is unable to take over control of BESS. This is a marginal issue that might be caused due to the wrong configuration.

10. **Shared setpoints**
All setpoints prefixed by "#" character - Due to the identical CAN address of the MASTER and the BACKUP controller, there is a problem with writing Shared setpoints and it takes these consequences. If we consider that the Hot Swap system is in the default state then:

a. Inserting a shared setpoint to the BACKUP controller will not be reflected in any of the other controllers on the CAN (even not in its pair MASTER controller).

b. Inserting a shared setpoint in the MASTER controller will be reflected in all controllers on the CAN except for its paired BACKUP controller.

> **IMPORTANT: Ensuring the synchronity of shared setpoints must be ensured by the operator!**

11. **Time synchronization**
Synchronizing shared setpoints, changing the Time setpoint will not be reflected throughout the system. Therefore, time synchronization must again be ensured by the operator. With the advantage it is possible to use the function of time synchronization via SNTP server. This ensures that each controller synchronizes the exact time independently of the other controllers.

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6.1.21 I/O Configuration

Binary Inputs 171
Binary Outputs 171
Analog Inputs 172
Analog Outputs 173
Functions Configuration 174
Protections Configuration 174
Transfer I/O Configuration 174
Remove I/O Configuration 175

> ***Note:*** *This is only quick illustration for I/O configuration, see the InteliConfig manual for more information about configuration via PC tool InteliConfig.*

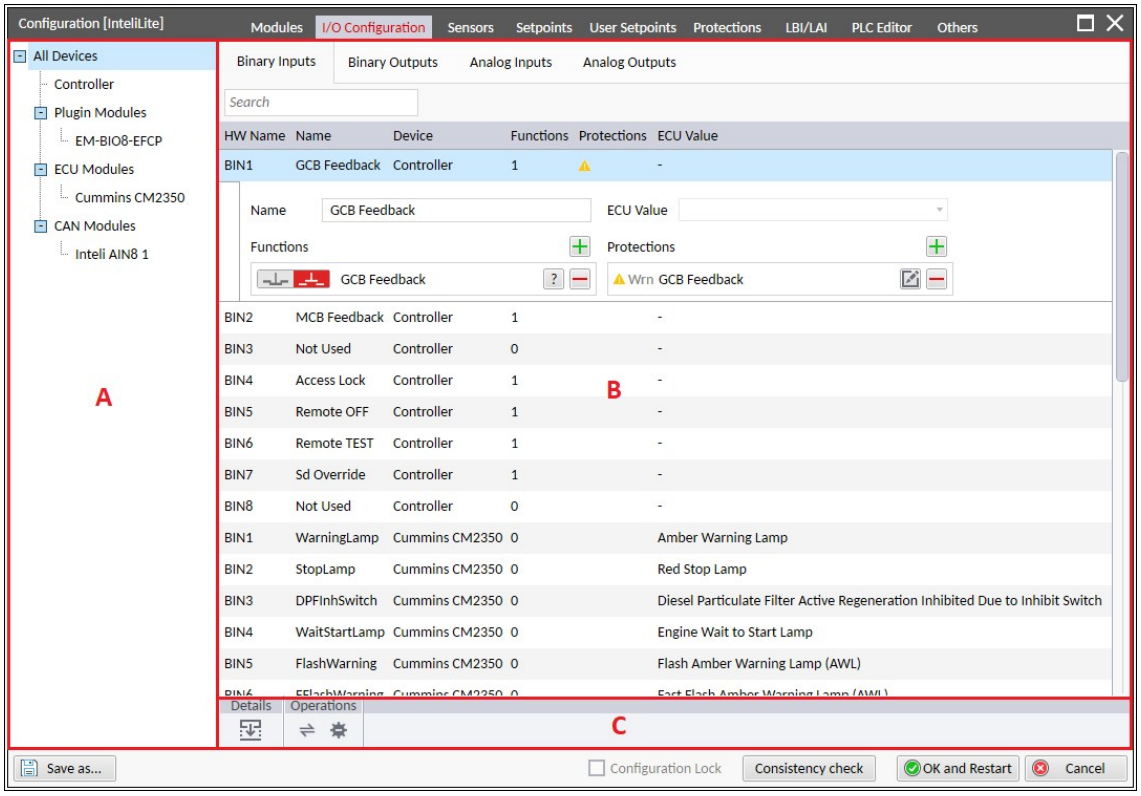


Image 6.35 I/O Configuration window

A. **Device tree** – contains groups of devices with inputs/outputs to configure
B. **Configuration panel** – the list of available inputs/outputs related to device tree selection
C. **Tool bar**
   - **Expand All Details** - Expands the configuration part of all inputs/outputs
   - **Transfer IO Configuration** - **see Transfer I/O Configuration on page 174**
   - **Remove IO Configuration** - **see Remove I/O Configuration on page 175**

Binary Inputs

The configuration of the binary input consists of:

1. **Name** - the name identification of the binary input
2. **ECU Value** - electronic control unit value, available only for ECU devices (otherwise disabled)
3. **Functions** - the set of functions **see Functions Configuration on page 174**
4. **Protections** - the set of protections **see Protections Configuration on page 174**

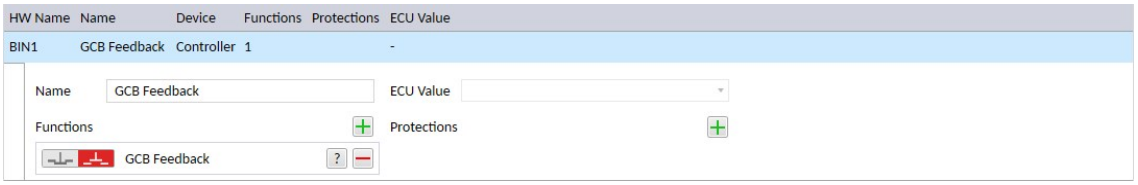


Image 6.36 Binary input configuration

Binary Outputs

The configuration of the binary output consists of:

1. **Name** - the identification name of the binary output
2. **Source** - the source value for the binary output
3. **Contact Type** - represents the default state of output (Normally Open/Normally Closed)
4. **ECU Value** - electronic control unit value, available only for ECU devices (otherwise disabled)
5. **Protections** - the set of protections **see Protections Configuration on page 174**

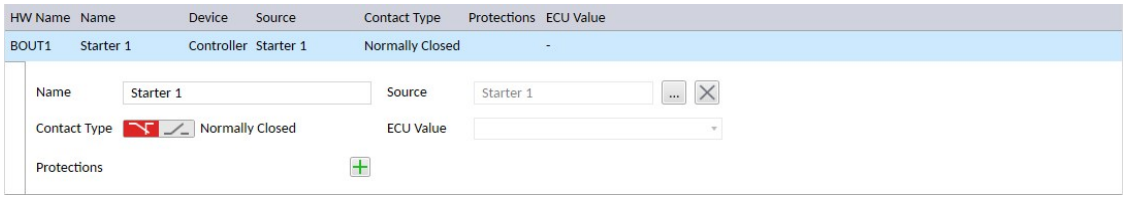


Image 6.37 Binary output configuration

Analog Inputs

The configuration of the analog input consists of:

1. **Name** - the identification name of the analog input
2. **Sensor** - sensor used for the analog input **see Sensor Curves on page 207**
3. **Dimension** - dimension used for analog input (Can be set directly in form if the electronic sensor is configured, otherwise it can be set in sensor configuration.)
4. **Resolution** - resolution used for analog input (Can be set directly in form if the electronic sensor is configured, otherwise it can be set in sensor configuration.)
5. **Sensor Range** - range used for linear sensor (Range for measured values is defined by Offset + Sensor Range)
6. **Offset** - offset used for linear sensor
7. **Bargraph 0%** - lower bargraph limit displayed on the controller display
8. **Bargraph 100%** - upper bargraph limit displayed on the controller display
9. **ECU Value** - electronic control unit value, available only for ECU devices (otherwise disabled)
10. **History Abbreviation** - shortcut used in the History.
11. **Functions** - the collection of functions **see Functions Configuration on page 174**
12. **Protections** - the collection of protections **see Protections Configuration on page 174**

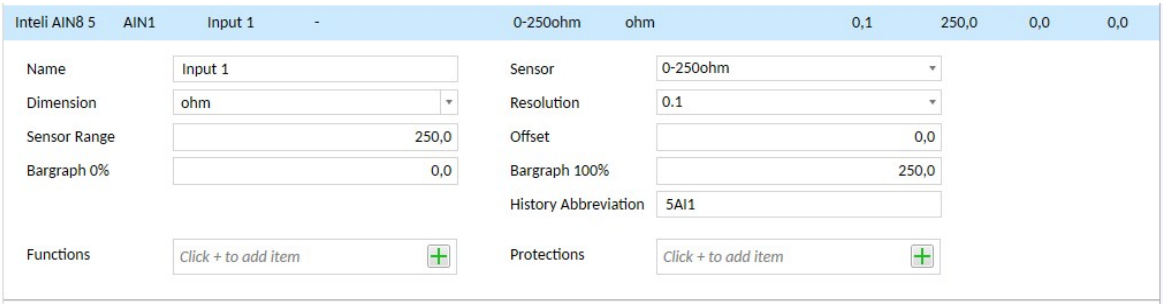


Image 6.38 Analog input configuration using linear sensor

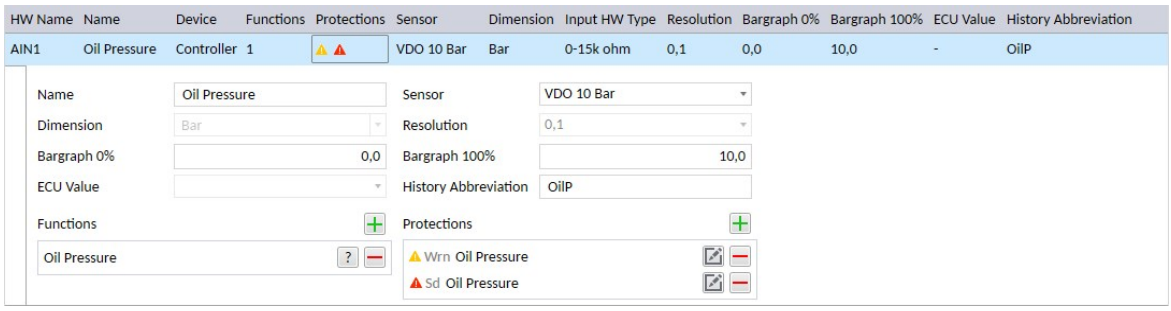


Image 6.39 Analog input configuration using user sensor

Analog Outputs

The configuration of the analog output consists of:

1. **Source** - the source value for the analog output
2. **Output Curve** - definition of the transferring output curve
   a. The output curve is not available if the "No Conversion" parameter is checked.
3. **No Conversion** - Define whether the source value is converted by the output curve or not
4. **PWM Frequency** - setting of the PWM frequency
   a. The PWM frequency can be set only if the output curve is a type of PWM.
5. **ECU Value** - electronic control unit value, available only for ECU devices (otherwise disabled)

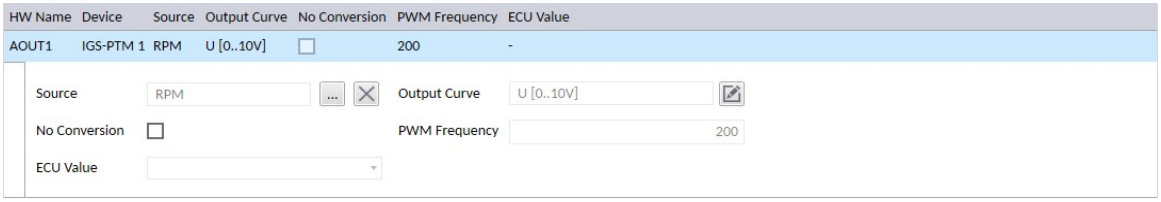


Image 6.40 Analog output configuration

IMPORTANT: Output Curves are in Int16 format (range -32768 to 32767). Therefore if the source value is a decimal value, the range is reduced accordingly.

Example: When **BESS Frequency** (0.001 resolution) is used as a source value, it has to be converted to a lower resolution in PLC (e.g. 0.01) in order to work correctly. Otherwise the upper level of the curve's input would be cut to 32.767.

Functions Configuration

- It is possible to assign more functions (Logical Binary Inputs) to the specific input (BIN, AIN)
  - Add new function to the input
  - Remove function from the input
- For the binary input functions the contact type for each function can be set
  - - Normally Closed/Normally Open
- Each function (LBI) has the link to the help through button ?

Protections Configuration

- It is possible to assign one level 1 and level 2 protection to the specific input or output (BINT, BOUT, AIN).
  - Add new protection
  - Remove protection
  - Edit protection

For more information about protections **see Protections on page 191**

Transfer I/O Configuration

This functionality offers to transfer the whole input/output configuration to another compatible input/output in the same category. The icon for transfer is available in the bottom toolbar.

After clicking on the transfer icon is displayed window for selecting the target input/output. Offered are only compatible inputs/outputs of the same category. When the required input/output is selected and confirmed by the OK button, the transfer operation starts.

Note: *The configuration is transferred completely (functions, protections, sensor, PLC configuration) except Modbus definition.*

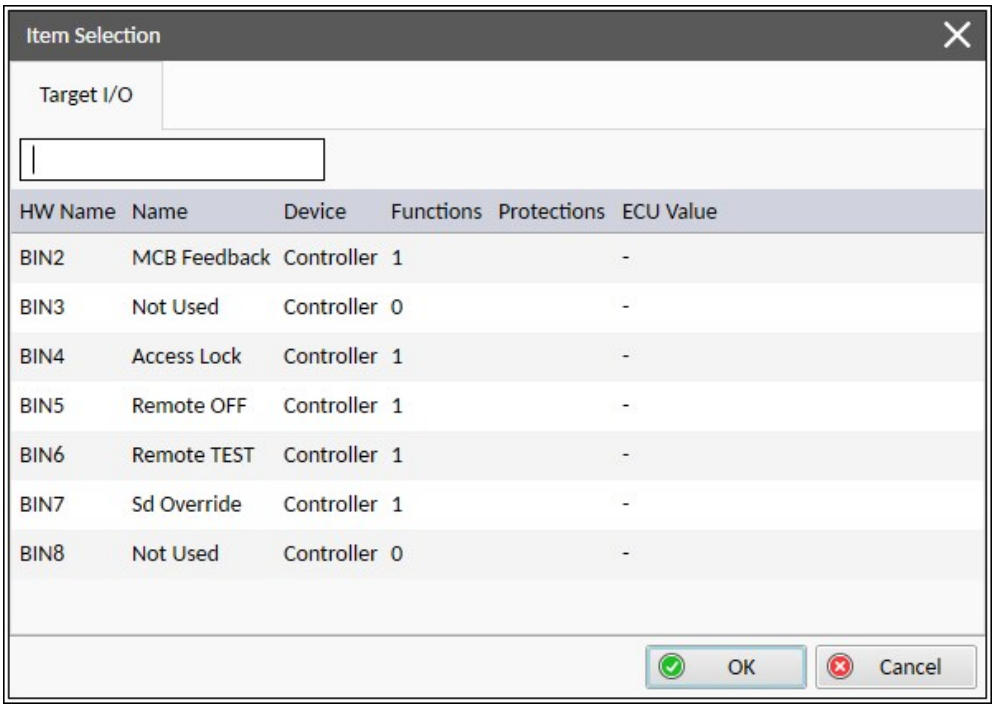


Image 6.41 The window for selecting the target for I/O configuration transfer

Remove I/O Configuration

This functionality offers to remove the whole input/output configuration. The icon for remove is available in the bottom toolbar. The name of input/output is after remove set to "Not Used".

Note: *The configuration is removed completely (functions, protections, sensor, PLC configuration) except Modbus definition.*

6.1.22 Load Shedding

The Load Shedding is controlled disconnection of less important load groups when the object consumption is too high.

Load shedding stages

The Load Shedding function consists of 8 stages which are numbered 1-8. Stages are disconnected in ascending order up to the last configured stage. Reconnecting of stages is in descending order and starts with higher configured stage. Stage is considered as configured when respective Load Shedding Output is configured. Highest activated load shedding stage is stored in value **Load Shedding Status**.

Load shedding outputs

Stage	LBO
Stage 1	LOAD SHEDDING STAGE 1
Stage 2	LOAD SHEDDING STAGE 2-
Stage 3	LOAD SHEDDING STAGE 3
Stage 4	LOAD SHEDDING STAGE 4
Stage 5	LOAD SHEDDING STAGE 5
Stage 6	LOAD SHEDDING STAGE 6
Stage 7	LOAD SHEDDING STAGE 7
Stage 8	LOAD SHEDDING STAGE 8

Active Power Load Shedding

The Load Shedding function can be used if **Controller Mode** != OFF.

Activation of the function is adjusted via setpoint **Load Shedding Active**. Function could be active when:

- Entering **Breaker state** = IslOper/MultIslOp - all stages are disconnected.
- Change from **Breaker state** = ParalOper/MultParOp
  to **Breaker state** = IslOper/MultIslOp - all stages are disconnected.
- During **Breaker state** = IslOper/MultIslOp - only one stage is disconnected/reconnected at a moment

Decisive level for disconnecting of load is adjusted via setpoint **Power Load Shedding Level** and the minimal delay between two disconnections is adjusted via setpoint **Power Load Shedding Delay**. When relative **BESS P** exceeds **Power Load Shedding Level** and delay **Power Load Shedding Delay** elapsed from last disconnection of stage, another stage is disconnected.

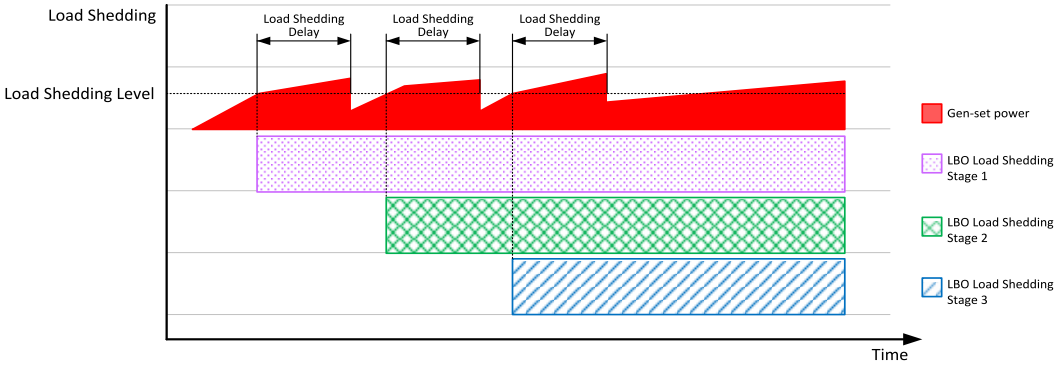


Image 6.42 Load shedding

Note: *Besides load shedding based on monitoring the value of active power P, inteliNeo also offers other variants of this function. These include load shedding based on the value of Apparent Power, i.e.,* ***BESS S****, Frequency* ***BESS Frequency****, and the state of charge of the BESS,i.e.,* ***BESS SOC****.*

Reconnection of load

Disconnected load can be also reconnected. Reconnecting of stages is in descending order and begins with highest disconnected stage. Behavior of this function is adjusted via setpoints **Auto Load Reconnection**, **Power Load Reconnection Level** and **Load Reconnection Delay**.

Manual reconnection

Conditions:

- Setpoint **Auto Load Reconnection** = Manual
- LBI **MANUAL LOAD RECONNECTION** has to be configured

When relative **BESS P** drops below **Power Load Reconnection Level** rising edge of LBI **MANUAL LOAD RECONNECTION** reconnects the highest disconnected stage.

Note: *Setpoint* ***Load Reconnection Delay*** *is not considered*

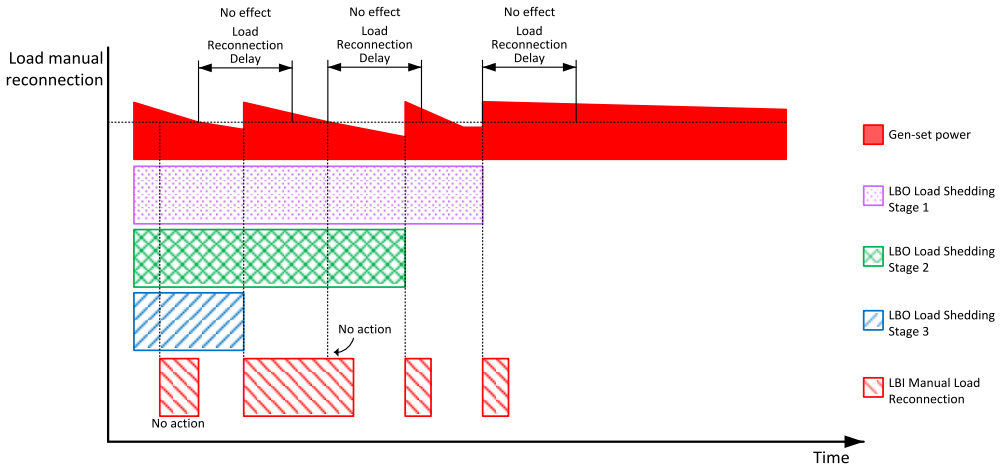


Image 6.43 Manual Load reconnection

Auto reconnection

Conditions:

- Setpoint **Auto Load Reconnection** = Auto

When relative **BESS P** drops below **Power Load Reconnection Level** and delay **Load Reconnection Delay** elapsed from last reconnecting of stage, another stage is reconnected.

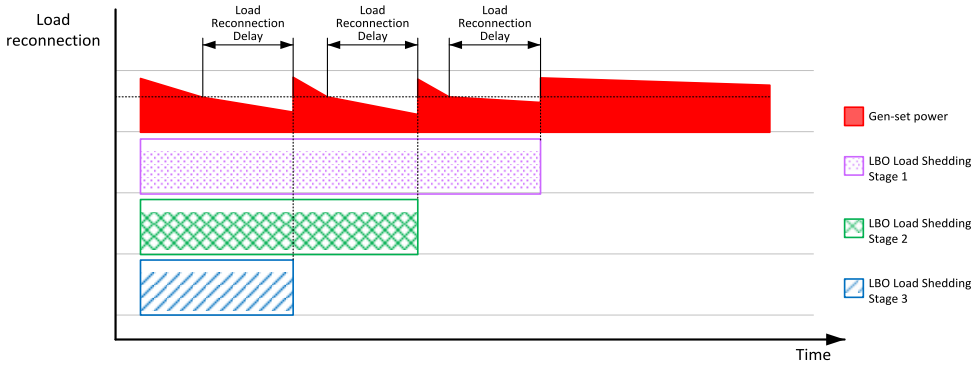


Image 6.44 Auto Load reconnection

Apparent Power based and Frequency based Loadsheddig are based on the same principle as Active Power Load Shedding and share the same load shedding outputs (e.g., **LOAD SHEDDING STAGE 1**). Their mutual interaction on these outputs (over each of these outputs) means that the stages of individual load shedding methods are in a logical “OR” function. Essentially, these are parallel and independent functions that manifest by controlling the common load shedding outputs.

Apparent Power Load Shedding

The function is based on the value of **BESS S** and its principle is identical to the **Active Power Load Shedding** function.

The function is governed by the settings of the setpoints **Apparent Power Load Shedding**, **Apparent Power Load Shedding Level**, **Apparent Power Load Shedding Delay**, and **Apparent Power Load Reconnection Level**.

Frequency Load Shedding

The function is based on the value of **BESS Frequency** and its principle is identical to the **Active Power Load Shedding** function.

The function is governed by the settings of the setpoints **Frequency Load Shedding**, **Frequency Load Shedding Level**, **Voltage Load Shedding Delay**, and **Frequency Load Reconnection Level**.

Battery SOC Load Shedding

The function is based on monitoring the value of **BESS SOC** - State Of Charge of the Energy Storage.

Similar to other types of Load Shedding functions, it involves shedding less critical loads, but this time with the aim of slowing down the discharge of the BESS or preventing deeper discharge of the BESS.

However, the **BESS SOC** value has a different nature as it is an integral value, so the principle of controlling individual stages is fundamentally different.

Battery SOC Load Shedding works only with the load shedding outputs **LOAD SHEDDING STAGE 1**, **LOAD SHEDDING STAGE 2**, and **LOAD SHEDDING STAGE 3**. Each stage is controlled according to these rules.

- The Stage 1 is tripped if the SOC Level **BESS SOC** gets under the limit given by setpoint **Battery SOC Shedding Level 1** at least for time **Battery SOC Shedding Level 1 Delay**. The Load Shedding Stage 1 is deactivated (the LBO **LOAD SHEDDING STAGE 1** is inactive) once the SOC rise over the **Battery SOC Load Shedding Level 1 Reconnection Level** for time given by setpoint **Load Reconnection Delay**.
- The Stage 2 is tripped if the SOC Level **BESS SOC** gets under the limit given by setpoint **Battery SOC Shedding Level 2** at least for time **Battery SOC Shedding Level 2 Delay**. The Load Shedding Stage 2 is deactivated (the LBO **LOAD SHEDDING STAGE 2** is inactive) once the SOC rise over the **Battery SOC Shedding Level 1** for time given by setpoint **Load Reconnection Delay**.
- The Stage 3 is tripped if the SOC Level **BESS SOC** gets under the limit given by setpoint **Battery SOC Shedding Level 3** at least for time Battery SOC Shedding Level 3 Delay. The Load Shedding Stage 3 is deactivated (the LBO **LOAD SHEDDING STAGE 3** is inactive) once the SOC rise over the **Battery SOC Shedding Level 2** for time given by setpoint **Load Reconnection Delay**.

6.1.23 Loss of Mains (Decoupling) Protections

Vector shift

The vector shift function is the fast protection for Mains decoupling (loss of Mains). It monitors the Load angle of the BESSand if it gets changed dramatically, the protection is issued. The Vector shift is evaluated from the **Mains/Bus Voltage L1-N**.

Protection is enabled via setpoint **Vector Shift Protection** . Limit of protection is adjusted via setpoint **Vector Shift Limit**. When protection is activated, the breaker is opened. Which breaker is opened is adjusted via setpoint **Vector Shift/ROCOF CB Selector**. Maximal value of vector shift is represented by value **Max Vector Shift**.

Note: *VectorShift protection gets active (is unblocked) right 500 ms after the condition for activation of protection gets fulfilled = when Controller goes to parallel to Mains operation (When Vector Shift Protection = PARALLEL ONLY) or when MCB gets closed (when Vector shift protection = Enabled).*

The settings can lead to these situations:

MCB STATUS	BCB STATUS	Vector Shift/ROCOF CB Selector	Vector Shift Protection	Action
1	1	MCB or BCB	Enabled or Parallel Only(no influence)	Opens MCB or BCB based on **Vector Shift/ROCOF CB Selector**
0	1	MCB or BCB (no influence)	Enabled or Parallel Only(no influence)	No action (BCB stays always closed)
1	0	MCB or BCB (no influence)	Parallel Only	No action (MCB stays closed)
1	0	MCB	Enabled	Opens MCB
1	0	BCB	Enabled	No action (MCB stays closed)

If a vector shift is detected and consequently the MCB is opened, however Mains voltage and frequency remain in limits, the MCB is then closed again (synchronized) as the Mains is evaluated as healthy.

If a vector shift is detected and consequently the BCB is opened, however Mainsvoltage and frequency remain in limits, the BCB is then closed again (synchronized) immediately (no delay).

ROCOF

The Rate of Change of Frequency function is the fast protection for Mains decoupling (loss of Mains). It monitors the change of frequency and if it gets changed dramatically, the protection is issued.

There are in total 4 independent ROCOF protections devided to 2 kinds.

Common behavior

Protections are enabled/disabled by setpoints **ROCOF1 Protection**, **ROCOF2 Protection**, **ROCOF3 Protection** and **ROCOF4 Protection**.

Option	Vector Shift/ROCOF CB Selector	Behavior
Enabled	MCB	Protection is reactivated with closing of MCB
	BCB	Protection is reactivated with closing of BCB
Parallel Only	Not relevant	Protection is reactivated with entering Parallel Operation Mode **Breaker state** = ParalOper

Sample based ROCOF

These protections are based on controller's sampling. This means that protection is evaluated after certain amount of samples have been obtained by the controller.

ROCOF1 Protection

- Protection is evaluated from last **ROCOF1 Windows Length** samples. If **ROCOF1** is over **ROCOF1 df/dt**, breaker selected by **Vector Shift/ROCOF CB Selector** is opened. Maximal measured ROCOF, from start of evaluation, is stored in **Max ROCOF1**.

Time based ROCOF

These protections are based on specified time period. This means that protection is evaluated from all samples that have been received in that period.

ROCOF2 Protection

- Protection is evaluated from samples received in last **ROCOF2 Windows Length** period. If **ROCOF2** is over **ROCOF2 df/dt**, breaker selected by **Vector Shift/ROCOF CB Selector** is opened. Maximal measured ROCOF, from start of evaluation, is stored in **Max ROCOF2**.

ROCOF3 Protection

- Protection is evaluated from samples received in last **ROCOF3 Windows Length** period. If **ROCOF3** is over **ROCOF3 df/dt**, breaker selected by **Vector Shift/ROCOF CB Selector** is opened. Maximal measured ROCOF, from start of evaluation, is stored in **Max ROCOF3**.

ROCOF4 Protection

- Protection is evaluated from samples received in last **ROCOF4 Windows Length** period. If **ROCOF4** is over **ROCOF4 df/dt**, breaker selected by **Vector Shift/ROCOF CB Selector** is opened. Maximal measured ROCOF, from start of evaluation, is stored in **Max ROCOF4**.

6.1.24 Modbus Client (Master)

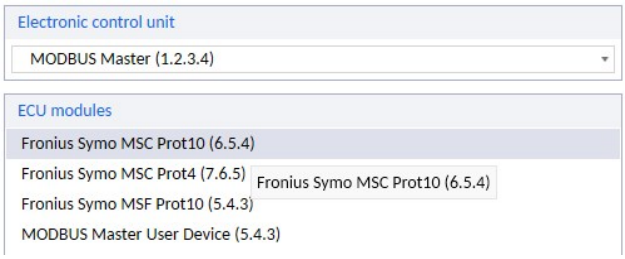
The Controller InteliNeo 6000 is equipped by the function of Modbus Client (Master). Actually it means that controller can play the role of the device which initiate the modbus communication, i.e. controller can ask and command other devices being in role of modbus server (slave). In standard terms role of modbus client (master) on modbus TCP or RTU. The communication protocol with server device is a matter of configuration.

Modbus Client (Master) configuration step by step

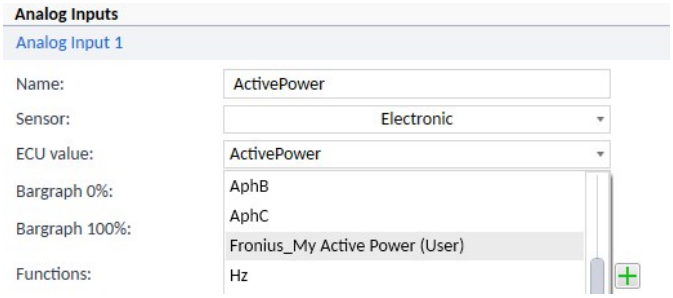
Controller is able with up to 9 modbus devices on RTU and TCP supported. The modbus server device is configured like the ECU module, it is part of Multi ECU configuration. Modbus server devices uses the same pool (resources) for the inputs and outputs as standard ECUs. All modbus server devices share the common pool of inputs and outputs which is limited on 256 Binary Inputs, 256 Binary Outputs, 600 Analog Inputs and 128 Analog Outputs

Modbus Server Devices Predefined by ComAp

ComAp offers several predefined Modbus Server Devices. These devices can be found in Standard ECU list (i.e. under **Inverters – Battery**).



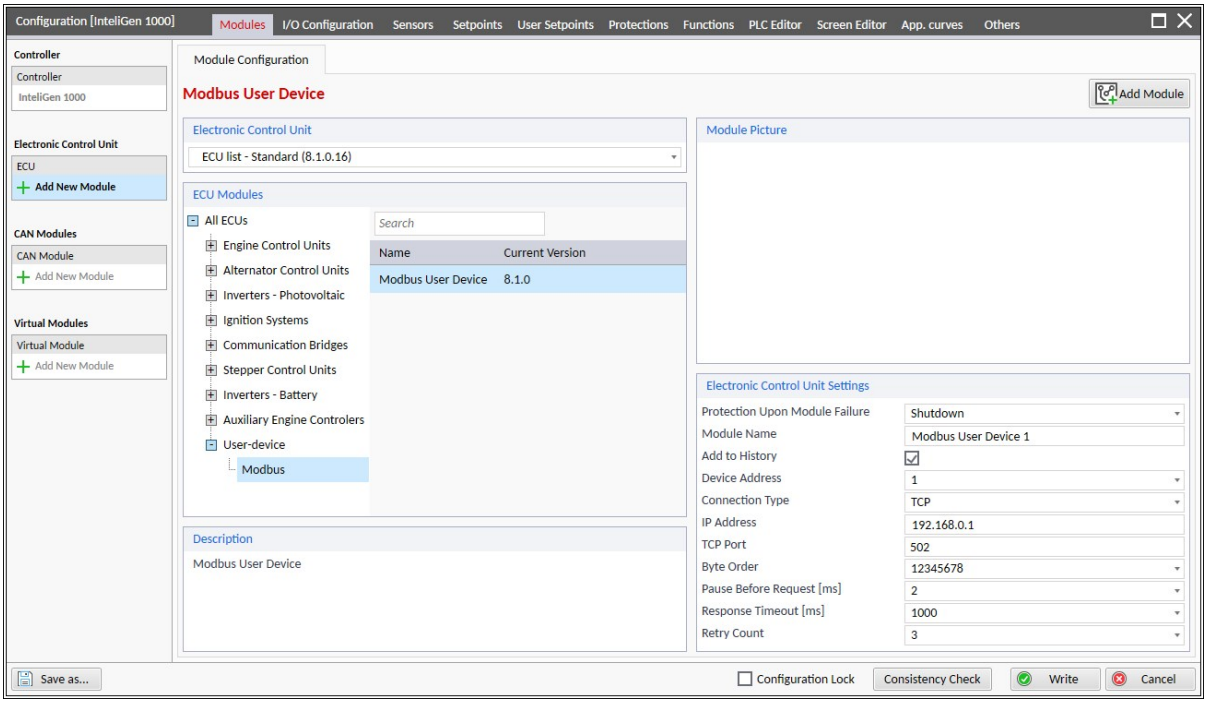
Once the device is added into the configuration there are the same options for extending the definitions of inputs and outputs configuration as for user device. All custom inputs and outputs will be always signed by " (User)" suffix after the name of the signal. This is the way how to recognize custom definitions from ComAp definitions which can not be edited and how to prevent creating duplicity signals by user definitions.



User defined Modbus Server Devices

1. Adding Modbus Server Device

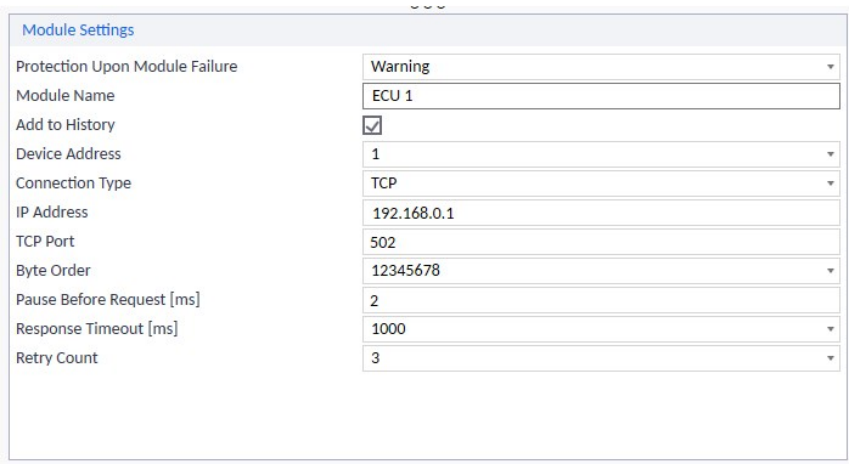
Open the Controller Configuration in InteliConfig, go to section **Modules**, and click on **Add New Module** in **ECU** section. Then under **Electronic Control Unit** select **ECU list - Standard** and choose **User device - Modbus - Modbus User Device** to define your own device definition. Then confirm the settings by pressing the button **Add Module**. Now your modbus server device is added into the configuration.



2. Modbus Server Device Settings

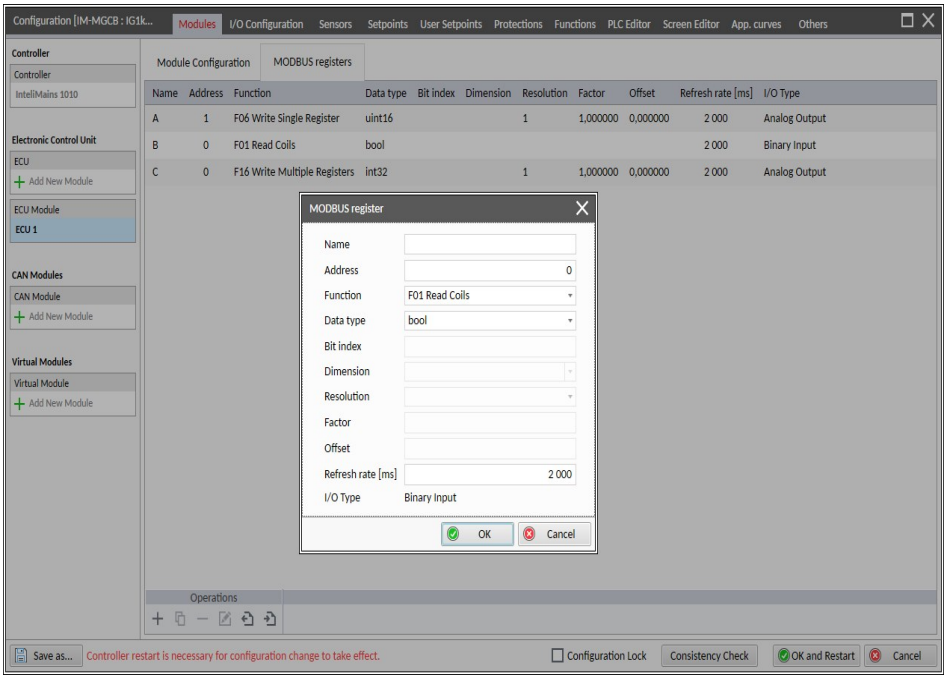
Once the device that was added into the configuration it is necessary to edit number of parameters for the device like Device Address, TCP/RTU, Device Address, etc.

Number of inputs and outputs are not a part of the definition of the device. Inputs and outputs for each device can be defined in menu I/O Configuration.



3. MODBUS Registers (Datapoints) definition

Open the section **MODBUS registers** for editing or creating new registers (datapoints). The list of registers is actually a set of definitions belonging to your specific device and has no direct connection to specific control signals in the controller. So, you can create large set of registers without any limitation. Register definitions for all devices are integrated into the configuration and uploaded into the controller. Therefore there is no need to share the "original Modbus Device List" containing all registers, when editing the configuration which was not created in your computer.



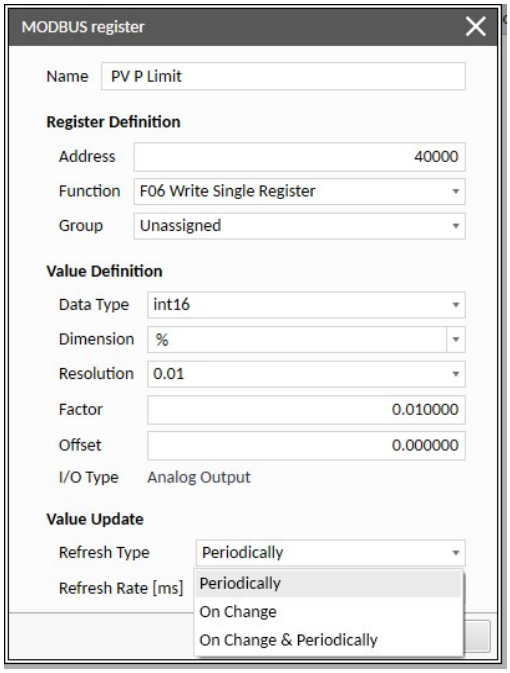
Block of registers reading

As modbus protocol allows reading of block of registers using one operation Modbus Master functionality offers this option. If possible using of this operation is strongly recommended to decrees the numbers of polls in modbus communication. The block reading is a matter of the configuration in InteliConfig. It allows to merge more datapoints into the group or to define each input datapoint directly under this group. The group operation (modbus function) is then defined by the first datapoint which was added (or created) inside this group. Configuration tool automatically construct the modbus poll operation based on the renge of register adresses inside this group.

Write on change option

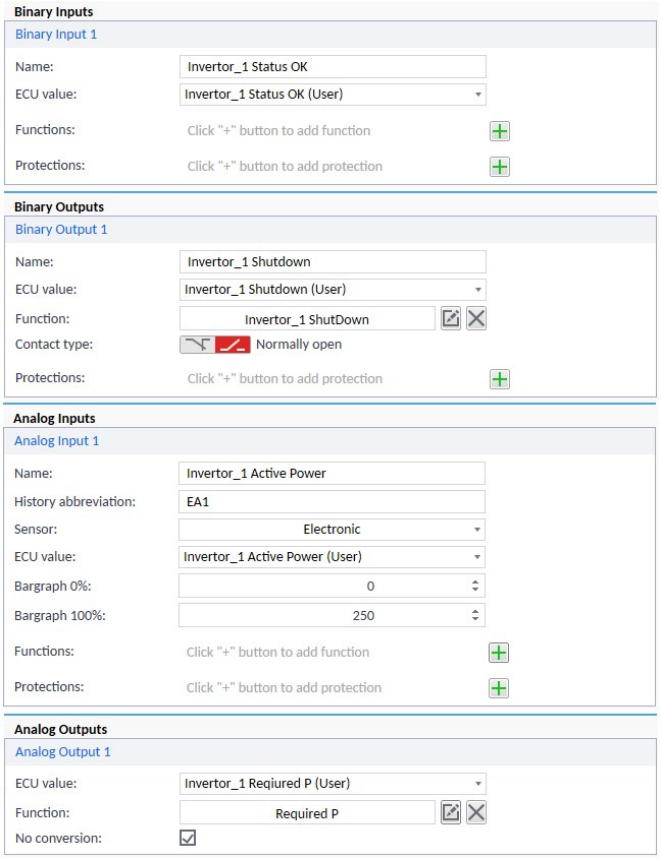
For writing operation it is possible to define the Refresh Type parameter which offers these options:

- **Periodically** - The writing operations is performed every period based on the settings of Refresh Rate parameter regardless the real change of the output which is to be written.
- **On Change** - The write operation is only performed on change of output value.
- **On Change & Periodically** - The Write operation is always performed on change as same as periodically. This allows to set relatively slow refresh rate but accept the change of the output at the same time.



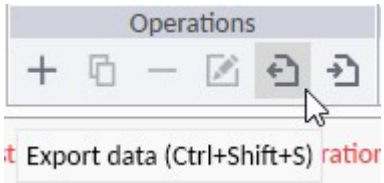
4. Configuration of Inputs And Outputs

Now, when the definition of your Modbus Server Device was created, go to section **I/O Configuration** and assign the specified registers to inputs and outputs. Then assign the functions for inputs and outputs. You can select from the list of standard logical signals or use your inputs and outputs in the PLC configuration.

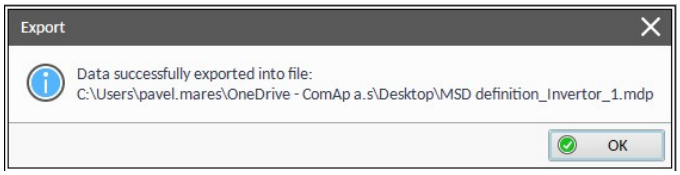


5. Clonning of The Modbus Server Device

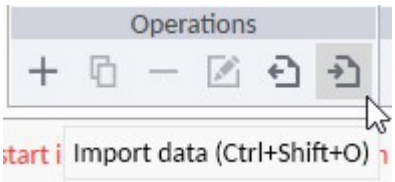
When using more then one instance of a specific Modbus Server Device in one configuration, or when needed the Modbus Server Device definition for configuration of another controller, there is a way how to Export and Import the definitions. Go to section **MODBUS registers** in **Modules** and select the icon for exporting data.



Insert the name and select the target folder for exporting data. You will be informed about successful exporting of your device definition.



After that select the icon for importing data in a new configuration.



Select one of your Modbus Server Device definition files and Import it into the configuration for a new instance of your device.

6. State Decoders

Some devices (for example PV inverters) use an analog value to report their status, where each individual state is represented by a single integer value (for example 0 - Not Ready, 1 - Ready, 2 - Online...). Some controllers support processing of such information (depending on the FW version). Each defined state activates the corresponding bit.

InteliConfig allows defining conversion rules between an analog value and individual bits. We call the set of these rules a State Decoder.

Multiple State Decoders can be defined in a configuration. At the same time, one State Decoder can be used for multiple analog values (typically in the case when there are multiple inverters of the same type in the configuration and it is necessary to perform conversion for all of these inverters).

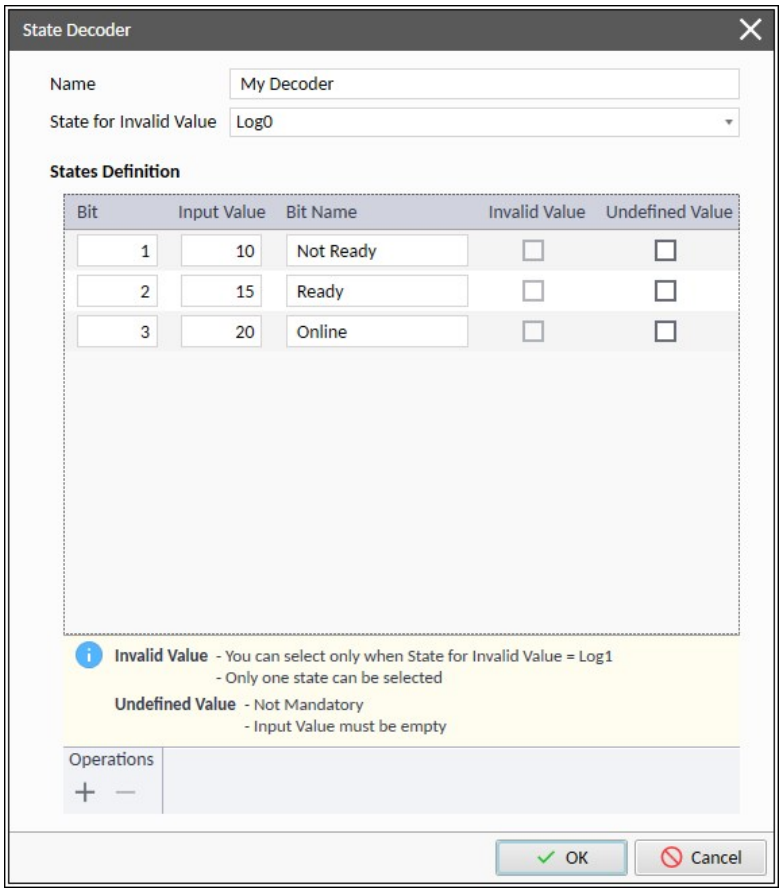
Principle

It is possible to define a State Decoder. The decoder definition is something like a template, it is a rule according to which binary value will be created when used on a specific analog value of the ECU. The definition specifies the value of the analog value and the corresponding bit that should be active. It is also possible to define a bit that will be active in the case when the incoming value is not valid. This is for example in the case when there is no communication with the relevant device. It is also possible to define a bit that will be active in the case when the incoming value does not correspond to any definition.

The defined State Decoder can then be used with any analog ECU Value (it is assumed that the value has no decimal places). By selecting the decoder, a new free Value is selected and its bits are linked to the relevant states. The Controller has a set of Values available, each with 16 bits. If more than 16 bits are defined in the definition, more Values are used. The Values are named according to the source analog Value . If more Values are used, a numerical suffix is added.

State Decoder definition

State Decoders are managed on the I/O Configuration - State Decoders tab. Here you can add, delete, edit, export and import definitions.



Bit - The bit number used for the given incoming value. This number must be unique within the definition. It is advisable to avoid a situation where some bits are not defined. The decoders will still work correctly, it is just that more resources will be used. If I define bit 1 and bit 16, 2 Values will be used, only one bit from each.

Input Value - This is the incoming value to be converted to the appropriate bit. The value must be unique.

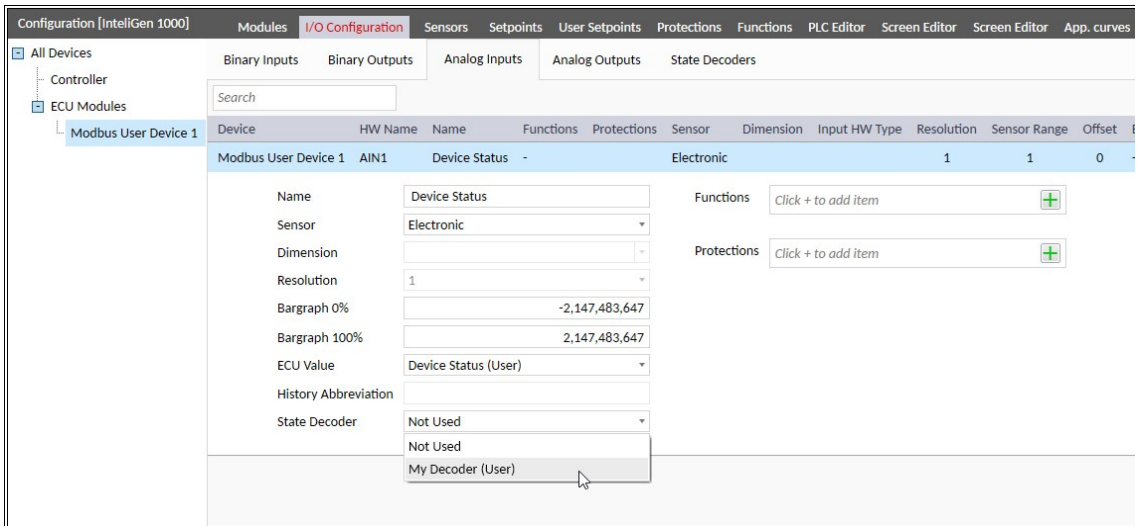
Bit Name - Name of the corresponding bit in the resulting Value.

Invalid Value - If *State for Invalid Value* is set to Log1, it is possible to specify one bit that will be active when the input value is invalid (usually displayed as #### in terminals).

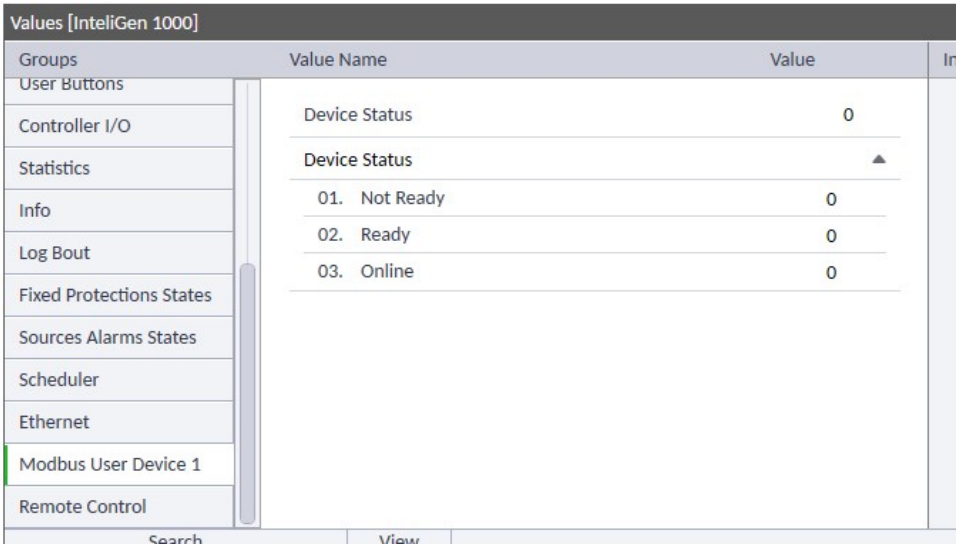
Undefined Value - Here you can define a bit that will be active when the input value is valid but does not match any definition in the State Decoder. In this case, the *Input Value* field must be empty.

Using the State Decoder

The definedState Decoder can be used for analog ECU values. The assignment is made to the corresponding analog input on the I/O Configuration tab.



After writing the configuration, a new binary value will be added to the group of the given ECU and will contain the bits defined in the State Decoder definition.



As mentioned above, one State Decoder definition can be used for multiple Values.

Note: *A used State Decoder can still be edited or deleted. In this case, the change will be reflected in all places where the givenState Decoder is used.*

6.1.25 Multiple ECU

InteliNeo 6000 allows you to configure, monitor and control multiple Electronic Control Units (ECUs), such as Battery Management and Power Conversion modules. At this moment there are 32 ECU slots available, each slot can contain one ECU/Modbus Master which settings can be separately configured. ECU can be configured via InteliConfig (Control → Configuration → Modules → Electronic Control Unit).

In order to ensure proper functionality you shall pay extra attention to the ECU settings. ECU address has to be always unique whereas Controller address is required to be set to the same value as **CAN Controller Address** of the Controller Unit that sends commands frames to this ECU. Aftertreatment can be enabled only for one ECU, enable it by using a check box.

ECU I/O can be configured in I/O Configuration.

Controller objects related to ECU

ECU Slot	LBO	Alarm
1	**ECU 1 COMM FAIL**	**Wrn ECU 1 Comm Fail**
2	**ECU 2 COMM FAIL**	**Wrn ECU 2 Comm Fail**
3	**ECU 3 COMM FAIL**	**Wrn ECU 3 Comm Fail**
4	**ECU 4 COMM FAIL**	**Wrn ECU 4 Comm Fail**
5	**ECU 5 COMM FAIL**	**Wrn ECU 5 Comm Fail**
6	**ECU 6 COMM FAIL**	**Wrn ECU 6 Comm Fail**
7	**ECU 7 COMM FAIL**	**Wrn ECU 7 Comm Fail**
8	**ECU 8 COMM FAIL**	**Wrn ECU 8 Comm Fail**
9	**ECU 9 COMM FAIL**	**Wrn ECU 9 Comm Fail**
10	**ECU 10 COMM FAIL**	**Wrn ECU 10 Comm Fail**
11	**ECU 11 COMM FAIL**	**Wrn ECU 11 Comm Fail**
12	**ECU 12 COMM FAIL**	**Wrn ECU 12 Comm Fail**
13	**ECU 13 COMM FAIL**	**Wrn ECU 13 Comm Fail**
14	**ECU 14 COMM FAIL**	**Wrn ECU 14 Comm Fail**
15	**ECU 15 COMM FAIL**	**Wrn ECU 15 Comm Fail**
16	**ECU 16 COMM FAIL**	**Wrn ECU 16 Comm Fail**

For each ECU there is LBO which gets activated when communication issue with respective ECU is detected. For easier detection whether all configured ECUs are communicating, there is LBO **ECU COMM OK**. During detected communication issue an alarm is issued for respective ECU.

All protections which evaluation depends on values from the ECU with communication error are blocked in order to pervent showing of invalid protections in the Alarm list.

6.1.26 Operating Modes

The operating mode can be selected by pressing Left and Right buttons on the front panel/display, by changing the **Controller Mode** setpoint, or by activating respective LBI.

Note: *If the setpoint is configured as password-protected, the correct password must be entered prior to attempting to change the mode.*

The following binary inputs can be used to force one respective operating mode independent of the mode setpoint selection:

- **Remote OFF MODE**
- **Remote MANRUN MODE**
- **Remote AUTO**

If the respective input is active the controller will change the mode to the respective position according to the active input. If multiple inputs are active, the mode will be changed according to priorities of the inputs. The priorities match the order in the list above. If all inputs are deactivated, the mode will return to the original position given by the setpoint.

Another chapter related to the Operating modes is in the Operator Guide **see Basic operating modes description on page 119**.

Switching Control Mode

Controller recognize two possible ways to change mode:

- Setpoint

Controller mode is selected by Setpoint **Controller Mode**. Change of this setpoint will change controller mode. Terminals such as InteliConfig, InteliSCADA or Displays uses this setpoint to change controller mode, but they use their own visualization for it.

MODBUS can be used to change this setpoint as well.

- LBI

Dedicated LBIs to change mode have higher priority than the setpoint. When LBI is activated th setpoint is unchanged.

When all LBIs are deactivated controller mode is changed to one that is in Setpoint **Controller Mode**.

Signalization of Control Mode

Controller offers two kinds of signalization:

- Value

Current controller mode is always show in Value **Controller Mode**.

LBO

There is a dedicated LBO for each mode.

- **MODE OFFPRG**
- **MODE MANRUNSEM**
- **MODE AUTO**

OFF

Start of the BESS is blocked, the controller will stay in **Not Ready** state, and starting command cannot be issued. If the BESS is already running, it is not possible to switch directly to the OFF mode. Firstly you have to stop the BESS and after that switch to the OFF mode.

For MPTM application, if Mains is healthy and MCB is opened, then MCB is automatically closed after the delay given by setpoint MCB Close Delay.

No Power management function will be performed. The buttons **MCB ON/OFF** I/O, **BCB ON/OFF** I/O, **START** I, and **STOP** O including the appropriate binary inputs for external buttons are not active.

Note: *When BESS is running, it is not possible to switch the controller to OFF mode.*

MAN

The BESS can be started and stopped manually using the **START** and **STOP** buttons (or external buttons wired to the appropriate binary inputs) if no 2nd level alarm is active. When the BESS is running and BESS parameters are in the limits, BCB can be closed to a dead bus or synchronization can be started by the BCB button.

The MCB (in case of MPTM application) can be closed and opened manually using the MCB button, if Mains is present. MCB can be opened manually after Mains failure (it is not tripped in case of Mains failure).

Opening and closing of breakers depends on the setpoint **CB Control In MAN Mode**.

Controller does not respond to external signals and/or conditions. The BESS is fully in manual control; there is no automatic way to stop it (except protections). The BESS stays running until STOP button is pressed. Controller does not take place in **Power Management** in MINT application.

No AMF or Power management function will be performed.

AUTO

BESS is controlled based on external signal (**UNIVERSAL GENSET START/STOP**) or by conditions (Peak shaving, Power management system, etc.). When one condition deactivates the BESS does not stop if another condition for automatic starts is active. System Start/Stop can be received from other controllers via Intecontroller Communication.

The controller does not respond to the buttons **START**, **STOP**, **MCB ON/OFF**, and **BCB ON/OFF**.

If peak shaving stop condition occurs, but **UNIVERSAL GENSET START/STOP** is active, BESS stays running.

> **IMPORTANT: If a red alarm is present and the controller is in the AUT mode, the BESS can start by itself after all red alarms become inactive and are acknowledged (fault reset is pressed)! To avoid this situation, adjust the setpoint Fault Reset To Manual to the Enabled position.**

> **IMPORTANT: BESS will start if at least one external signal or condition is fulfilled.**

6.1.27 Power Formats And Units

InteliNeo 6000 allows users to choose from several Power Formats that affect dimensions in which values and some setpoints are interpreted or adjusted. Power formats and units can be changed with InteliConfig in the following way. Control tab → Controller configuration → Others tab → Units/Power format

Power formats are available in decimal and non decimal format. Units can be changed to metric or US units.

Units

Metric	20 °C	10.0 bar	11.4 l/h
US	68 °F	145 psi	3.01 gph

Power Format

Small	0.1 kW / kVA / kVAr	1 V
Standard	1 kW / kVA / kVAr	1 V
Large HV	0.01 MW / MVA / MVAr	0.01 kV
Large LV	0.01 MW / MVA / MVAr	1 V

Note: *Range of some setpoints and values is changed significantly when different Power Formats are selected. Affected setpoint are displayed during selection of power format.*

6.1.28 Power Management

In the description of the ComAp system, the term Power Management traditionally refers to the way in which the system decides which sources (historically gensets) actively participate in the supply of electrical energy and which sources are on standby. Simply put, which gensets are running and connected to the common bus and which gensets are idle. The decision-making principle is based on the required load reserve (i.e., which combination of sources (gensets) is most advantageous to cover the current load and maintain the required load reserve), as well as the principle of balancing engine hours, etc.

Power management in this sense mainly concerns gensets. A precise description of the Power Management function is not the subject of this document. For a closer understanding of this function, read the **InteliGen 1000 Global Guide**.

Therefore, InteliNeo sources integrated into the system participate in the Power Management function only to the extent related to covering the required load reserves. This is discussed in more detail in chapter **Power management in a system combining BESS, PV and Gensets**.

6.1.29 Protections

Protection types 192
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Protection blocking 194
Fixed protections 194
User protections 199
Protection states 204

InteliNeo 6000 combines **Fixed protections** with **User protections** which allows users to configure their own protections to any analog or binary input. Multiple protections can be configured on each analog input, number of configured protections are not limited. Only **one** protection of **1st level** and/or **one** protection of **2nd level** can be configured on logical binary output. The maximum number of configured **User protections** is limited to 200. The maximum number of configured **fast User protections** is limited to 50.

Protection types

Level 1 Protections

✓ **LBO Common Alarm Level 1**

✓ **LBO Common Alarm Active Level 1**

✗ **Action: CB open**

✗ **Action: BESS stop**

✗ **SD Override blocking**

Name	Warning	Alarm Only	History Record Only	Alarm List Indication	Alarm List + History Record Indication
Abbreviation	Wrn	Al	Hst	ALI	AHI
Alarm List indication	✓	✓	✗	✓	✓
History record	✓	✗	✓	✗	✓
Fault Reset needed	✓	✓	✗	✗	✗
LBO Alarm activation	✓	✓	✗	✗	✗
LBO Horn activation	✓	✓	✗	✗	✗
Common LBO	Common Warning	Common Alarm Only	Common History Record	✗	✗

Level 2 Protections

✓ **LBO Common Alarm Level 2**; except **Mains Protection**

✓ **LBO Common Alarm Active Level 2** ; except **Mains Protection**

Name	Shutdown	Shutdown Override	Slow Stop	Mains Protection	PVCB Open
Abbreviation	Sd	Sd	Stp	MP	PVBO
Alarm List indication	✓	✓	✓	✗	✗
History record	✓	✓	✓	✓	✓
Fault Reset needed	✓	✓	✓	✗	✗
Action: CB open	✓	✓	✓	✗	✓
Action: BESS stop	✓	✓	✓	✗	✗
SD Override blocking	✓	✗	✓	✗	✗
LBO Alarm activation	✓	✓	✓	✗	✗
LBO Horn activation	✓	✓	✓	✗	✗
Common LBO	Common Shutdown + FltRes	Common Shutdown Override	Common SlowSystem Stop Protection	Common Mains ProtectionCommon Mains Protection	Common PVCB Open

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Protection activation

The table below shows the availability of conditions for analog and binary values

Type	Name of activation	Protection is activated if value is
Analog	Over Limit	over limit
	Over Limit+Fls	over limit or in fault state
	Under Limit	under limit
	Under Limit+Fls	under limit or in fault state
	Fls only	in fault state
Binary	True	logical 1
	TrueOrFls	logical 1 or in fault state*
	False	logical 0
	FalseOrFls	logical 0 or in fault state*

* Fault state can occur if there is loss of communication with configured CAN module.

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Protection blocking

It is possible to configure one Protection Blocking to any **User protections**. This function is used to block certain protections when their function is unwanted or meaningless. Each user protection has an option to set the blocking condition.

The blocking conditions can be also applied on the **Fixed protections**.

General protections

Each of the LBI Protection Force Disable 1 is paired with an option of protection condition "Force Block 1–3" and can be used for Blocking / Disabling of protections, however on user defined protections the option causes protection Blocking instead of Disabling.

Run only protections

Each of the setpoint **Run Only Block Delay 1** is paired with an option of protection condition "Run Only Block Delay 1–3". The protection

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Fixed protections

Some selected fixed protections has an option to DISABLE the protection.

The setting is done by using the setpoint which is associated to the fixed protection. Each setpoint offers these options.

Setpoint options

Alarms	Fixed Protection States
Enable	Protection is enabled
Disable	Protection is disabled
PROTECTION FORCE DISABLE BLOCK 1 PROTECTION FORCE DISABLE BLOCK 2	Disabling of the protection can be forced by LBI

Setpoint options

Alarms	Fixed Protection States
PROTECTION FORCE DISABLE BLOCK 3	

BESS Voltage Protections

Protection	Alarms / Protection name	Fixed Protection States
BESS >>V Protection	Sd BESS >>V L1-N Sd BESS >>V L2-N Sd BESS >>V L3-N Sd BESS >>V L1-L2 Sd BESS >>V L2-L3 Sd BESS >>V L3-L1	FIXED PROTECTIONS STATES 2
BESS >V	Sd BESS >V L1-N Sd BESS >V L2-N Sd BESS >V L3-N SdBESS >V L1-L2 Sd BESS >V L2-L3 Sd BESS >V L3-L1	FIXED PROTECTIONS STATES 2
BESS <V Protection	Sd BESS <V L1-N Sd BESS <V L2-N Sd BESS <V L3-N Sd BESSMains <V L1-L2 Sd BESSMains <V L2-L3 Sd BESSMains <V L3-L1	FIXED PROTECTIONS STATES 2
BESS V Unbalance Protection	Sd BESS V Unbalance Ph-N Sd BESS V Unbalance Ph-Ph	FIXED PROTECTIONS STATES 2

BESS Frequency Protections

Protection	Alarms / Protection name	Fixed Protection States
BESS >f Protection	Sd BESS >f	FIXED PROTECTIONS STATES 2
BESS <f Protection	Sd BESS <f	FIXED PROTECTIONS STATES 2

BESS Load & Current Protections

Protection	Alarms / Protection name	Fixed Protection States
Short Circuit Protection	Sd Short Circuit	FIXED PROTECTIONS STATES 4
IDMT BESS >A Protection	Sd IDMT BESS >A	FIXED PROTECTIONS STATES 4
BESS Current Unbalance Protection	Sd BESS Current Unbalance	FIXED PROTECTIONS STATES 2

BESS Load & Current Protections

Protection	Alarms / Protection name	Fixed Protection States
IDMT Overload Protection	Sd IDMT Overload	FIXED PROTECTIONS STATES 4

BESS Other Protections

Protection	Alarms / Protection name	Fixed Protection States
BESS Anti Islanding Protection	BESS Anti Islanding	FIXED PROTECTIONS STATES 5
Earth Fault Current Protection	Sd IDMT Earth Fault Current	FIXED PROTECTIONS STATES 4
Phase Rotation ***Note:*** *This protection monitors phases rotation and compares it with* ***Phase Rotation****, in case of inconsistency, proper alarm is activated* ***Note:*** *This protection can't be disabled.*	ALI BESS Ph Rotation Opposite	-
Inverted Phase ***Note:*** *This protection monitors phases inversion and in case of inconsistency of all phases, proper alarm is activated* ***Note:*** *This protection can not be disabled.*	ALI BESS Ph L1 Inverted ALI BESS Ph L2 Inverted ALI BESS Ph L3 Inverted	-

Note: *BESS Anti Islanding Protection is only in use if the selected method of controling of the BESS is P-Q, see* ***BESS output control methods P-Q / U-f****. BESS in P-Q control mode is not suppose to perform the Grid Forming function. Anytime when the BESS in P-Q mode stays on the bus alone without any other Grid Forming source (like Genset or Mains) the BESS Anti Islanding protection is tripped, BCB is opened, the BESS goes to Stop and Ready state while the DC circuit is to be opened - LBO* ***PRECHARGE REQUEST*** *inactive (causes History Record DC Bus Deenergized).*

PV Protections

Protection	Alarms / Protection name	Fixed Protection States
PV Anti Islanding Protection	PVBO PV Anti Islanding	FIXED PROTECTIONS STATES 2

Bus Voltage Protections

Protection	Alarms / Protection name	Fixed Protection State
Bus V Unbalance Protection › Behavior of protection is adjusted via setpoints **BESS V Unbalance** and **BESS V Unbalance Delay** When relative difference between bus voltages is over setpoint **BESS V Unbalance** for time longer than **BESS V Unbalance Delay** history record "**Bus V Unbalance Ph-N**" or/and "**Bus V Unbalance Ph-Ph**" is written to the history. **IMPORTANT: Behavior of this protection is influenced by setpoint Connection type.** ***Note:*** *This protection can not be disabled.*	**Mains/Bus V Unbalance Ph-N** **Mains/BusV Unbalance Ph-Ph**	**FIXED PROTECTIONS STATES 3**

Bus Other Protections

Protection	Alarms / Protection name	Fixed Protection State
Bus Meas Error	**Bus Meas Error**	**FIXED PROTECTIONS STATES 4**

Mains Voltage Protections

Protection	Alarms / Protection name	Fixed Protection States
Mains >>V Protection	**Mains/Bus >>V L1-N** **Mains/Bus >>V L2-N** **Mains/Bus >>V L3-N** **Mains/Bus >>V L1-L2** **Mains/Bus >>V L2-L3** **Mains/Bus >>V L3-L1**	**FIXED PROTECTIONS STATES 3**
Mains >V Protection	**Mains/Bus >V L1-N** **Mains/Bus >V L1-N** **Mains/Bus >V L2-N** **Mains/Bus >V L3-N** **Mains/Bus >V L1-L2** **Mains/Bus >V L2-L3** **Mains/Bus >V L3-L1**	**FIXED PROTECTIONS STATES 2** **FIXED PROTECTIONS STATES 3**
Mains <V Protection	**Mains/Bus <V L1-N** **Mains/Bus <V L2-N** **Mains/Bus <V L3-N** **Mains/Bus <V L1-L2**	**FIXED PROTECTIONS STATES 2** **FIXED PROTECTIONS STATES 3**

Mains Voltage Protections

Protection	Alarms / Protection name	Fixed Protection States
	Mains/Bus <V L2-L3 Mains/Bus <V L3-L1	
Mains <V Protection	Mains/Bus <<V L1-N Mains/Bus <<V L2-N Mains/Bus <<V L3-N Mains/Bus <<V L1-L2 Mains/Bus <<V L2-L3 Mains/Bus <<V L3-L1	FIXED PROTECTIONS STATES 3
Mains V Unbalance Protection	Mains/Bus V Unbalance Ph-N Mains/BusV Unbalance Ph-Ph	FIXED PROTECTIONS STATES 2 FIXED PROTECTIONS STATES 3

Mains Frequency Protections

	Protection	Alarms / Protection name	Fixed Protection States
Frequency	Mains >>f Protection	Mains/Bus >>f	FIXED PROTECTIONS STATES 3
	Mains >f Protection	Mains/Bus >f	FIXED PROTECTIONS STATES 3
	Mains <f Protection	Mains/Bus <f	FIXED PROTECTIONS STATES 3
	Mains <<f Protection	Mains/Bus <<f	FIXED PROTECTIONS STATES 3

Loss of Mains Protections

Protection	Alarms / Protection name	Fixed Protection States
Vector Shift Protection	Hst Wrn Vector Shift	FIXED PROTECTIONS STATES 4
ROCOF1 Protection	Hst ROCOF 1	-
ROCOF2 Protection	Hst ROCOF2	-
ROCOF3 Protection	Hst ROCOF3	-
ROCOF4 Protection	Hst ROCOF4	-

Grid Codes Protections

Protection	Alarms / Protection name	Fixed Protection States
Mains 10min Avg >V Protection	-	FIXED PROTECTIONS STATES 2
Mains Params/MP Synchronization	SyncNotAllowed	FIXED PROTECTIONS STATES 1
Q&U Protection	Wrn Q&U Protection	FIXED PROTECTIONS STATES 1
Pave	Hst Pave	-
Dynamic Support	MP VRT Protection Trip	FIXED PROTECTIONS STATES 1

User protections

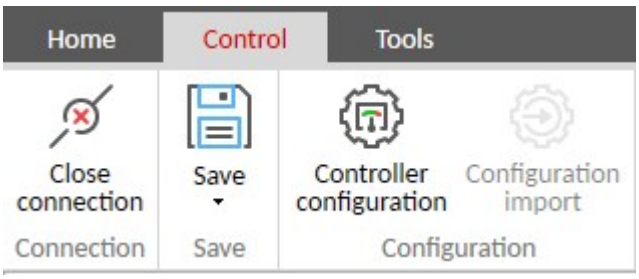
Source upon which the protection is configured can be selected. It can be any analog value or binary state.

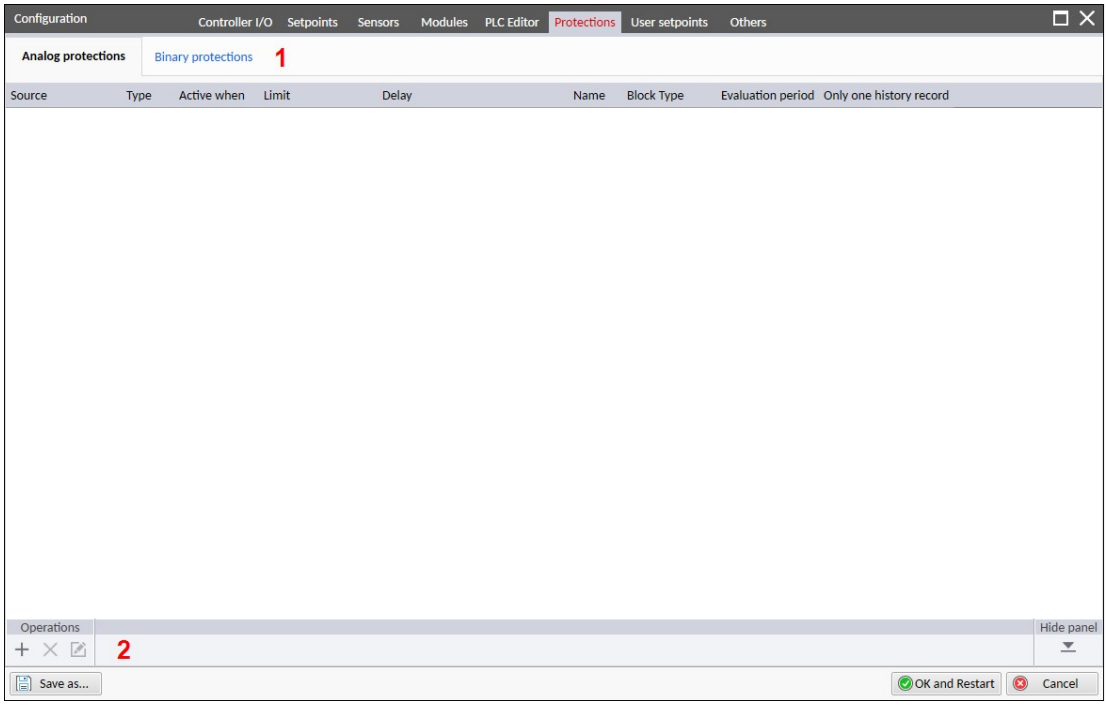
Source

Analog values	Binary states
> Analog inputs » Controller, Modules > Values » ECU, Measured values, Application, PLC, Shared I/O » Modbus server, Modbus Master > Statistics	> Binary inputs » Controller, Modules, ECU, Shared I/O » Modbus server, Modbus Master > Binary outputs » PLC > Protection states > LBOs

Configuration of protections in InteliConfig

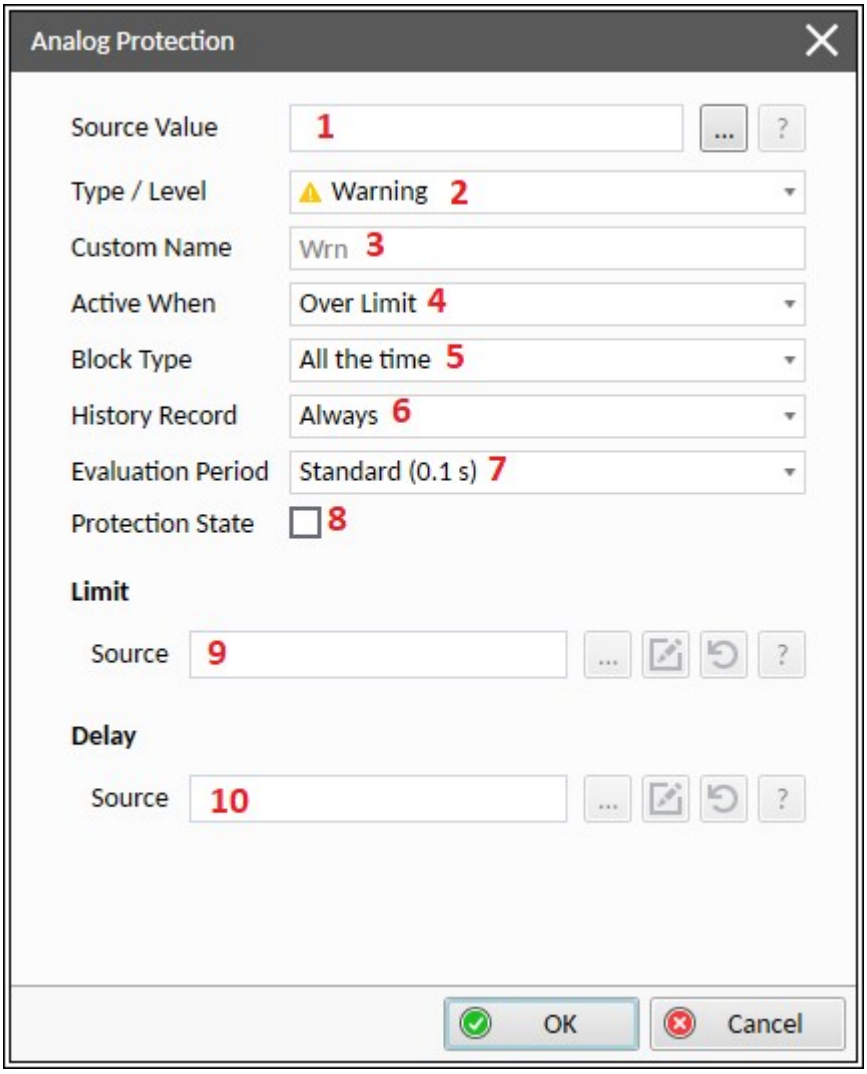
Control tab → Controller configuration → Protections tab → Analog / Binary protections





1	Select the desired protections to be configured (Analog protections / Binary protections).
2	**Add** protection by clicking on the + icon **Delete** selected protection by clicking on the × icon. **Edit** selected protection by clicking on the icon.

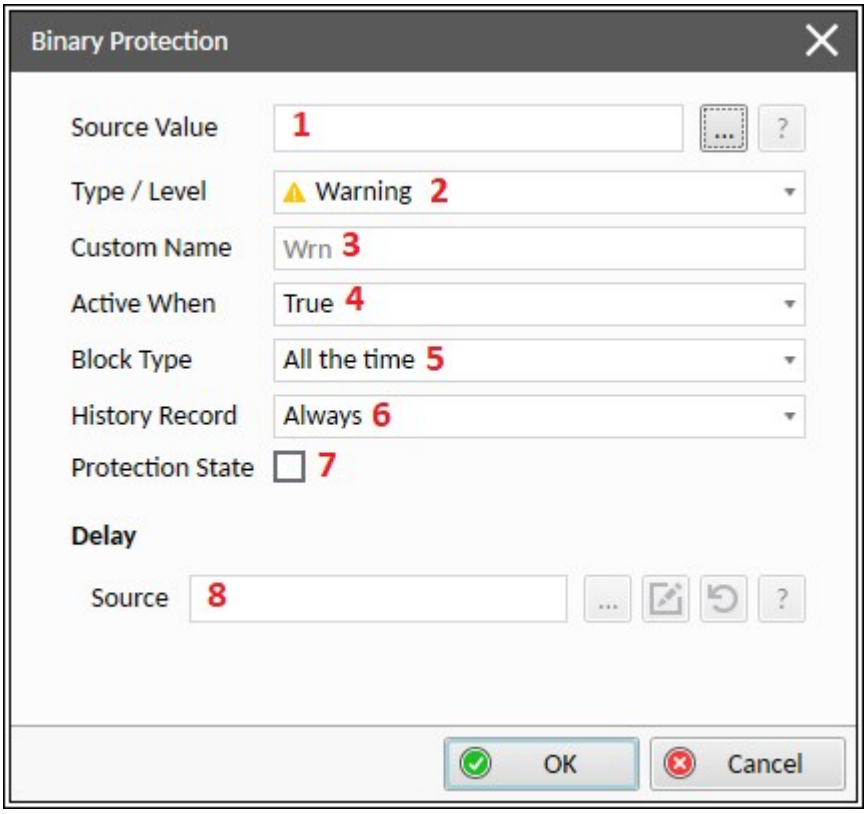
Adding analog protection



1	Selecting the input source **see User protections on page 199**
2	Selecting the protection type **see Protection types on page 192**
3	Text input for Alarm / History message
4	Selecting the protection activation **see Protection activation on page 194**
5	Selecting the block type **see Protection blocking on page 194**
6	Selecting if the occurrence of a protection is recorded every time or only once after a Fault Reset.
7	Selecting the evaluation period

8	If **Protection State** is checked the protection is then shown in the **Values** in the group **User Protection States**.
9	Selecting the input for limit. Setpoints must have the correct resolution and dimension as protection source value. › Existing setpoint › New user setpoint › Existing user setpoint Prefix is added to the name based on protection type / level
10	Selecting the input for delay. Setpoints must have the correct resolution **0.1** and dimension **[s]** › Existing setpoint › New user setpoint › Existing user setpoint Prefix is added to the name based on protection type / leve

Adding binary protection



1	Selecting the input source **see User protections on page 199**
2	Selecting the protection type **see Protection types on page 192**
3	Text input for Alarm / History message
4	Selecting the protection activation **see Protection activation on page 194**
5	Selecting the block type **see Protection blocking on page 194**

6	Selecting if the occurence of a protection is recorded every time or only once after a Fault Reset.
7	If **Protection State** is checked the protection is then shown in setpoints under the group **User setpoints**.
8	Selecting the input for delay. Setpoints must have the correct resolution **0.1** and dimension **[s]** › Existing setpoint › New user setpoint › Existing user setpoint

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Protection states

Protection states is a new feature introduced inInteliNeo 6000, which helps with better management of alarms. Until now, you could only use LBO **ALARM** which did not specify what is going on. Protection states work in similar way, like any other LBO. The difference is, that protection state gets active only when there is specific alarm present in the alarm list. Thanks to this, you can create PLC logic, which will react to specific alarms only.

Fixed protection states

Important **Fixed protections** have a protection state. The protection state is (usually) named exactly as the alarm. Fixed protection states are in a group of 32.

› **Protection states groups:**

- FIXED PROTECTIONS STATES 1
- FIXED PROTECTIONS STATES 2
- FIXED PROTECTIONS STATES 3
- FIXED PROTECTIONS STATES 4
- FIXED PROTECTIONS STATES 5
- FIXED PROTECTIONS STATES 6
- FIXED PROTECTIONS STATES 7

User protections states

During the **Configuration of protections in InteliConfig**, you can decide whether you want to add user protection state for the protection. The name is exactly same as the alarm's message.

When you're adding user protection state, it will try to fill in gaps (if there are any present) in an actual list of **User Protection States**, if there is no gap, it will be automatically added to the end. User protection states are in a group of 32 with maximally 10 groups i.e. 320 user protection states are available.

Note: *Group of User protection states is showed only when there is at least 1 protection state in it.*

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6.1.30 Pulse Counters

InteliNeo 6000 has 4 internal counters 2 of them are physically configured to the specific binary inputs which makes them faster than another 2 "slow" pulse counters which are using LBIs. Value of the each pulse counter is increased by one step whenever the number of pulses counted reaches the value of setpoint Conversion Coefficient Pulse. The fast pulse counters are able to count reliably pulses longer than 10 ms ON / 10 ms OFF whereas the "slow" pulse counters are able to count reliably pulses longer than 200 ms ON / 200 ms OFF.

Conversion setpoint	Value	Binary Input
Conversion Coeff. Fast Pulse 1	**Fast Pulse Counter 1**	BI9
Conversion Coeff. Fast Pulse 2	**Fast Pulse Counter 2**	BI10
Conversion Coefficient Pulse 1	**Pulse Counter 1**	**PULSE COUNTER 1**
Conversion Coefficient Pulse 2	**Pulse Counter 2**	**PULSE COUNTER 2**

Note: *Value of the internal counters remains even if the controller is unplugged from power.*

Note: *Counter counts leading edges.*

6.1.31 SD Card Storage

> **IMPORTANT: Only *SanDisk Industrial XI microSD Cards* (vendor order codes *SDSDQAF3–xxxG-XI*) are currently supported.**

> ***Note:*** *16 GB Industrial memory card is also available in ComAp portfolio (ComAp product number OT1C16GBXQX)*

The controller is equipped with a ⑤ **SD Card** slot for a possibility of storing large amount of data.

Formatting process

> **IMPORTANT: It is strongly recommended to perform the formatting of SD Card in OFF mode.**

Alarm **ALI SD Card Formatting/Mounting** is displayed during the formatting process.

After changing the setpoint **SD Card File System** to Format, the controller checks whether the inserted SD card is supported - **ALI SD Card Not Compatible** alarm is displayed if it is not. If the formatting is not successful, the value **SD Card Status** shows Formatting Failed, the alarm **ALI SD Card Not Compatible** is activated, and controller will not try formatting process again **SD Card File System** is automatically set to Mounted).

If the formatting is successful, the **SD Card File System** is automatically changed to Mounted and the card is ready for operation.

Mounting the SD Card

For enabling the SD card functions, setpoint **SD Card File System** has to be set to option Mount.

> **IMPORTANT: It is strongly recommended to perform the mounting of SD Card in OFF mode.**

Alarm **ALI SD Card Formatting/Mounting** is displayed during the mounting process.

In case that it is not possible to read or write to the SD Card, alarm **Wrn SD Card Failed** is activated. The alarm is also activated in case the SD card is not inserted. See the value **SD Card Status** for further information about the fail.

Alarm **ALI SD Card Full** is displayed if value SD Card Free Space drops below 10 %.

In case that the card has a wrong file system, alarm **Wrn SD Card File System Failed** is displayed. Therefore formatting process should be performed again.

Unmounting the SD Card

If the setpoint **SD Card File System** is set to Unmount, the controller is able to detect the SD card, but it will not do any reading or writing of the data. The **SD Card Status** will show Unmount, and in case the card is still in the slot, the alarm **ALI SD Card In Slot** is issued.

Long term history

If an SD Card is successfully mounted, the controller is able to store history records onto the SD Card. This function is activated by adjusting setpoint **Long Term History** to Enabled.

Long Term History data are stored in folder named "HISTORY_SN" wheren SN is serial number of respective controller that stored the data. Inside this folder there is another folder named "YYMMDDhhmmss" which is created at the moment of switching the setpoint **Long Term History** to Enabled. Inside this folder you may find two files:

- SN_YYMMDDhhmmss.hist - which contains history records.
- SN_YYMMDDhhmmss.cfg - which contains important related data required in order to elaborate history records.

Reading the data

1. Download the history records files from your SD card into the PC.
2. Open the InteliConfig, go to Tools and select Long Term History.
3. In the opened window choose the Input directory (destination of the SN_YYMMDDhhmmss.hist file) and Output directory.
4. Choose Delimiter parameter and press Start.
5. The file containing the readable data should be created at the Output directory when conversion is finished.

6.1.32 Sensor Curves

Default sensor curves

There are 16 default resistive curves available. The following table provides information on minimum/maximum values of respective sensors. Actual values especially of temperature curves may differ.

Curve	Min X [Ω]	Max X [Ω]	Min Y	Max Y	Units Y
General line 1	0	1	0	1	Ω
General line 2	0	1	0	1	Ω
General line 3	0	1	0	1	Ω
General line 4	0	1	0	1	Ω
General line 5	0	1	0	1	Ω
General line 6	0	1	0	1	Ω
General line 7	0	1	0	1	Ω
General line 8	0	1	0	1	Ω
General line 9	0	1	0	1	Ω
General line 10	0	1	0	1	Ω
General line 11	0	1	0	1	Ω
General line 12	0	1	0	1	Ω
General line 13	0	1	0	1	Ω
General line 14	0	1	0	1	Ω
General line 15	0	1	0	1	Ω
General line 16	0	1	0	1	Ω

Note: *Curves can be modified via InteliConfig. In InteliConfig are also prepared some standard curves.*

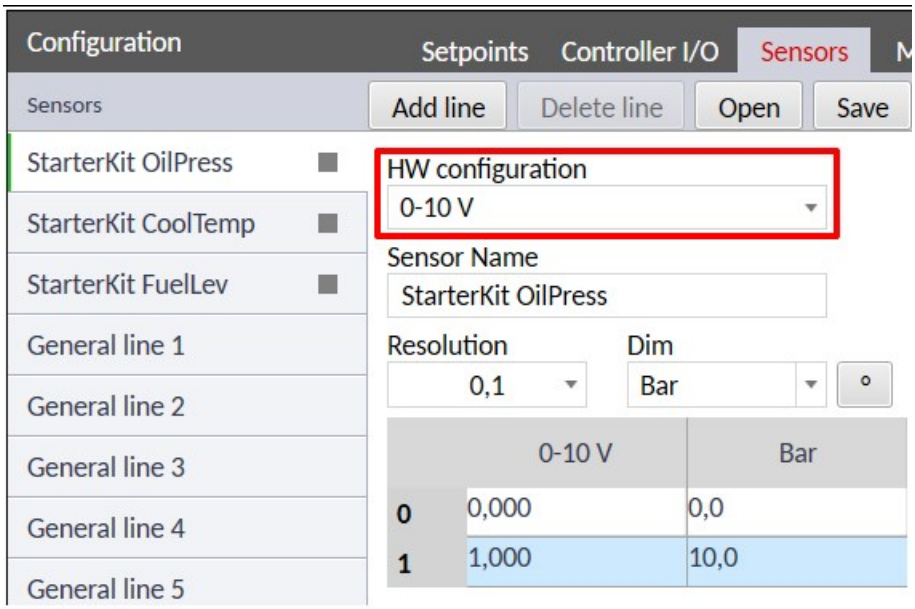
Sensor curve HW configuration

InteliNeo 6000 analog inputs allows you to select Input HW type. Three HW configuration options are available:

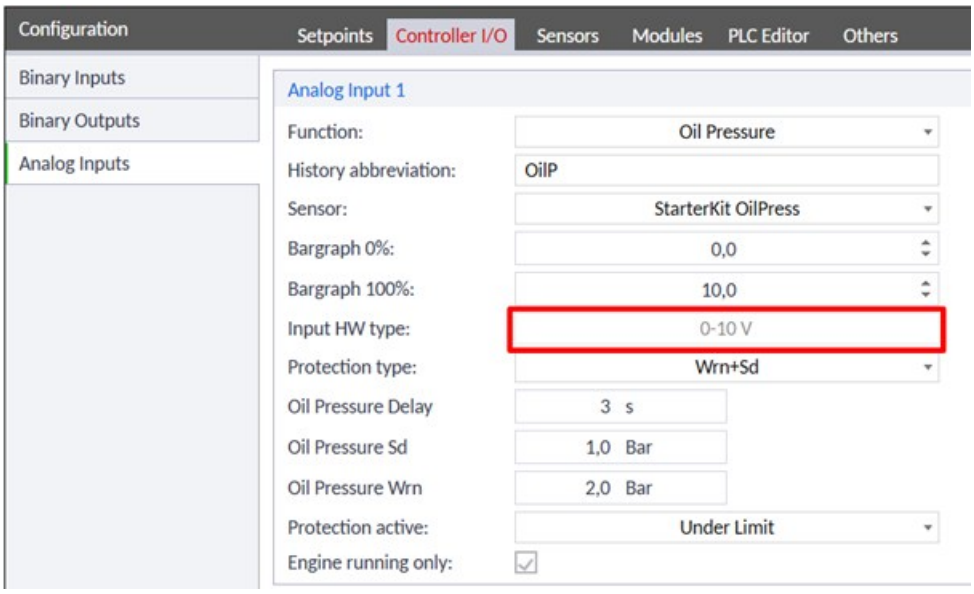
- 0-15 kΩ
- 0-10 V
- 0-20 mA passive

Setup controller analog input in this way to use other than the default HW configuration (0-15 kΩ):

1. Start with a sensor configuration and select requested HW configuration



2. Use the adjusted sensor with an analog input and the requested HW configuration will be used with the analog input automatically. There is no need to use a jumper, configured Input HW type is used by controller automatically.



6.1.33 Service Timers

Maintenance timers

There are 4 maintenance timers which are used as counters which are counting down months and BESS running hours. How much months / BESS running hours will be counted down is setup by the setpoints Maintenance Timer Interval / Maintenance Timer RunHours. The actual state of the timer is visible in the values Maintenance Timer RunHoursOnce / Maintenance Timer Interval. Once any timer reach zero value (days / running hours) the alarm Maintenance Timer RunHours/ Maintenance Timer Interval will be activated together with the LBO AL Maintenance. The type of the alarm (Wrn / Sd) can be defined by the setpoint Maintenance Timer Protection. Each timer has its Setpoints, Values, Alarms and LBOs according to the table below.

	Maintenance Timers 1	Maintenance Timers 2	Maintenance Timers 3	Maintenance Timers 4
Setpoints	**Maintenance Timer 1 RunHours**	**Maintenance Timer 2 RunHours**	**Maintenance Timer 3 RunHours**	**Maintenance Timer 4 RunHours**
	Maintenance Timer 1 Interval	**Maintenance Timer 2 Interval**	**Maintenance Timer 3 Interval**	**Maintenance Timer 4 Interval**
	Maintenance Timer 1 Protection	**Maintenance Timer 2 Protection**	**Maintenance Timer 3 Protection**	**Maintenance Timer 4 Protection**
Values	**Maintenance Timer 1 RunHours**	**Maintenance Timer 2 RunHours**	**Maintenance Timer 3 RunHours**	**Maintenance Timer 4 RunHours**
	Maintenance Timer 1 Interval	**Maintenance Timer 2 Interval**	**Maintenance Timer 3 Interval**	**Maintenance Timer 4 Interval**
Alarms	**Maintenance Timer 1 RunHours**	**Maintenance 2 RunHours**	**Maintenance 3 RunHours**	**Maintenance 4 RunHours**
	Maintenance 1 Interval	**Maintenance 2 Interval**	**Maintenance 3 Interval**	**Maintenance 4 RunHours**
LBOs	**AL Maintenance 1**	**AL Maintenance 2**	**AL Maintenance 3**	**AL Maintenance 4**

6.1.34 Sunrise/Sunset

Based on GPS coordinates, date and actual timezone can controller calculate real sunrise and sunset time. This functionality is enabled/disabled by setpoint **Sunrise/Sunset Function** and works in all controller modes. Setpoint **Sunrise/Sunset Latitude** and setpoint **Sunrise/Sunset Longtitude** are automatically set from GPS module. If coordinates are valid. they will be written on the rising edge of LBI **SUNRISE/SUNSET HOME POSITION**. Otherwise, these setpoints need to be set manually. Values **Sunrise Time**, **Sunset Time**, **Time To Sunrise**, **Time To Sunset** are calculated from setpoints **Sunrise/Sunset Latitude** and **Sunrise/Sunset Longtitude**. LBO **DAY/NIGHT** is active during the day (between Sunrise and Sunset Time).

6.1.35 Sunspec

SunSpec is an application-layer communications protocol designed to achieve interoperability between Distributed Energy Resource (DER) components and smart grid applications. SunSpec has not static Modbus registers, it uses block of registers in predefined order, but for each device is necessary to calculate Modbus address. Register blocks are in row (where first ends, second starts).

6.1.36 SW Key Features

The controller offers premium features which are unlocked by software key.

The SW key is stored in setpoint **SW Key** which is protected against rewriting during configuration update. Value **SW Key Feature List** contains actual list of features which requires SW key in order to be used. When there is logical 1 respective function is unlocked and can be used without of limitation.

Note: *Each SW Key is unique and valid only for specific serial number of a controller.*

Using of SW Key

- Insert your SW Key into setpoint **SW Key**
- Restart the controller
- Check value **SW Key Feature List** whether functions were unlocked

Note: *Please contact technical support in case that functions which were supposed to get unlocked after inserting the SW key did not get unlocked*

List of SW Key Features

Extended Feature	More information	**Order Code**
CAN bus redundancy	**CAN Intercontroller Communication Redundancy**	SKREDCAN201
Hot Swap Redundancy	**Hot Swap Redundancy**	SKHOTSWAP01
Bank controller function in IN6000 for multiple IN530	Function to aggregate and bank multiple InteliNeo 530 controllers to a single InteliNeo 6000 as the higher level controller with communication over CAN 1.	SKIN530CTRL

6.1.37 User Buttons

User Buttons can be used to assign function of user's choice to button on the **External display** or like remote switch. There are 32 user buttons and the behavior of each of them can be adjusted by it's relative setpoint.

Each setpoint has these options:

Option	**Description**
COMMAND	The relative User Button is controlled by command from **External display**.
MAN OFF	The relative User Button is controlled manually via the setpoint. Value of the user button is still 0.
MAN ON	The relative User Button is controlled manually via the setpoint. Value of the user button is still 1. ***Note:*** *You should always switch from MAN ON to MAN OFF before switching to COMMAND, otherwise value of the User Button will be 1 until command is received.*

Commands

If relative setpoint is set to COMMAND, the User Button will react to commands sent via button from **External display**. Type of command is selected during controller configuration in Screen Editor.

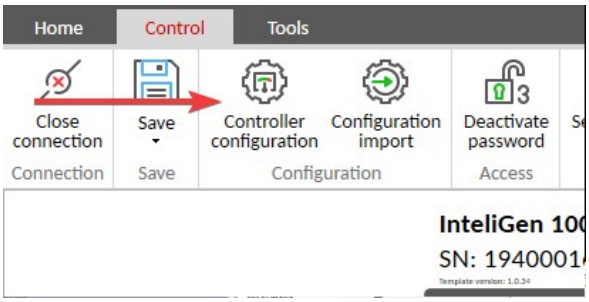
There are following commands:

Command	Description
ON/OFF	While this command is selected, pressing the button negate the actual value of the user button
ON	While this command is selected, pressing the button sets the actual value of the user button to 1. ***Note:*** *Will not have any effect if the value is already 1.*
OFF	While this command is selected, pressing the button sets the actual value of the user button to 0. ***Note:*** *Will not have any effect if the value is already 0.*
Pulse ON	While this command is selected, pressing the button sets the actual value of the user button to 1 for 200 ms. ***Note:*** *The command reacts only to rising edge of the button.*

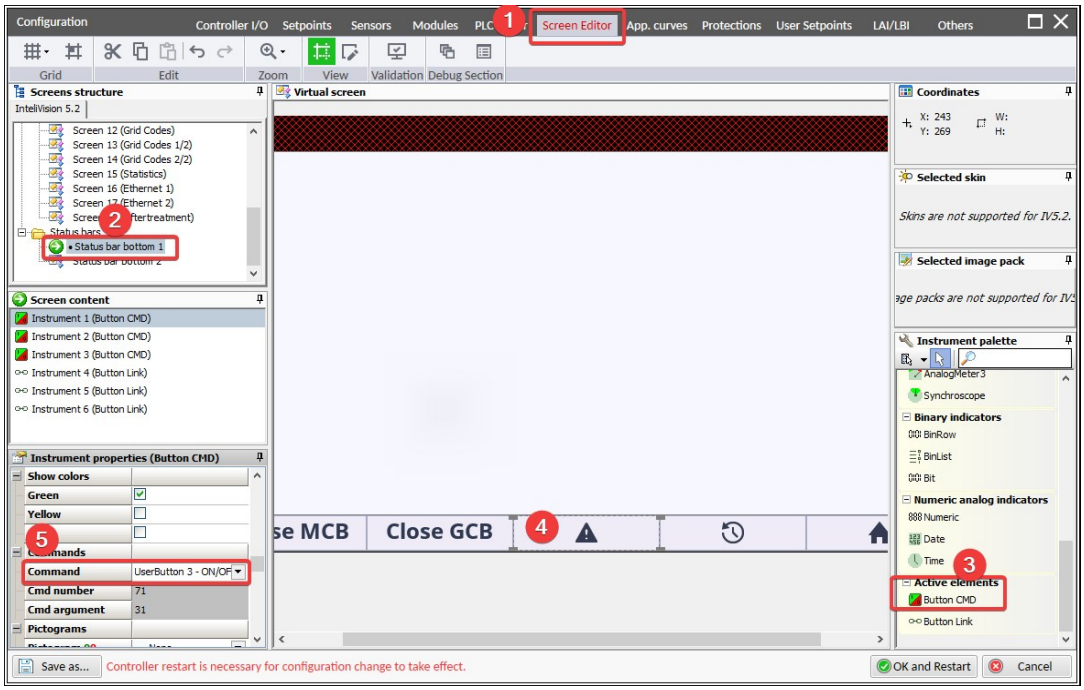
See list of MODBUS comands in chapter **List of commands and arguments**.

Configuration of user button command

To configure Command on User Button, navigate to Configuration in InteliConfig



1	Select Screen Editor tab
2	Select Status bar
3	Add "Button CMD", for example to position 4
5	Select required user button and COMMAND



6.1.38 User Management And Data Access Control

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Managing accounts 216
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Access to controller data 218

- Accessing, monitoring, and controlling the device via any communication interface requires an user to be logged-in.
- When a task (read data, write data , control) is to be performed the role of the user who is currently logged-in must be higher or equal to the role required for the particular task.
- First of all the account has to be created/defined by the controller administrator before the subuser can log in.

Note: *For trusted interfaces there is an "implicit user"(**see Implicit account on page 214**) automatically logged in always while no other explicit user is logged in.*

Types of interfaces

The controller communication interfaces are split into three categories according to what kind of environment the interface is exposed.

Trusted

- Are **USB Type B** and in the default configuration **Communication peripherals** terminals.
- It is expected that these interfaces are operated locally inside a closed environment / infrastructure where additional measures against misuse or attack take place (e.g. physical access limitation).
- Due to nature of this interface less strict cyber-security rules apply at it and that is why Implicit account is introduced here to make working with the controller simpler.

Untrusted

- Is in the default configuration **Ethernet 2** terminal.
- This interface is a general-purpose one and it is expected that it may be exposed to public networks, such as Internet, which are not under control of the entity operating the controller.
- Thus, strict cyber-security rules apply for this type of interface.
- The correct user account with password has to be used in order to connect to the controller.
- This interface can be also used for SMTP and SNMP protocols.

Modbus

- Is in the default configuration **Communication peripherals** terminal.
- This interface is used for **Modbus Client (Master)** or server.
- It is expected that this interface is operated locally inside a closed environment / infrastructure where additional measures against misuse or attack take place (e.g. physical access limitation).
- Due to nature of this interface and fact that it is not possible to use it for connection to the controller, less strict cyber-security rules apply at it.

Connections to ethernet interfaces

Either ComAp clients (InteliConfig, WebSupervisor, WinScope, InteliVision displays, etc.) or Modbus clients can connect to the controller's ethernet interfaces. Number of possible connections is listed in the table below.

Type of interface	ComAp clients	Modbus clients
Trusted	6	3
Untrusted	8	3
Modbus	0	3

> **Example:** If **Communication peripherals** = Trusted, **Ethernet 2** = Trusted, **Communication peripherals** = Trusted, then it is possible to connect 6 ComAp clients and 3 Modbus clients on all three ports in sum.

> **Example:** If **Communication peripherals** = Trusted, **Ethernet 2** = Untrusted, **Communication peripherals** = Modbus client, then 6 ComAp clients and 3 Modbus clients can be connected to **Communication peripherals**, 8 ComAp clients and 3 Modbus clients can be connected to **Ethernet 2** and 3 Modbus clients can be connected to **Communication peripherals**.

back to User Management And Data Access Control

User accounts

User account must be created in the controller by administrator before the particular user can login to the controller.

Note: *User accounts must be created for each controller separately and manually. It is not possible to transfer the accounts from one controller to another.*

User account must has following properties:

Username	Consists of 6-15 alphanumeric characters, must contain at least 1 letter. This is the main identifier of the particular user account.
Password	Consists of 6-15 alphanumeric characters, must contain at least 1 letter and 1 digit. This is the password that is used together with user name to authenticate (log-in).
User identifier (UID)	Optional 4-digit identification string which can be used for simplified login at trusted interfaces (e.g. from InteliVision display when connected via **Communication peripherals**).
PIN	4-digit “password” to be used together with UID.
Role	Determines **Access to controller data**
Role mask	Determines **Access to controller data**

User login

To login to the controller the **username and password must be provided into the login form** of the application (**InteliConfig**, **WebSupervisor**, **External display** etc.).

Alternatively, at **trusted interfaces**, it is possible to **login using UID and PIN** instead of username and password. This method of login is designed to simplify the login procedure at devices without alphanumeric keyboard (e.g. InteliVision).

Note: *The controller is featured with a protection against brute force attack to user account credentials. For details please refer to the -* ***Account break protection***

Changing password and PIN

The password and/or PIN for currently logged user can be changed. The user must be logged with username and password even if PIN has to be changed.

Implicit account

There is one implicit user account in the system. This user account can not be deleted. This account is **automatically logged in at a trusted interface** while communication channel is open and there is not any other user logged in. The account is fixedly assigned to role 1.

Production mode

The Production mode is intended to simplify manufacturing process for OEMs. While production mode is active the implicit user is fixedly member of role 0 (administrator role) and alarm **Wrn Production Mode** is displayed. Practically it means that while production mode is active it is possible to perform any operation with the controller without any user needed to login.

> **WARNING: Production mode must be disabled before the controller is put into regular operation.**

Note: *Production mode can be turned off either from InteliConfig or from InteliVision 5.2.*

Factory default accounts

Each controller comes from the production with one factory default administrator account having following credentials:

Username: “administrator”

Password: <serial number of the controller>

This account is member of role with index 0 (administrator role)

When the controller is being configured for operation the desired user accounts including the administrator account should be created and then the factory default account must be deleted.

The controller issues warning alarm **Wrn Default Password** all the time the above default account (username and password) is present in the controller.

> **IMPORTANT:** Adjust the backup e-mail address before you delete the default administrator account. This address is used **as second authentication factor** in password reset request and the password reset action code will be sent to this and only this e-mail address.

Administrator account

There may be multiple accounts which are members of the administrator role. There must always remain at least one account with administrator role.

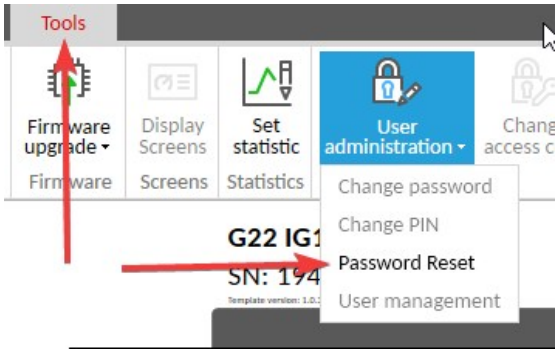
> ***Note:*** *there must always remain at least one administrator account in the system. The controller will not allow deleting last administrator account.*

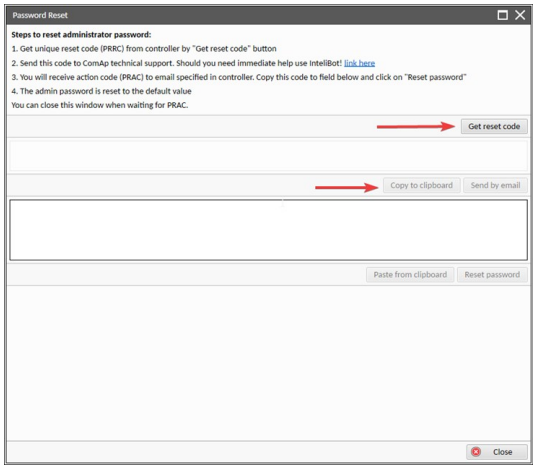
Reset accounts to factory default

If credentials (username and/or password) for administrator account are lost, it is possible to reset all user accounts to the factory default state.

1. Connect to the controller through a InteliConfig tool

2. In the menu Tools under User administrator can be generated a Password Reset Required Code (PRRC). This code should be saved (copied) for further step.





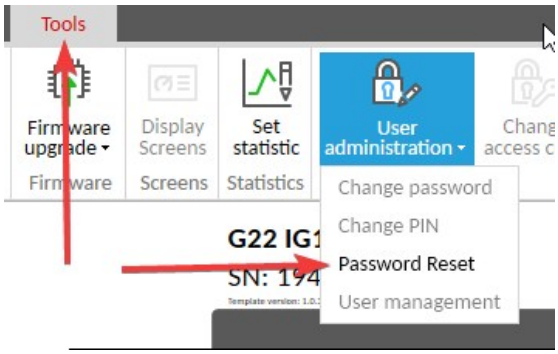
3. You may disconnect from the InteliConfig now

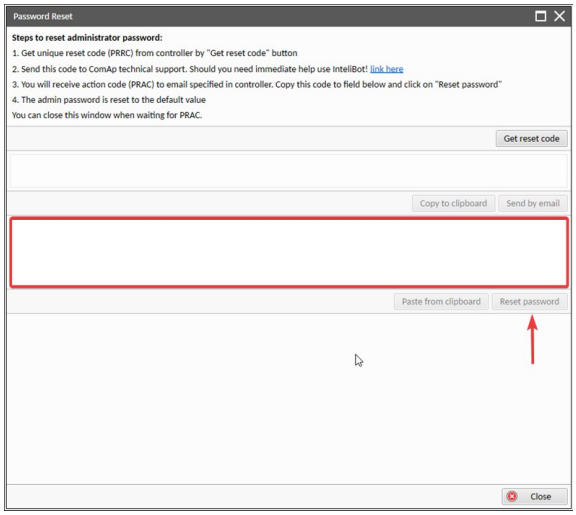
4. Put the PRRC code into the “IntelliBot” application at https://www.comap-control.com/support or e-mail the code to support@comap-control.com.

5. A unique, one-time Password Reset Action Code (PRAC) will be sent to the backup e-mail address adjusted in the controller.

6. Connect to the controller through a InteliConfig tool again

7. Enter the Password Reset Action Code into the appropriate form





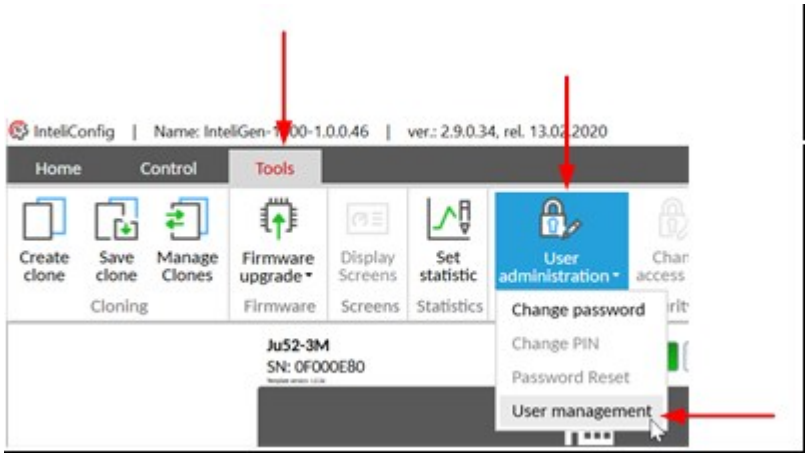
8. Now the user accounts are in factory default state

back to User Management And Data Access Control

Managing accounts

User accounts can be managed from InteliConfig while an online connection to the controller is established. The right to manage accounts is explicitly and fixedly given only to administrator role (index 0). This right can not be granted to any other role. The administrator must be logged with username/password and is prompted to re-enter accounts password before the user management dialog is opened.

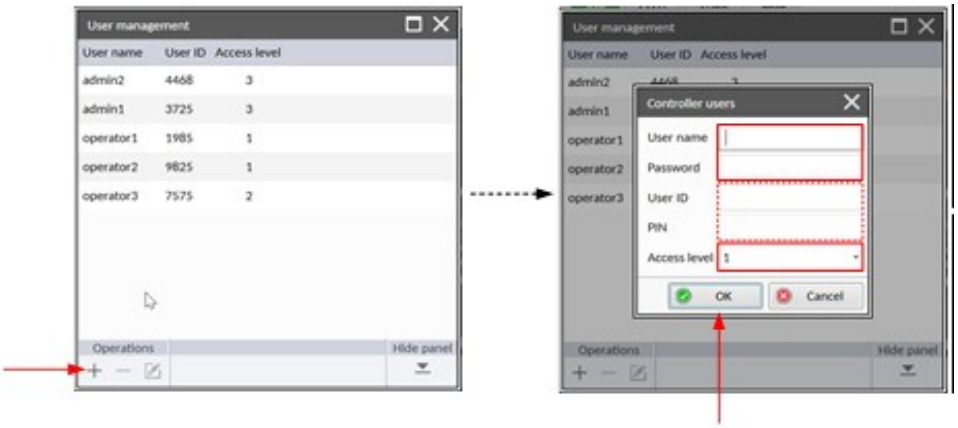
IMPORTANT: The total available number of accounts in the controller is 30.



Adding account

Click on “+” button in the lower left corner of the user management window, then provide the account properties as described in **User accounts**.

Note: *Rules for the **User accounts** credentials apply and some items are optional*



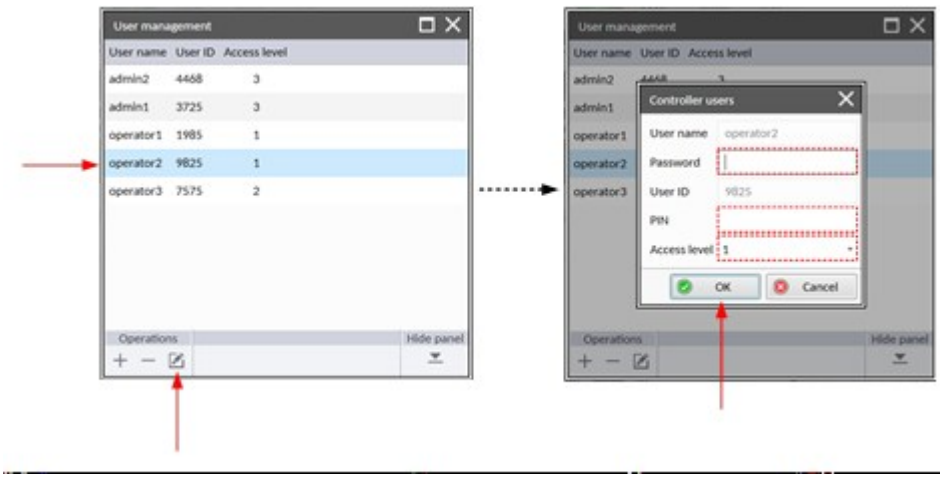
Deleting account

Select the account that has to be deleted and click on "-" button in the lower left part of the user management window.

Note: *you can not delete your own administrator account unless there is another administrator account present in the controller.*

Changing account properties

Select the account that has to be deleted and click on the "pencil" button in the lower left part of the user management window. Then modify the desired property or properties. You can modify one or more properties at once.



Note: *It is not possible to change user name or UID. Instead of this create a new account with the required changes and delete the original one.*

back to User Management And Data Access Control

Account break protection

The controller is protecting the user accounts against breaking by a brute-force attack, i.e against breaking into the controller by fast repeating attempts to login with credentials generated from the range of all possible combinations.

If the account break protection detects a possible attack and blocks an account or interface the alarm **Wrn Brute Force Protection Active** is activated. The alarm can be used to send an active message (e.g. e-mail) to inform about that situation The detailed behavior of the controller depends on situation.

Password protection

1. If an user performs **five consecutive attempts** to login using username/password, providing **correct username** but **incorrect password**, the **respective user account is blocked** for a time period of 1 minute. The attempts count regardless of the interface from which it is performed.
2. During the blocking period it is not possible to login with the respective account (username) from any interface even if correct password is provided.
3. After the blocking period elapsed next attempt to login with the respective account (username) is possible. If this attempt fails again the account is blocked again, now for period of 2 minutes.
4. The points 1-3 repeats further, the blocking period is multiplied by 2 in each next cycle. However, the maximal blocking time is 20 minutes, the blocking time is never higher.

PIN protection

If an user performs **ten consecutive attempts** to login using UID/PIN, providing **correct UID** but **incorrect PIN**, the user account is permanently blocked for login using UID/PIN. The user must login with username/password and change the PIN to unblock this login method again.

Interface protection

If anyone performs **twenty consecutive attempts** to login via one particular interface (e.g.**Communication peripherals**) and does not neither provide a valid username nor a valid uid the respective interface is blocked for 2 minutes. During this period it is not possible to use that interface for any login. The blocking period is not progressive in this case.

back to User Management And Data Access Control

Access to controller data

Every request for reading data from the controller or writing data into it requires an user to be logged and that **user must have access rights higher or equal to the role defined for the particular object and operation.** Access right is the relation between an User and an Object inside the controller.

There are 10 roles with indexes 0..9 in the system.

- Role 0 is administrator role. All objects/commands are fixedly assigned to this role.
- Roles 1..7 are configurable roles. Each communication object/command can be assigned independently to each of these roles.
- Role 8 is Modbus client. Each communication object/command can be assigned to this role.
- Role 9 is SNMP Manager. Each communication object/command can be assigned to this role.

Note:

Modbus and SNMP clients do not have implicit access to all objects. The access is limited by mapping tables present in configuration. So, successful writing of an object require that object 1) to be present in the respective mapping table, 2) to be assigned to the respective role.

> ***Example:*** *If a setpoint X shall be adjustable by Modbus this setpoint must be 1) mapped to a holding register, 2) assigned to role 8.*

Reading data

For each object the Access right "Read" (R) is fixedly granted to each role*. That means **reading of data** (except some system objects) **is available for any user**.

Writing data

For each object the Access right "Write" (W) can be granted to one or more roles (indexes 1..9). For each object the Access right "Write" (W) is fixedly granted to administrator role (index 0).

Special situations

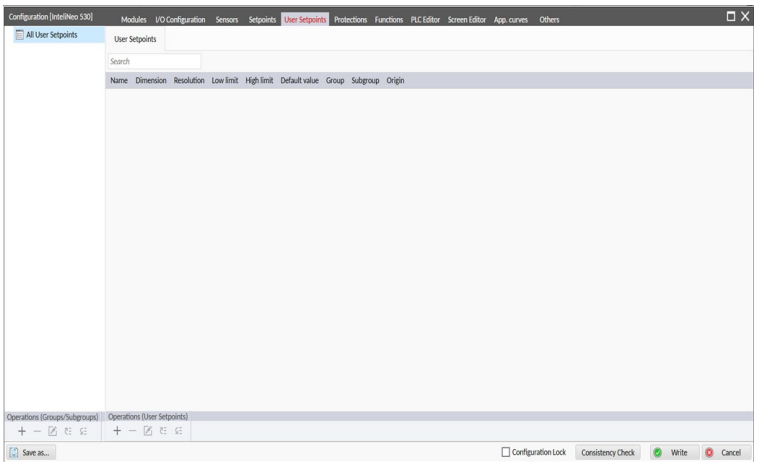
There are several operations that require administrator role:

- Programming firmware
- Programming configuration
- Managing user accounts.

These rights can not be granted to any other role.

6.1.39 User Setpoints

Controller allows user to create their own setpoints, groups and subrgroups. You can also edit and delete the created setpoints/groups/subgroups and choose a group in which the setpoint or subgroup will be located. Number of setpoints created by user is limited to 2047. The Comm. object number (**CO**) can be found via InteliConfig (Tools tab → Generate Cfg image (COM)). User setpoints can be used to manage User protections and PLC.



Add Groups/Subrgoups or User setpoint

1 **Delete** selected Groups/Subrgoups or User setpoint

Edit selected Groups/Subrgoups or User setpoint

Image 6.45 User setpoints tab in InteliConfig

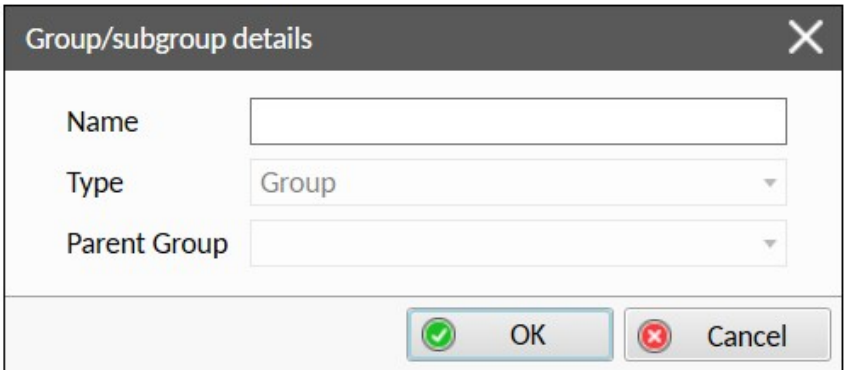


Image 6.46 Setting parameters of Group/Subgroup

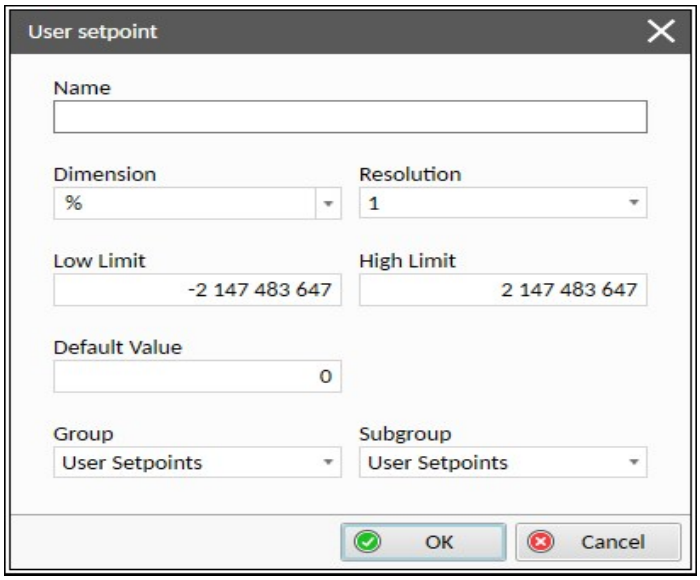


Image 6.47 Setting parameters of an user setpoint

Contents of the user Group/subrgroup

Name	Max. 32 characters ***Note:*** *Does not consider duplicities (It is possible to have groups/subgroups with the same name, but it is not recommended.)*
Type	Group type can be Group or Subgroup.
Parent group	If you are creating a subgroup, parent group must be selected from created groups, except for exceptions.

Contents of the user setpoint

Name	Max. 32 characters ***Note:*** *Does not consider duplicities (It is possible to have setpoints with the same name, but it is not recommended.)*
Dimension	Can be chosen from a list or User can create their own with a limit of 32 characters.
Resolution	Max. 4 decimal places
Low Limit	Range of the data type INT32 (restricted by resolution). Value is set as a constant (can not be set as setpoint). Max. value cannot exceed High Limit.
High Limit	Range of the data type INT32 (restricted by resolution). Value is set as a constant (can not be set as setpoint). Min. value cannot be lower than Low Limit.
Default value	Must be in range between Low and High Limit (restricted by resolution).
Group	Group in which setpoint will be shown.
Subgroup	SubGroup in which setpoint will be shown.

Available groups and subgroups

The user setpoint can be put into some selected groups and subgroups.	
Note: *Setpoint is always added as last in selected subgroup.*	
List of available groups and it's subgroups:	
Group	**Subgroup**
Process control	User setpoints
Basic Settings	User setpoints
BESS Settings	User setpoints
BESS Protections	BESS Protections User setpoints
Protections	User setpoints
Mains Settings	Mains Protections User setpoints
Grid Codes	User setpoints
Power Management	User setpoints
User setpoints	User setpoints
Analog Protections	Analog Protections 1 – Analog Protections 8

6.1.40 Voltage Phase Sequence Detection

Controller detects phase sequence on both voltage terminals. This protection is important after controller installation to avoid wrong voltage phase connection. The phase sequence is adjusted via setpoint **Phase Rotation**. When the phases are connected in different order (e.g. L1,L3,L2 or L2,L1,L3) the following alarms are detected:

- **ALI BESS Ph Rotation Opposite**
- **ALI BESS Ph Rotation Opposite**

back to General functions

6.2 Hybrid-Microgrid application Functions

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6.2.29 Regulation Loops 271

Functions directly related to the Hybrid-Microgrid applications are described in this chapter.

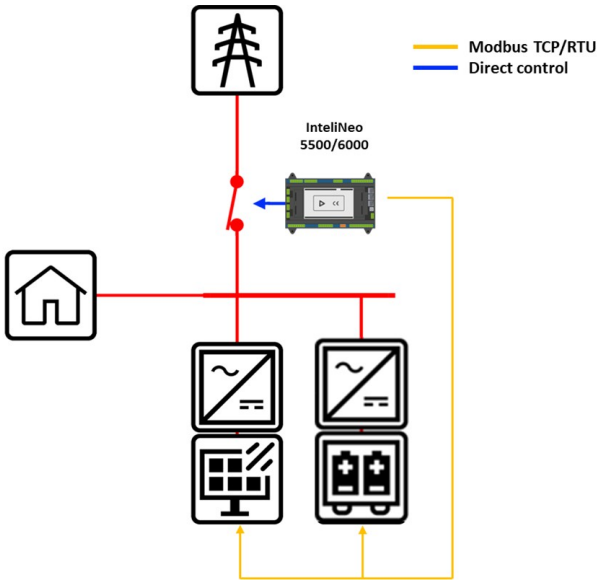
back to Controller setup

6.2.1 Application modes MPTM and MINT

Application mode MPTM

MPTM Application is intended to integrate the BESS and PV in parallel operation to the grid. All control functions are performed by one controller. MPTM Application does not allow to combine multiple sources like more BESS and gensets. Typical scenarios for the MPTM application are:

- Mains and PV with zero export limit. PV covers the object's consumption, in case of excess of the power from the PV, the PV output is limited due to the curtailment function.
- Mains, PV and 1x BESS. PV and BESS optimizes the object consumption, or BESS is used for peakshaving.
- On-grid application combining Mains, PV and Multiple BESS. PV and BESS optimizes the object's consumption, or BESS is used for peakshaving.



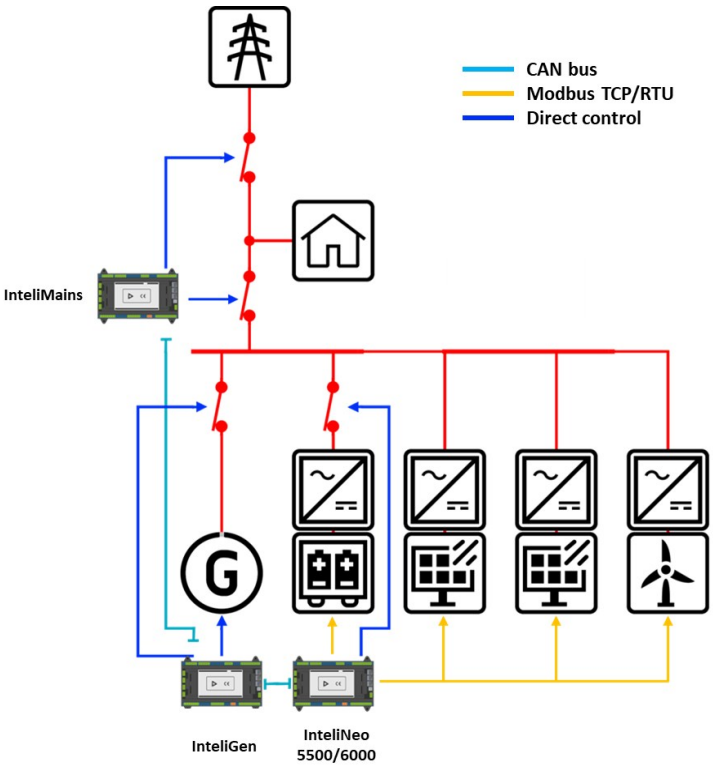
Note: *Details preview of the wiring diagram for the MPTM application is shown in* ***MPTM – Microgrid Parallel to Mains****.*

Note: *Both MINT and MPTM applications use identical principles in many cases. For the purpose of this document, these common functions are described in relation to the MINT application. Specific functions of the MPTM application are then described here* ***MPTM application****.*

Application mode MINT

The MINT application is intended for the integration of BESS and PV sources using InteliNeo into a system where the cooperation of several sources is required, while each of these sources is integrated by its own controller (InteliNeo, InteliGen). The MINT application must therefore be used, for example, in the scenarios 2x BESS, BESS and Genset, BESS and Genset and Mains. The following is a list of typical MINT application scenarios.

- The existing island power plant primarily consists of gensets supplemented with PV, or PV and BESS. BESS is charged with excess from PV or gensets. BESS increases the load reserve of the system, possibly with PV enables gensets to run at the minimum partial load.
- On-grid/Off-grid application combining operation in island mode and parallel operation to the grid, for example in Mains Import/Export control mode, peakshaving etc.



Note: *Details preview of the wiring diagram for controller in the MINT application is shown in* ***MINT – Multiple island-parallel****.*

6.2.2 InteliNeo integration in MINT application

In the MINT application each controller InteliNeo can integrate the following sources in any combination:

1x BESS

The primary purpose of the InteliNeo is to control the BESS like the primary purpose of the IG1000 is to control the Genset. The AC measurement, BCB (BESS Circuit Breaker) control, state machines, Start/Stop buttons are used exclusively for BESS control. Additional information necessary to control the BESS InteliNeo obtain through communication with the BESS Itself. It can be the master control unit of the BESS, but more often we approach the BESS as multiple devices (ECU). Usually InteliNeo obtains information regarding the energy storage from the BMS and information regarding the electrical part from the PSC. Then there are other support systems like HVAC and others. The BESS and all its part are configured using the **Multiple ECU** system.

PV system

PV is one of the secondary sources integrated into the system itself through InteliNeo. We obtain all information about PV exclusively through communication via modbus. One PV system can consist of up to 32 inverters/PV Manager system (for example Huawei Smart Logger). Each inverter is configured as a separate ECU. Any other InteliNeo controller can then integrate one PV system within the site.

WT system

WT is one of the secondary sources integrated into the system itself through InteliNeo. We obtain all information about WT exclusively through communication. One WT system can consist of up to 8 inverters.

Each inverter is configured as a separate ECU. Any other InteliNeo controller can then integrate one WT system within the site.

Universal Genset

The Universal Genset is one of the secondary sources integrated into the InteliNeo system itself. In essence, it is the possibility to integrate gensets equipped with a third-party control unit into the ComAp system via InteliNeo, without the need to superimpose your own ComAp controller. InteliNeo obtain all information about individual Universal Gensets exclusively through communication. Using the Universal Gensets function, up to 16 gensets can be integrated into the system. A group of Gensets is then presented via IntelNeo to the control system like it was one of standard ComAp Gensets. There can be only one InteliNeo controller using this function in the system. See **Universal Genset support**.

Strategy for managing individual resources within the system

For sources of the same type (same physical nature) integrated with their own controllers, we generally want to apply the same control strategy. InteliNeo is equipped with a range of functions based on this principle and designed to maximize the optimization of the control process for the production and storage of electrical energy. The main criteria of this strategy are:

- We strive to maximize the use of energy from renewable sources, namely PV (photovoltaic) and WT (wind turbines). Unless otherwise specified, energy from renewable sources is always preferred and managed to maximize their penetration.
- Excess energy from renewable sources (hereinafter referred to as PV) is stored in the BESS (Battery Energy Storage System) or exported to the grid according to the chosen strategy.
- Limiting the output of PV occurs only if the system is unable to process this excess further, i.e., the BESS is fully charged, or export to the grid is limited by the conditions at the connection point.
- The genset strategy within the system may vary depending on the conditions and specific application requirements. Here, the ratio of the installed PV power and BESS capacity to the total consumption of the object is very important. The most common requirement aims to minimize the energy produced by gensets (because of fuel price). In extreme cases, it is possible to stop the gensets and operate from PV supplemented by BESS. However, gensets are most often used as a so-called Grid Forming source, which aims to stabilize the microgrid parameters and maintain sufficient power reserve of the system. Then, gensets are most often operated at the value **#Gen P Min**. Any excesses or shortages of system power are compensated by BESS.
- Any source can be excluded from this principle and controlled in an individual mode at constant P or PF/Q values. The rest of the system then reacts by balancing the power to meet the common strategy. The power of the source in constant power mode can then be internally limited if it would push the rest of the system beyond the allowed limits.

Principles of managing individual resources within the system

Within the system, there are sources in the “Grid Forming” mode and sources in the “Grid Following” mode.

- **Grid Forming** - Also known as “dispatchable sources,” these are sources capable of stabilizing voltage and frequency, thus operating in voltage source mode. Generally, a genset is considered such a source. A BESS (Battery Energy Storage System) operating in the “U-f” mode (see **BESS output control methods P-Q / U-f**) can also be considered a Grid Forming source. The presence of one or more Grid Forming sources in the system is a prerequisite for operation in island mode. The grid itself can, of course, be considered a Grid Forming source.

- **Grid Following** - Typically renewable sources, such as PV (photovoltaic) or WT (wind turbines). Generally, these are sources operating in current source mode, i.e., in P and Q power control mode. A BESS in P-Q power control mode (see **BESS output control methods P-Q / U-f**) is also considered a Grid Following source.

6.2.3 System variability

As already mentioned in chapter **Application modes MPTM and MINT**, InteliNeo can integrate up to 4 different types of sources into the system. In most cases, it is a combination of some of them. InteliNeo directly offers the function of configuring the controller according to the specific combination. Using the **Group: Process Control** setpoints, you can define which sources are used and which are not installed within the given controller.

BESS

Whether InteliNeo integrates BESS or not can be set using the **BESS** setpoint. By default, the setpoint is set to Installed. If the setpoint is switched to *Not Installed*, all references to BESS within the controller, such as Values, setpoints, and Screens on displays and in InteliConfig, are hidden.

PV

Whether InteliNeo integrates PV or not can be set using the **PV Address** setpoint. The value of the setpoint indicates the CAN address under which the PV system is represented within the system. It can be said that InteliNeo virtualizes the PV system under this CAN address within its inter-controller communication. For setting the CAN address of PV, the general rules for setting CAN addresses in the system apply, where each address is unique and must not be repeated. Switching the **PV Address** setpoint to *Not* Installed makes the PV module within InteliNeo inactive, information about it is not propagated on CAN, and all references to PV within InteliNeo are hidden (Setpoints, Values, Screens). By default, PV within InteliNeo is activated, and its CAN address is set to 2.

Wind Turbine

Wind turbines are one of the secondary sources integrated into the systém if they are connected via a PCS or inverter and communicating directly to InteliNeo.

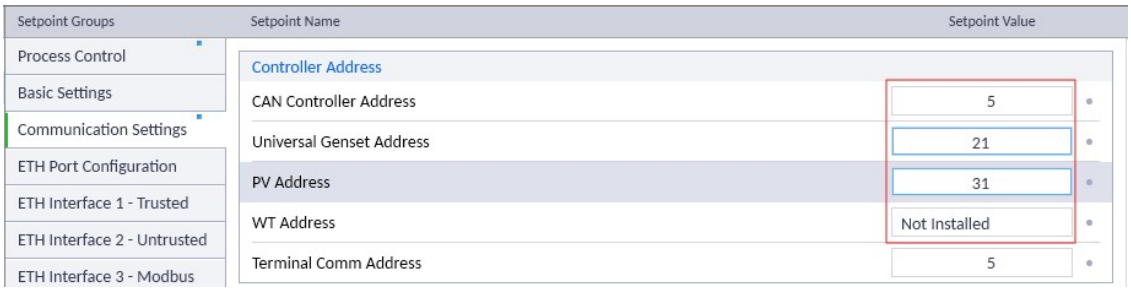
Whether InteliNeo integrates WT or not can be set using the **WT Address** setpoint. The value of the setpoint indicates the CAN address under which the WT system is represented within the system. It can be said that InteliNeo virtualizes the WT system under this CAN address within its inter-controller communication. For setting the CAN address of WT, the general rules for setting CAN addresses in the system apply, where each address is unique and must not be repeated. Switching the **WT Address** setpoint to Not Installed makes the WT module within InteliNeo inactive, information about it is not propagated on CAN, and all references to WT within InteliNeo are hidden (Setpoints, Values, Screens). By default, WT within InteliNeo is not active, and its CAN address is set to *Not Installed*.

Universal Genset (UG)

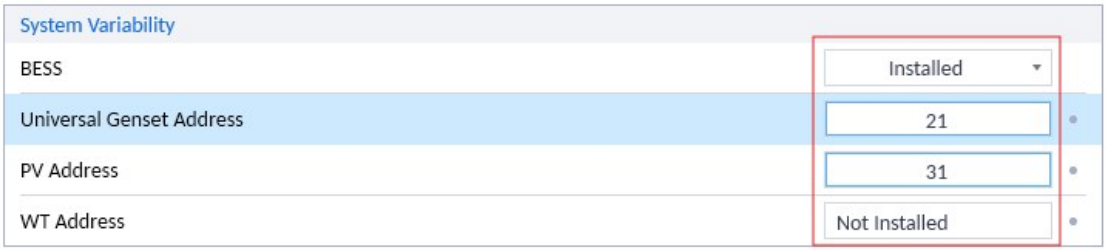
Whether InteliNeo integrates UG (3rd party Genset controller support) or not can be set using the **Universal Genset Address** setpoint. The value of the setpoint indicates the CAN address under which the UG system is represented within the system. It can be said that InteliNeo virtualizes the UG system under this CAN address within its inter-controller communication. For setting the CAN address of UG, the general rules for setting CAN addresses in the system apply, where each address is unique and must not be repeated. Switching the **Universal Genset Address** setpoint to Not Installed makes the UG module within InteliNeo

inactive, information about it is not propagated on CAN, and all references to UG within InteliNeo are hidden (Setpoints, Values, Screens). By default, UG within InteliNeo is not active, and its CAN address is set to Not Installed.

The following is an example of System Variability settings where the Universal Genset function is installed and presented under address 21 in inter-controller communication. PV is installed and presented under address 31. WT is not installed. The BESS itself is installed and presented under address 5, which is also the main address of the controller, used by native controller function related to the inter controller communication, such as DIST IN / DIST OUT signals see **Distributed modules**.



The same information is then mirrored into the System Variability setpoints group in the Process Control group. Here, it is possible to remove BESS from the integrated sources. However, address 5 remains active as the main address of the controller.



6.2.4 Communication with subordinated devices

The InteliNeo application requires cooperation with subordinate controllers. For this purpose, it is necessary to set up communication with these devices. In the case of BESS, we are talking about communication with the BESS control unit, more often about communication with the BMS (Battery Management System) unit and communication with the PCS (Power Conversion System). In the case of PV and WT, we are talking directly about communication with individual inverters. For the Universal Genset, it involves genset controllers, most often third-party units. This communication is most often mediated via Modbus TCP or Modbus RTU links, either directly through the Modbus protocol or through the SunSpec overlay protocol. InteliNeo also allows communication over the CAN bus using the J1939 protocol. The communication speed can be either 250 or 500 kbit/s, see the chapter **ECU CAN bus communication speed**.

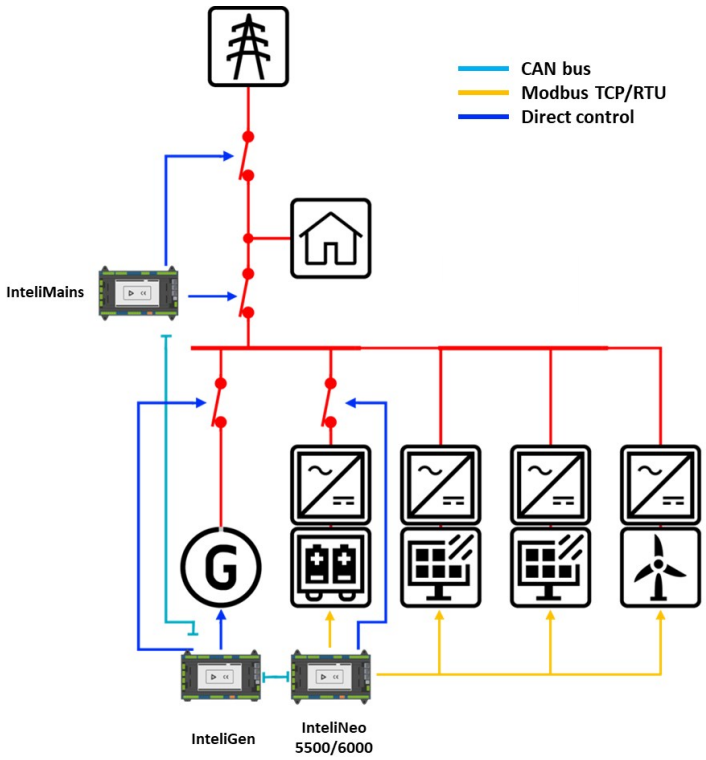


Image 6.48 picture of site with multiple assets like BESS PV, Gen - the picture demonstate how the BESS and PV is connected to the IN via modbus TCP or RTU.

In this case, InteliNeo is the superior unit (Client/Master) on the given communication line. For more information about this function, read chapter **Modbus Client (Master)** and chapter **Multiple ECU**.

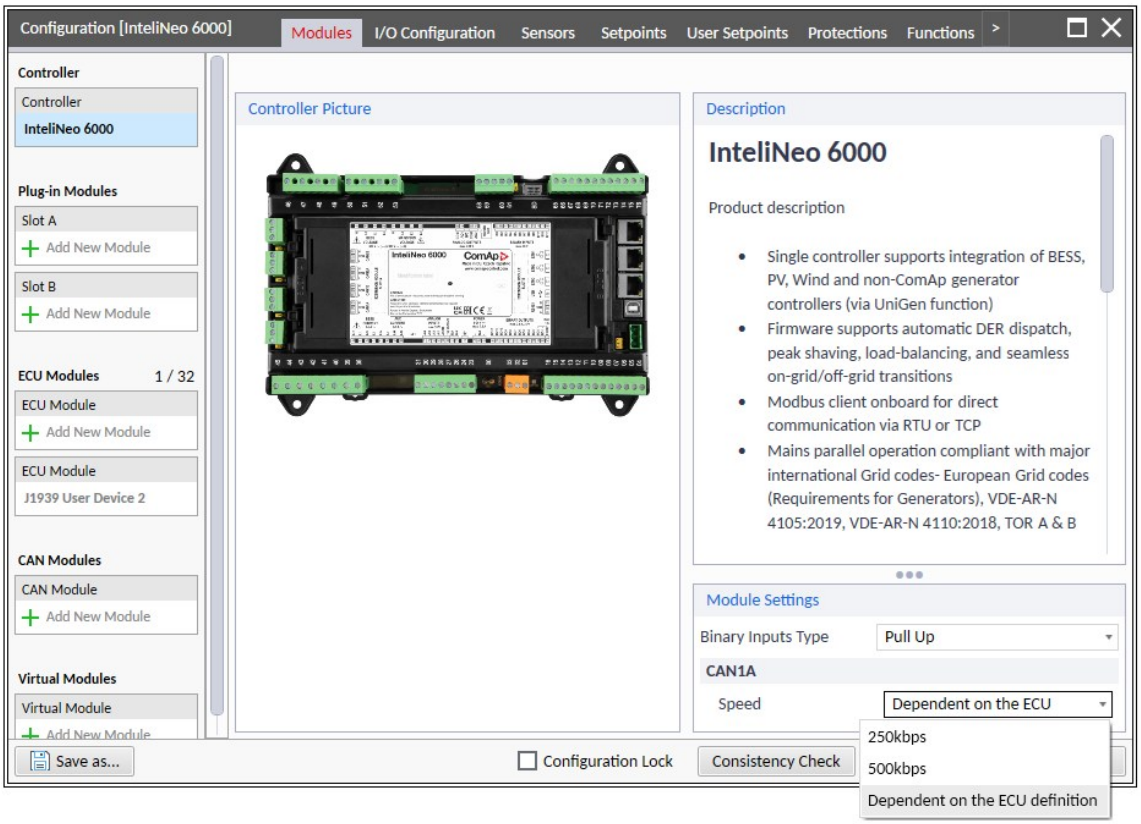
All subordinate units draw from common resources reserved for ECU support. InteliNeo 6000 supports up to 32 ECU units. These units share common resources in total according to the following table:

Analog Inputs	600
Analog Outputs	128
Binary Inputs	256
Binary Outputs	256

Note: *All Analog Inputs are defined as data type INT32.*

6.2.5 ECU CAN bus communication speed

ECU units communicating via the CAN bus using the J1939 protocol most commonly use a speed of 250 kbit/s. However, there are exceptions — some units communicate at a speed of 500 kbit/s. The communication speed can be set to automatic mode or selected manually. This is done through the InteliConfig settings in the controller properties.



For automatic speed selection, i.e., "**Dependent on the ECU definition**", the following applies:

- If the ECU is configured from the list of ComAp-supported ECU units, the communication speed is set automatically, and there is no need to worry about setting the correct speed.
- For user-defined ECUs, the default communication speed is set to 250 kbit/s.

Due to the nature of the configuration method, the following ECU combinations may arise — these then determine the communication speed when "**Dependent on the ECU definition**" is selected:

ECU 1	ECU 2	ECU 3	Communication Speed
User ECU	User ECU	x	250 kbit/s
User ECU	ComAp ECU - 250 kbit/s	x	**250** kbit/s
User ECU	ComAp ECU - **500** kbit/s	x	**500** kbit/s
User ECU	ComAp ECU - 250 kbit/s	ComAp ECU - **500** kbit/s	**500** kbit/s

In case of manual selection of the CAN communication speed, the selected communication speed is used regardless of the value included in the ECU definition.

6.2.6 BESS starting sequence and BESS states

The method of puting of the BESS in operation - so-called starting sequence of the BESS - directly depends on the construction of the BESS itself, the power control modes P, possibly Q, and the ability of the BESS to operate independently in an island mode (so-called Grid Forming Mode) or the ability to operate only in parallel with another source with this property (so-called Grid Following Mode).

InteliNeo essentially allows the commissioning of the BESS through these sequences:

Start Sequence Type	BESS Construction and Control Method	Setpoint Configuration	Representation in Previous Version InteliNeo 2.0.0
Start with opened BCB	This sequence is appropriate if the BESS inherently supports Grid Forming Mode. Typically, this involves BESS with U-f control mode or so-called VSG mode.	Setpoint **Starting Sequence BCB Control** = Start With Opened BCB.	In previous versions of InteliNeo, it directly corresponds to the choice BESS Precharge Type = DC.
Start with closed BCB to energized bus	This sequence is appropriate if the BESS inherently supports only Grid Following Mode. Typically, this involves BESS with P-Q control mode.	Combination of setpoints**Starting Sequence BCB Control** = Start With Closed BCB and **Start To Dead Bus** = Disabled.	In previous versions of InteliNeo, it directly corresponds to the choice BESS Precharge Type = AC.
Start with closed BCB to dead bus	This sequence is appropriate if the BESS inherently supports Grid Forming Mode. Most often due to the realization of the Soft Bus Energize function, i.e., gradual bus energization to limit Inrush currents.	Combination of setpoints **Starting Sequence BCB Control** = Start With Closed BCB and **Start To Dead Bus** = Enabled.	Replaces the function applied in previous versions called LBI Soft Bus Energize.

Start with opened BCB

The condition for the starting sequence with opened BCB is that the PCS supports this configuration. Typically, this involves PCS in U-f control mode with droop regulation or fixed voltage and frequency regulation. Generally, the PCS must support voltage source mode (Grid Forming mode).

- The condition for starting the BESS with opened BCB configuration is that the BESS is in the Ready state. See the value **BESS state**. If the necessary conditions for starting are temporarily not met from the BESS perspective, the BESS start can be blocked using **BESS Start Blocking**. If the BESS is in error, i.e., permanently not ready for start and requires some intervention, it is advisable to set the BESS to Not Ready state using user protection type Sd.
- The start command is issued either in MAN operating mode by pressing the START button or in AUT operating mode upon receiving the **BESS Remote Start/Stop** signal.
- The BESS (PCS) output must be detected as inactive. The determination voltage level is defined by the voltage setpoint **Bus Dead Level** (for nominal voltage 231V, the default value is 6.5%, approximately 15V).
- The bus is either dead or powered by another Grid Forming source. This fact only defines whether the BESS will synchronize to the bus after a successful start or switch the BCB to a dead bus. The detection of a dead bus is again based on the setpoint **Bus Dead Level** (for nominal voltage 231V, the default value is 6.5%, approximately 15V).
- The startup sequence is directly controlled by signals **Precharge Request** (activates the precharge process) and **Precharge Finished** (confirms that the precharge process is complete). Essentially, this is feedback from the DC relay. During Precharge, the BESS is in the Precharge state.
- The BESS transitions to Standby. In this state, the BESS start can be delayed indefinitely using the signal **PCS Start Disabled**.
- After closing the DC link , the controller issues a command to start the PCS **PCS Run Request** and expects the PCS to output healthy AC voltage.
- The BESS readiness to connect to a load is then confirmed by the BESS signal **BESS 01 Ready To Load**. This confirmation is expected within the interval defined by the setpoint **BESS Ready to Load TO**. If the controller does not receive confirmation within this timeout, it transitions to the error **BESS Start Fail**.
- If **BESS 01 Ready To Load** is not configured, the BESS is declared ready to load after the timeout **BESS Ready to Load TO**.

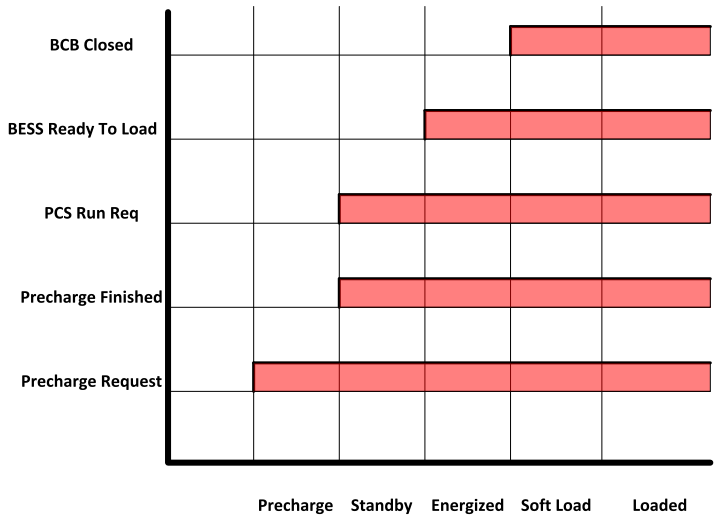
- The BESS transitions to the Energized state. The **Minimal Stabilization Time** is counted down. After this time, the BESS is ready to synchronize to a live bus or switch the BCB to a dead bus, provided the output voltage and frequency are stable. At this point, voltage and frequency protections are also unlocked, but no later than the timer **Maximal Stabilization Time**. If the output parameters do not stabilize within this time, the BESS transitions to error due to voltage and frequency protections (see **Fixed protections**).

> **IMPORTANT: Healthy bus voltage is a prerequisite for initiating the synchronization of BESS to this bus. BESS not only detects the voltage on the bus but also compares this fact with the information on whether it detects another Grid Forming source powering this bus on the inter-controller line. This can also include its own MCB feedback activation or a closed breaker in the functionality of the Universal Genset. This consistency is checked, and any discrepancy leads to the inability to initiate synchronization to such a bus or the detection of the error Bus Meas Error.**

BESS states for start with opened BCB

The value **BESS state** mirrors the state of the BESS state machine. The state machine goes through these states:

State	Description
Ready	There is no 2nd level alarm in the alarm list. The controller Mode is set to MAN or AUT mode.
Precharge	The BESS DC circuit is being precharged during this state. The state is initiated due to the start request. The LBO **Precharge Request** is active. The state machine steps to the next state once the "LBI Precharge Finished" gets active. If LBI **PCS Start Disabled** is activated before or during this state, the state machine is held in this state until it is active.
Standby	The PCS is being initiated in this state - LBO **PCS Run Request** gets active. Controller stay in this state until the BESS is Ready to Load.
Energized	The PCS (BESS) is ready to load. There is a healthy voltage on the output of PCS. BCB can be synchronized to a Healthy bus or be closed to the dead bus (then controller steps to the state Loaded directly).
Soft Load	The BESS load is ramped according to **Soft Load Ramp**. Once the BESS power reaches the required value but latest after the load ramp elapsed is finished the state machine steps to the state Loaded.
Loaded	The BESS is loaded and it follows the selected strategy. See **BESS P and Q control strategies**. The active power of the BESS is ramped to the actual request **BESS Required P Target** according to the ramp **Load Ramp PTM** or **Load Ramp Island**.
Soft Unload	When the BESS stopping request or BCB opening request received the BESS initiate the soft unloading phase. The BESS output is ramped down to zero. BCB opens and the state machine steps to the state Energized or Stop. During the unloading process the **Soft Unload Ramp** is used.
Stop	The BESS is being stopped. The LBO **PCS Run Request** is opened and BESS is expected to not produce any voltage on its Output, see **Bus Dead Level**. Once no other evidence of BESS running is detected, the BESS steps to the state Ready. In other case the alarm **Wrn Stop Fail** is issued if the BESS stopping was not detected until the timer **Stop Time** has elapsed.



Note: *Losing* ***PRECHARGE FINISHED*** *unexpectedly anytime when the BESS is in Standby, Energized, or Loaded state causes the alarm* ***Sd DC Circuit Close Fail****.*

Start with closed BCB to energized bus

This sequence is appropriate if the BESS inherently supports only Grid Following Mode. Typically, this involves BESS with P-Q control mode.

- The condition for starting the BESS in this configuration is that the BESS is in the Ready state. See the value **BESS state**. If the necessary conditions for starting are temporarily not met from the BESS perspective, the BESS start can be blocked using LBI **BESS START BLOCKING** . If the BESS is in error, i.e., permanently not ready for start and requires some intervention, it is advisable to set the BESS to Not Ready state using user protection type Shutdown.
- The start command is issued either in MAN operating mode by pressing the START button or in AUT operating mode upon receiving the **BESS REMOTE START/STOP** signal.
- The BESS (PCS) output must be detected as inactive. The discrimination voltage level is defined by the voltage setpoint **Bus Dead Level** (for nominal voltage 231V, the default value is 6.5%, approximately 15V).
- The condition for continuing the startup sequence is a energized bus, meaning that healthy AC voltage is detected on the bus. If this is the case, the controller initiates the startup sequence by closing the BCB to the energized bus.
- The startup sequence is directly controlled by signals LBO **PRECHARGE REQUEST** (activates the precharge process) and LBI **PRECHARGE FINISHED** (confirms that the precharge process is complete). Essentially, this is feedback from the DC relay. During Precharge, the BESS is in the Precharge state.
- The BESS transitions to Standby. In this state, the BESS start can be delayed indefinitely using the signal LBI **PCS START DISABLED**.
- After closing the DC link , the controller issues a command to start the PCS LBO **PCS RUN REQUEST**.
- The readiness to load is then confirmed by the BESS signal LBI **BESS 01 READY TO LOAD**. This confirmation is expected within the interval defined by the setpoint **BESS Ready to Load TO**. If the controller does not receive confirmation within this timeout, it transitions to the error **BESS Start Fail**.
- If **BESS 01 READY TO LOAD** is not configured, the BESS is declared ready to load after the timeout **BESS Ready to Load TO**.

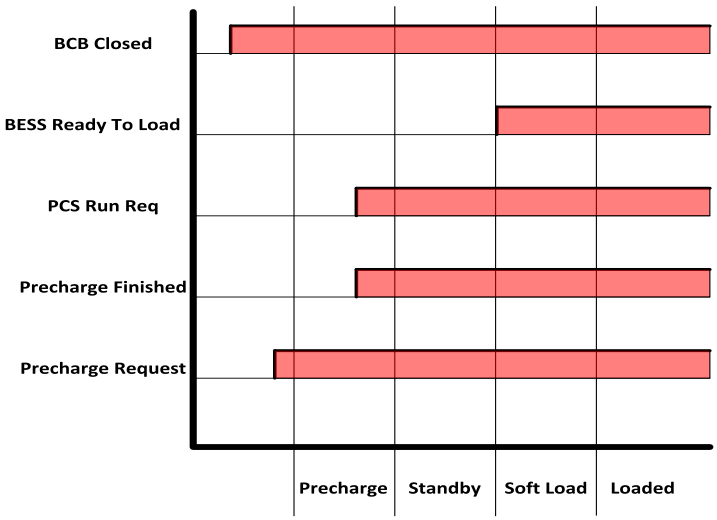
- The BESS transitions to the Soft Load and Loaded states. At this point, the voltage and frequency protections of the BESS are unlocked.

> **IMPORTANT: Healthy bus voltage is a condition for initiating the start sequence with the closed BCB to energized bus. However, the BESS not only detects voltage on the bus but also compares this with information on whether another Grid Forming source is detected on the inter-controller line powering this bus. This could be its own MCB feedback activation or a closed breaker in the Universal Genset functionality. This consistency is checked, and any discrepancy leads to blocking the BESS start when start with closed BCB to energized bus is set.**

BESS states for start sequence with closed BCB to energized bus

The value **BESS state** mirrors the state of the BESS state machine. The state machine goes through these states:

State	Description
Ready	There is no 2nd level alarm in the larm list. The controller Mode is set to MAN or AUT mode.
Precharge	The BESS DC circuit is being precharged during this state. The State is initiated due to the start request. The LBO **PRECHARGE REQUEST** is active. The state machine steps to the next state once the **PRECHARGE FINISHED** gets active. If **PCS START DISABLED** is activated before or during this state, the state machine is held in this state until it is active.
Standby	The PCS is being initiated in this state The LBO **PCS RUN REQUEST** gets active. Controller stay in this state until the BESS is Ready to Load.
Soft Load	The BESS load is ramped according to **Soft Load Ramp**. Once the BESS power reaches the required value but latest after the load ramp elapsed the state machine steps to the state Loaded.
Loaded	The BESS is loaded and it follows the selected strategy of load control. See **BESS P and Q control strategies**. The active power of the BESS is ramped to the actual request **BESS Required P Target** according to the remp **Load Ramp PTM** or **Load Ramp Island**.
Soft Unload	When the BESS stopping request or BCB opening request received the BESS initiate the soft unloading phase. The BESS output is ramped down to zero. BCB opens and the state machine steps to the state Stop. During the unloading process the **Soft Unload Ramp** is used.
Stop	The BESS is being stopped. The **PCS RUN REQUEST** is opened and BESS is expected to not produce any voltage on its output, see **Bus Dead Level**. Once no other evidence of BESS running is detected, the BESS step to the state Ready. In other case the alarm **Wrn Stop Fail** is issued if the BESS stopping was not detected until the timer **Stop Time** has elapsed.



Note: *Losing* ***PRECHARGE FINISHED*** *unexpectedly anytime when the BESS is in Standby, Energized, or Loaded state causes the alarm* ***Sd DC Circuit Close Fail****.*

6.2.7 Operation of the BESS without BCB

The construction of the BESS is commonly done in such a way that there is no direct BCB that the controller would control. The PCS output is directly connected to the common bus. The situation essentially corresponds to the starting sequence with a closed BCB. In such a case, it is necessary to adhere to the setpoints **BCB Type** = Fuse/Disc. and **Starting Sequence BCB Control** = Start With Closed BCB. In case of a mismatch of this setting, the alarm **SD Wrong BCB Control Setting** is triggered and the start of the BESS is blocked.

In the case of operating the BESS without BCB, i.e., with the setting **BCB Type** = Fuse/Disc., the controller ignores any voltage on the measuring terminals of the BESS, which under normal circumstances (operation of the BESS with BCB) would be an obstacle.

6.2.8 BESS output control methods P-Q / U-f

When we talk about controlling the output of BESS, we mean controlling the frequency and voltage in Grid Forming mode, as well as controlling the active and reactive power when cooperating with another Grid Forming source. InteliNeo supports the most commonly used methods of controlling the output of BESS.

All of these are based on two basic control principles, which we refer to as P-Q or U-f.

P-Q

The power of BESS is controlled by a direct request for P and Q, most often in absolute values of kW and kVAr.

The regulation of the request takes place on the BESS side. Regulation on the controller side does not enter this process and is suspended in this mode.

The request is sent to BESS via communication (most often Modbus). As a source of the request for BESS, we use the values **BESS Required P** and **BESS Required Q** in case of absolute values, or **BESS Required Relative P** and **BESS Required Relative Q** in case of relative values.

The P-Q mode setting in BESS and InteliNeo must be consistent. If BESS is in P-Q control mode, then LBI **BESS OUTPUT CONTROL MODE U-F/P-Q** must be active.

In this mode, BESS can be viewed as a current source, thus allowing only Grid Following mode. It therefore requires another Grid Forming source to be connected to the common bus. If InteliNeo detects that this is not the case (all gensets or Mains have been disconnected from the bus), BESS will automatically disconnect from this bus. This is done based on the protection **BESS Anti Islanding**.

The starting sequence with closed BCB to energized bus type must be used because the controller is not able to perform the active forward synchronization to the bus. See chapter **BESS starting sequence and BESS states**.

U-f

The U-f mode, similar to a genset, is characterized by direct control of frequency and voltage, or rather the power P and Q, by the controller. The control loop is therefore situated on the controller side. BESS operates in frequency and voltage droop. Droop ensures the basic stability of the system and the short-term response of BESS to external changes. The frequency and voltage of BESS in droop mode depend on the current load of BESS and vice versa. InteliNeo intervenes in this process by influencing the Droop Offset parameter, specifically the Frequency Droop Offset and Voltage Droop Offset. This shifts the operating point of BESS as needed, achieving frequency and voltage control in an island, or P and Q in parallel with another source.

As mentioned, the active control element here is InteliNeo and its internal control loops. The outputs of the controller, regardless of the control mode, are the values **Frequency Regulator Output** and **Voltage Regulator Output**. These regulation outputs need to be configured to the control inputs of BESS through appropriate conversion. It greatly depends on the formats of the control values that BESS supports. Most often, these are formats in terms of frequency and voltage requests, either in absolute value or as an offset from nominal values. InteliNeo supports such input formats for control through the values

BESS Frequency Required, **BESS Frequency Offset**, or in the format of a request in terms of the required relative active power **BESS P Request %**. For correct calculation - conversion of the control outputs to values of this format, it is necessary to set the setpoint **BESS Frequency Droop Slope** in accordance with the internal settings inside BESS.

In terms of voltage and reactive power Q control, or PF, the outputs **BESS Voltage Required**, **BESS Voltage Offset**, **BESS Q Required %** are designated for control. For correct calculation - conversion of the control outputs to values of this format, it is necessary to set the setpoint **BESS Voltage Droop Slope** in accordance with the internal settings inside BESS.

Values dedicated for BESS output control

Frequency and P control

Value	Dimension	Resolution	Definition	Intended for control method
BESS Required P Target	kW/MW	According to selected power format	This valu is internal calculation of the target BESS P which corresponds with the actual control strategy.	-
BESS Required P	kW/MW	According to selected power format	This Value is the requested power of the BESS, it is ramped using the **Soft Load Ramp**, **Load Ramp PTM** or **Load Ramp Island** towards the value BESS Required P Target.	P-Q
BESS Required Relative P	%	0,01	This is the relative value of requested power of the BESS, it is actually the value BESS Required P recalculated via BESS Nominal Power.	P-Q
Frequency Regulator Output	V	0,001	This is the output of the frequency / Active Power regulation loop.	U-f
BESS Frequency Required	Hz	0,01	This is the output of the frequency / Active Power regulation loop rescaled to the frequency dimension over the setpoint **BESS Frequency Droop Slope**.	U-f
BESS Frequency Offset	Hz	0,01	This is the output of the frequency / Active Power regulation loop rescaled to the frequency dimension over the setpoint **BESS Frequency Droop Slope** and ofset about the BESS Nominal Frequency.	U-f
BESS P Request %	%	0,1	This is the output of the frequency / Active Power regulation loop rescaled to the frequency dimension over the setpoint **BESS Frequency Droop Slope** and BESS Nominal Power.	U-f

Voltage and PF/Q control control

Value	Dimension	Resolution	Definition	Intended for control method
BESS Required Q	kVAr/MVAr	According to selected power format	This Value is the requested reactive power of the BESS it is ramped.	P-Q
BESS Required Relative Q	%	0,01	This is the relative value of requested reactive power of the BESS, it is actually the value BESS Required P recalculated via BESS Samax.	P-Q
Voltage Regulator Output	V	0,001	This is the output of the Voltage / Reactive Power regulation loop.	U-f
BESS Voltage Required	V	0,01	This is the output of the Voltage / Reactive Power regulation loop rescaled to the AC Voltage dimension over the setpoint **BESS Voltage Droop Slope**.	U-f
BESS Voltage Offset	V	0,01	This is the output of the Voltage / Reactive Power regulation loop rescaled to the AC Voltagedimension over the setpoint **BESS Voltage Droop Slope** and ofset about the BESS Nominal Voltage.	U-f
BESS Q Request %	%	0,1	This is the output of the Voltage / Active Power regulation loop rescaled to the AC Voltage dimension over the setpoint **BESS Voltage Droop Slope** and BESS Samax.	U-f

6.2.9 Max. charging/discharging power of the BESS

Nominal Power of BESS, i.e., the charging and discharging power that BESS possesses, is determined by the setpoint **Nominal power**.

This value is used in all functions where the charging and discharging capability of BESS is considered.

However, due to its physical nature, the battery storage does not allow working with the maximum nominal current under all circumstances, and this can be limited under certain conditions. This limit directly determines the maximum discharging and charging power of BESS. We can call it the dynamic nominal power of BESS.

This dynamic nominal power always narrows the interval of the maximum power of BESS given by the nominal power of BESS.

The maximum charging and maximum discharging power (dynamic nominal of BESS) can be independently defined using LAI **BESS 01 Max Charging P** and **BESS 01 Max Discharging P**. The dynamic nominal power of BESS is applied only if these inputs are configured.

The current values can then be monitored as **BESS Max Charging P** and **BESS Max Discharging P**.

The dynamic nominal power is then used everywhere as the limit of the maximum output of BESS considered for partial functions:

- The power request for BESS is always limited to this interval.
- The load reserve provided by BESS is determined by the value of the maximum discharging power **BESS Max Discharging P**.
- PV Curtailment is based on the ability of BESS to absorb excess power from PV and considers the value **BESS Max Charging P**.
- All other sources work with the information that the nominal power of BESS is limited to the interval of the dynamic nominal of BESS.

Note: *The values of the maximum charging and discharging current, or power, are usually provided by the BMS unit and are read via Modbus. If these values become invalid due to incorrect definition or communication error, the setting given by the setpoint* ***Nominal power*** *will apply again.*

6.2.10 BESS Max Charging P and BESS Max Discharging P transitions

The maximum charging and discharging power of the BESS is not simply a direct reflection of the value obtained from the LAI. These values are significantly influenced by the BESS's ability to charge or discharge (for example, due to reaching the maximum or minimum SOC level). The current value of the maximum BESS power can be monitored via the values **BESS Max Charging P** and **BESS Max Discharging P**.

When the maximum SOC level is reached (**see BESS SOC Control on page 250**), further charging of the BESS is prohibited. This results in a gradual reduction of the **BESS Max Charging P** value down to zero. To ensure a smooth transition and minimal disruption to system balance, this value is reduced using the **Soft Unload Ramp**. If the SOC returns to operational limits, the **BESS Max Charging P** value ramps back up to the value obtained from the LAI using the **Soft Load Ramp**.

When the minimum SOC level is reached (**see BESS SOC Control on page 250**), further discharging of the BESS is prohibited. This results in a gradual reduction of the **BESS Max Discharging P** value down to zero. To ensure a smooth transition and minimal disruption to system balance, this value is reduced using the **Soft Unload Ramp**. If the SOC returns to operational limits, the **BESS Max Discharging P** value value ramps back up to the value obtained from the LAI using the **Soft Load Ramp**.

The inability of the BESS to continue charging manifests as a decrease in the system's current load reserve. This naturally triggers the **Power Management** function to start another genset in order of priority. From the BESS perspective, the following scenarios may occur:

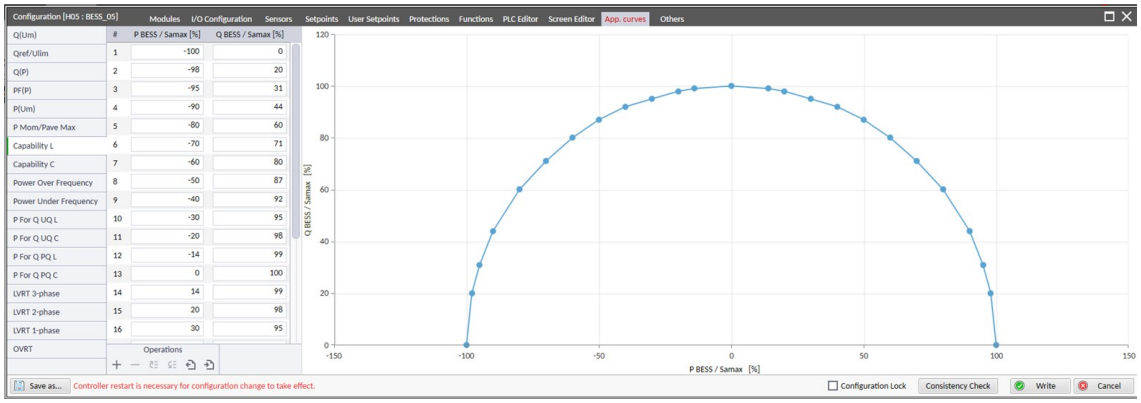
1. **The system load reserve is met even after BESS unloading to zero** – BESS begins unloading immediately (i.e., BESS Max Discharging P ramps to zero, and BESS power follows the limit).
2. **The system load reserve is not met after BESS unloading, and no other source (genset) is available to take over BESS power** – BESS begins unloading immediately to zero.
3. **The system load reserve is not met after BESS unloading, but another source exists that can take over BESS power** – in this case, BESS delays unloading and maintains its original load for a duration defined by the **#Slow Stop Delay** setpoint. The remaining time is indicated by the **Time To Unload** timer. Only after the next genset starts and enters the **Loaded** state with the load reserve met, BESS begins unloading. However, unloading will start no later than the expiration of the **Time To Unload** timer.

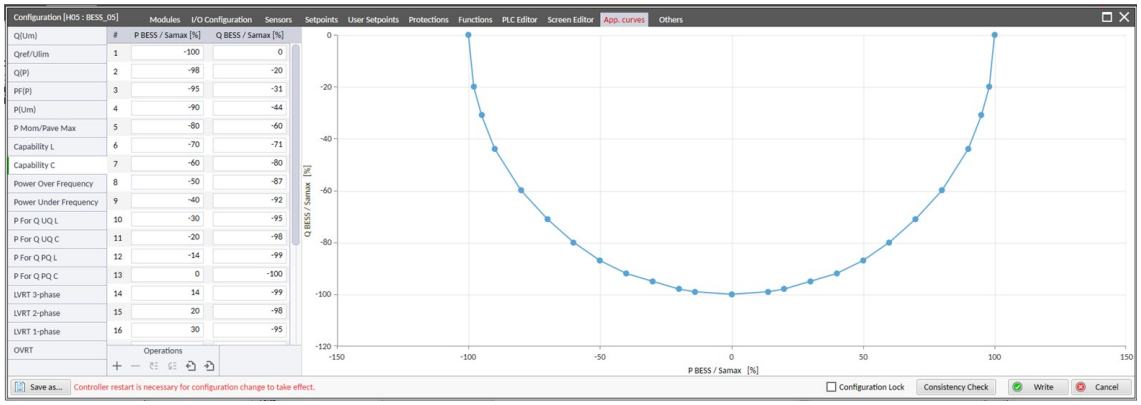
6.2.11 BESS operating area

The maximum active power P of BESS is determined by the setpoint **Nominal power**. The setpoint **Samax** then determines the maximum apparent power of BESS, i.e., the maximum current of BESS. This refers to

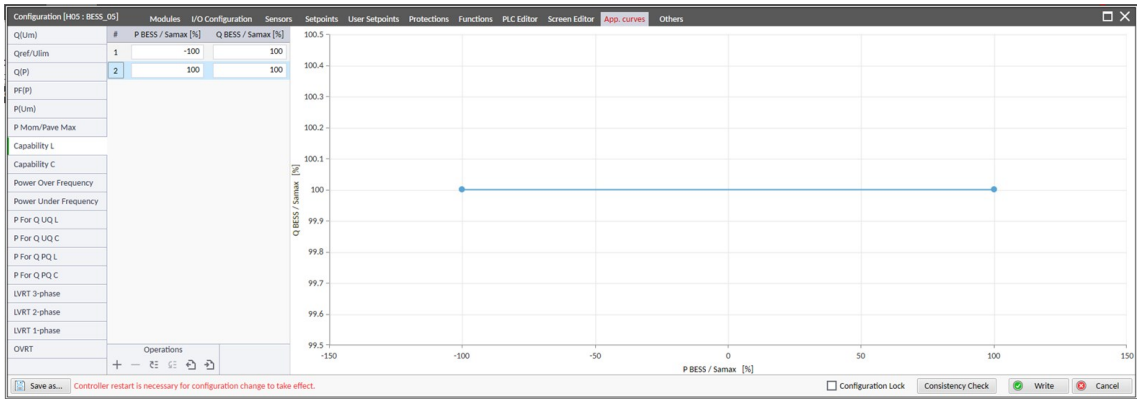
the output AC current PSC.

This current is determined by the operating area of BESS, which is initially defined in the shape of a circle using the application curves Capability L and Capability C. In cases where the BESS P and BESS Q request falls outside the operating area, the resulting vector is always limited in favor of delivering active power P.





The operating area can be adjusted as needed (depending on the relative size of the maximum power of the battery storage and PCS), for example, into a square shape. Both the active power P and the reactive power Q can then each reach their maximum value given by the setpoint **Nominal power** or **Samax**.



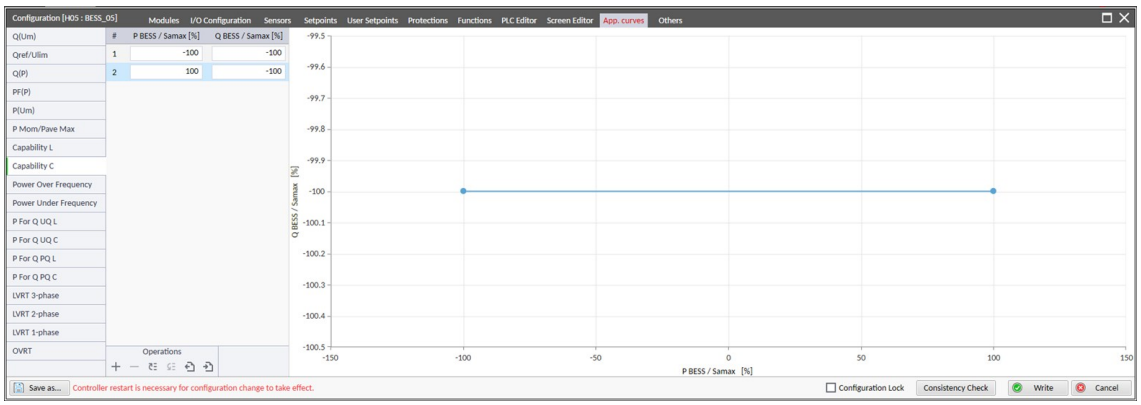


Image 6.49 Example of capavility curves settings to define the sqare shape operating area.

6.2.12 BESS P and Q control strategies

Active power control

The active power of the BESS can be controlled by a user or by internal controller logic. The user active power regulation has two options **BESS P Control** set to Analog and Setpoint. The Analog can be used for the BESS power P regulation defined by the PLC logic or by external signal regulation for example 3rd party device. The **BESS P Control** set to Setpoint is used for constant a request and can be used for manual a request to BESS defined by Setpoints **BESS Charge Power** and **BESS Discharge Power**. This option can be used for quick tests that BESS follows controller requests (communication).

In Balance mode (**BESS P Control** set to Balance) the BESS power is managed to achieve a certain balance in the system. In this mode, BESS P Request is defined by internal controller logic.

Constant Power Mode

This mode is suitable for manual control of BESS charging and discharging based on the requirements of a given scenario. It corresponds to the setpoint **BESS P Control** = Setpoint or Analog. For the Analog mode, the desired BESS P value enters the controller through LAI **BESS P REQUEST**. For the Setpoint mode, the charging/discharging power is controlled by the setpoints **BESS Charge Power** and **BESS Discharge Power**. The direction of BESS charging or discharging is determined by LBI **BESS CHARGE ENABLE** and **BESS DISCHARGE ENABLE**.

In this mode, the BESS attempts to deliver power as requested, but takes into account the current system conditions. It will limit its request to an acceptable level if fulfilling it would push other sources beyond their limits, such as overloading/reversing power genset or overloading/excessively charging another BESS in the group running in Balance mode.

All BESS in the system can be connected in constant power mode. It is possible to combine settings of BESS running in constant power mode with those running in Balance mode without restrictions.

> **IMPORTANT: The LBIs BESS CHARGE ENABLE and BESS DISCHARGE ENABLE are crucial for BESS charging or discharging control. These inputs have absolute priority for deciding if the BESS is enabled to be charged or discharged and are considered in any mode of P control. These inputs must be used in the configuration and must be active. If not, the BESS output will be limited to zero from one or the other side.**

Balance Mode

In this mode, the BESS actively and automatically participates in the selected power control strategy across the entire system. In off-grid applications, this can involve balancing the genset power to a constant level. In on-grid applications, it involves controlling the network power I/E, again in combination with balancing gensets to a constant P. This corresponds to the setpoint **BESS P Control** = Balance.

Reactive power control

The reactive power of the BESS can be controlled in several modes. The Q of the BESS can either be constant or participate in a common Q control strategy across the system. The choice of mode is determined by the setpoint **#BESS Q Control**.

Analog Mode

The BESS delivers constant Q as required. This mode is possible when the setting **#Genset PF Required** = Analog. The desired BESS Q value enters the controller through LAI **BESS Q REQUEST**. This mode is only possible in on-grid mode. In off-grid mode, the *Analog* setting behaves the same as the *VAr Sharing* setting.

Balance Mode

The BESS automatically selects such Q to balance the gensets in the group to a constant Power Factor according to the requirement **#Genset PF Required**. This applies to both off-grid and on-grid applications.

VAr Sharing Mode

The reactive power of the system (determined by the load in off-grid applications or the InteliMains requirement in on-grid applications) is evenly distributed among all sources, i.e., gensets and BESS. Thus, the BESS actively participates in the VAr Sharing function.

6.2.13 BESS Stabilization (DC Precharge)

> **IMPORTANT: This chapter is relevant only if BESS has setpoint Starting Sequence BCB Control = Start with BCB Opened**

When the BESS start is finished, the BESS goes into the stabilization phase. There are two timers (setpoints) in this phase:

- **Minimal Stabilization Time** starts to count down just after the idle period has finished. BESS voltage and frequency are not checked (respective protections are not evaluated) and the BCB cannot be closed even if the BESS voltage and frequency are within limits.
- **Maximal Stabilization Time** starts to count down just after the idle period has finished. BESS voltage and frequency are not checked (respective protections are not evaluated) but, opposite to the previous timer, the BCB can be closed if BESS voltage and frequency are within limits.

In situations where the BCB is closed automatically (AUTO mode), the closing of BCB or starting of synchronization will occur in the first moment when the BESS voltage and frequency will get into limits and the **Minimal Stabilization Time** has already elapsed.

In the event that the BESS voltage or frequency are not within limits within the **Maximal Stabilization Time** period, the appropriate protection(s) will be activated and the BESS will be stopped.

Note: *The limits for the BESS voltage and frequency are given by setpoints in the **Group: BESS Protections**.*

Note: *The value of the **Minimal Stabilization Time** setpoint has to be lower than the value of **Maximal Stabilization Time** setpoint.*

6.2.14 Connecting To Load

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BESS

Before connecting of the BESS to the load the LBI **Universal Genset Start/Stop** must be activated in case of AUT mode or start button must be pressed in case of MAN mode.

The connection of the BESS to the bus/load differs according to the setpoints **Starting Sequence BCB Control** and **Start To Dead Bus**. In case the start with closed BCB to energized bus is set, the BCB breaker can be closed immediately after the BESS is in the running phase. No stabilization time is counted because the inverter is not able to generate AC voltage on its output without being connected to the healthy bus. In this case the synchronization and connecting to the deadbus options are not available.

In case the start with opened BCB is set , connecting of the BESS to the load is same as for the Gen-set. See the text below.

When the **BESS Stabilization (DC Precharge)** phase is finished, the BESS can be connected to the load. The command for connecting the BESS to the load is issued either automatically (AUTO mode) or manually by pressing the BCB button. The following conditions must be valid:

- The BESS is running and the **Minimal Stabilization Time** timer has elapsed.
- The BESS voltage and frequency are within limits.

PV

The connection of the PV to the bus/load is not related to the LBI **Universal Genset Start/Stop** or start button in any way. Instead the LBO **PV/WT Run Request** is activated always when the CU is in the AUT or MAN mode and the controller expect activation of the LBI **PV Operable**. PVCB can be closed once the LBI is active and the bus is healthy. The PVCB cannot be closed to the deadbus or synchronized because PV inverter is not able to generate AC voltage on its own.

Connecting Mains to Load

Connecting to load depends on application, for BCB application it depends on the state of **BCB Feedback** and on the measured bus voltage. In case of MCB application depends only on measured bus voltage. In case the Load is without power (bus voltage is below 2 % of nominal voltage or BCB is opened) the connecting to dead bus is applied, in other case the synchronization process (reverse synchronization) is needed. See more information about synchronization process in chapter **Synchronization**.

Connecting to load (closing BTB) depends on the measured Bus Left and Bus Right voltage. In case one of the side of BTB is without power (Bus Left or Bus Right voltage is below 2 % of nominal voltage) the connecting to dead bus is applied, in other case the synchronization process is needed. See more information about synchronization process in chapter **Synchronization**.

Connecting To Dead Bus

MPTM

If the MCB is open, the bus bar is considered as dead and the BCB is closed without synchronization.

MINT

The Bus voltage is considered as Dead Bus when it´s below setpoint **Bus Dead Level** of the nominal bus voltage together with the open MCB (evaluated by LBI **MCB Feedback** or internally via CAN intercontroller communication if the LBI is not configured), and also others BCB have to be opened, to close the BCB without synchronization. The option to start the BESS to a dead bus is by using setpoint **Start To Dead Bus**. There are certain situations where the controller will not start to a dead bus especially if the controller receives information from another uf grid forming device that it will be starting or closing its breaker to the same bus which is the controlled BESS.

> **IMPORTANT: Connecting BESS to a dead bus can potentially cause damage if any unexpected changes occur on the ac bus. In order to negate any other grid forming device to connect to the starting of the BESS there are certain functions to utilize.**

Note: *If the group of / multiple BESSs have to start simultaneously and connect to the empty bus bar, there is an internal logic to prevent closing of more BCBs to the bus bar at the same moment without synchronization. One of the BESSs will close the BCB, the others will wait and then they will synchronize to the first one.*

> **IMPORTANT: The function described above works only if all controllers can see each other on CAN intercontroller line. You can use Emergency Droop function to detect missing controller on CAN.**

Note: *There is also a protection of "Bus power loss sensing". The "Bus Measure Error" is detected in MINT application when the voltage on the controller's bus terminals is out of limits 20 seconds after:*

- *BCB (own) was closed in MAN or AUT mode*
- *MCB (feedback) was closed in AUT mode*
- *Any other BCB in power management group (on CAN bus) was closed.*

The alarm is activated after 20s. However, the BCB (own) closing is blocked immediately for safety reasons. This protection can avoid e.g. potential direct closing of BCB while the controller's bus conductors are unintentionally unplugged from the terminals.

Synchronization

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Synchronization Process

Behavior of the synchronization process depends on, which breaker is used for synchronization and on the **Controller Mode**.

Note: *When the controller starts to synchronize and the main measuring screen is displayed, it will be automatically changed to the synchroscope screen for the entire duration of synchronization. The screen will also show* ***value Voltage Match 321*** *to inform you better about synchronization process. After synchronization the synchroscope screen is automatically changed back to the main measuring screen. It is also possible to change screens manually (arrows up and down) after displaying the synchroscope screen. In this case there is no automatic return to the main measuring screen after synchronization is finished.*

Voltage match 321

This value consists of 3 bits which are filled separately with logical 0 or logical 1 based on Mains/Bus Voltage and BESS Voltage of respective phases during synchronization.

Note: *Based on* ***Connection type*** *this value may either relates to Ph-N or to Ph-Ph values.*

Connection type	Relates to
3Ph4Wire	Ph-Ph
High Leg D	
3Ph3Wire*	
SplitPhase	Ph-N
MonoPhase	

**N - The N is virtualized inside the controller.*

- **1st Bit, logical 1 when:**

$$L1: \left|\frac{\text{BESS Voltage } L1-N}{\text{BESS Nominal Voltage } Ph-N}\right| - \left|\frac{\text{Mains/Bus Voltage } L1-N}{\text{Mains/Bus Nomnial Voltage } Ph-N}\right| \times 100 \leq \text{Voltage Window}$$

$$L1-L2: \left|\frac{\text{BESS Voltage } L1-L2}{\text{BESS Nominal Voltage } Ph-Ph}\right| - \left|\frac{\text{Mains/Bus Voltage } L1-L2}{\text{Mains/Bus Nomnial Voltage } Ph-Ph}\right| \times 100 \leq \text{Voltage Window}$$

- **2nd Bit, logical 1 when:**

$$L2: \left|\frac{\text{BESS Voltage } L2-N}{\text{BESS Nominal Voltage } Ph-N}\right| - \left|\frac{\text{Mains/Bus Voltage } L2-N}{\text{Mains/Bus Nomnial Voltage } Ph-N}\right| \times 100 \leq \text{Voltage Window}$$

$$L2-L3: \left|\frac{\text{BESS Voltage } L2-L3}{\text{BESS Nominal Voltage } Ph-Ph}\right| - \left|\frac{\text{Mains/Bus Voltage } L2-L3}{\text{Mains/Bus Nomnial Voltage } Ph-Ph}\right| \times 100 \leq \text{Voltage Window}$$

- **3rd Bit, logical 1 when:**

$$L3: \left|\frac{\text{BESS Voltage } L3-N}{\text{BESS Nominal Voltage } Ph-N}\right| - \left|\frac{\text{Mains/Bus Voltage } L3-N}{\text{Mains/Bus Nomnial Voltage } Ph-N}\right| \times 100 \leq \text{Voltage Window}$$

$$L3-L1: \left|\frac{\text{BESS Voltage } L3-L1}{\text{BESS Nominal Voltage } Ph-Ph}\right| - \left|\frac{\text{Mains/Bus Voltage } L3-L1}{\text{Mains/Bus Nomnial Voltage } Ph-Ph}\right| \times 100 \leq \text{Voltage Window}$$

IMPORTANT: Bits are counted from right to left!

Synchronization via BCB in AUTO mode

BESS synchronization to the Mains (common bus bar) via BCB (available for MPTM and MINT):

- If the Mains (bus) voltage or the Mains (bus) frequency gets out of the limits then the synchronization continues until the Mains fail is confirmed. Then:
  - In MPTM - MCB is opened and BCB is closed.
  - In MINT - **Bus Meas Error** alarm is issued.
- If the BESS voltage or frequency gets out of the limits during the synchronization the synchronization process is interrupted. The synchronization starts again when BESS parameters are restored. The **Synchronization Timeout** starts to be counted down again.
- If the **Synchronization Timeout** elapses alarm **Stp Synchronization Fail** is issued.

Synchronization via BCB in MAN mode

BESS synchronization to the Mains (common bus bar) via BCB (available for MPTM and MINT:

- Behavior is exactly the same as in AUTO mode - but the synchronization does not start again automatically when parameters of the BESS gets out of limits and back. The breaker control button must be pressed again.
- When the BCB button is pressed during the synchronization, then the synchronization process is interrupted.

Synchronization via MCB in AUTO mode

BESS synchronization to the Mains via MCB (available only for MPTM):

- if the Mains voltage or the Mains frequency gets out of the limits during synchronization, then the synchronization process is interrupted and can continue again when Mains parameters gets restored.
- if the BESS voltage or frequency gets out of the limits during the synchronization, the synchronization process continues until the BESSparameters fail is confirmed.
- If the synchronization timeout gets elapsed the **WrnHst Reverse Synchronization Fail** protection gets active and BCB stays closed. Synchronization is stopped.

Synchronization via MCB in MAN mode

BESS synchronization to the Mains via MCB (available only for MPTM):

- Behavior is exactly the same as in AUTO mode - but the synchronization does not start again automatically when parameters of the Mains gets out of limits and back. The breaker control button must be pressed again.
- When the MCB button is pressed during the synchronization, the synchronization process is interrupted.

back to Synchronization

Synchronization Types

There are two types of synchronization, Phase Match and Slip Synchronization. Type of synchronization is adjusted via setpoint **Synchronization Type**.

Phase Match

The phase match synchronization consists of voltage matching and frequency/angle matching. The maximum duration of synchronization is given by the setpoint **Synchronization Timeout**. If the synchronization is not successful within this period of time, the **Stp Synchronization Fail** alarm will be issued.

Voltage matching

The BESS voltage is regulated to match the Mains/Bus voltage with tolerance given by the setpoint **Voltage Window**. The regulation is adjusted by the setpoints **Voltage Gain** and **Voltage Int**.

Frequency/angle matching

The BESS frequency is regulated to match the Mains/Bus frequency first. The frequency regulation loop is active (setpoints **Frequency Gain** and **Frequency Int**). Once the frequency is matched, the regulation loop is switched to match the angle (setpoint **Angle Gain**). When the angle is matched with tolerance +/- **Phase Window** for a time given by the setpoint **Dwell Time** and the voltage is matched too, then the BCB or MCB is closed.

Note: *The matching loop will continue to run even if the BCB or MCB close command has been already issued until the controller receives* ***BCB FEEDBACK/MCB FEEDBACK*** *or* ***Sd BCB Fail To Close*** */****Wrn MCB Fail To Close*** *alarm occurs. After the feedback has been received, the control loops are switched to load and power factor loops respectively to load and power factor sharing.*

Slip Synchronization

The slip synchronizing is based on frequency/angle matching. The maximum duration of synchronizing is given by the setpoint **Synchronization Timeout**. If the synchronizing is not successful within this period of time, the **Stp Synchronization Fail** alarm will be issued.

The BESS frequency is regulated to match the Mains/Bus frequency + **Slip Frequency** value and the window is set by setpoint **Slip Frequency Window**. When the BESS frequency reaches (Mains/Bus Frequency + Slip frequency) value regulation loop is stopped (output is frozen at the actual value). If the BESS frequency reMains inside the window for the time longer than setpoint **Dwell Time** the controller will allow BCB or MCB closing. The controller calculates periodically so called preclosing angle (based on the actual value **Slip Frequency** and CB closing delay given by the setpoints **BCB Latency** or **MCB Latency**). When the preclosing angle is reached the controller issues CB closing command. The breaker will close and CB feedback confirms that to the controller. When the breaker is closed the controller goes to parallel and activates regulation loops again (parallel to Mains regulation loop).

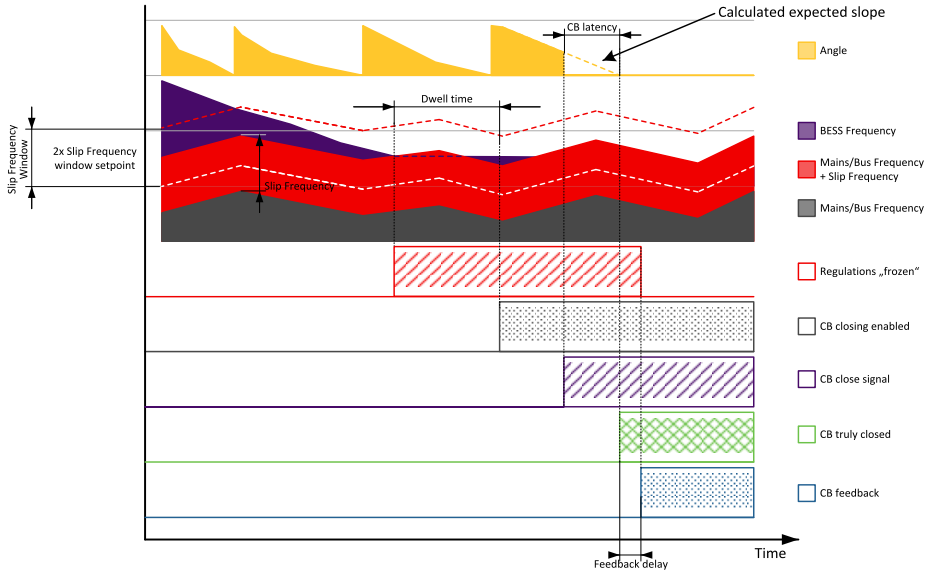


Image 6.50 Slip synchronization

Whenever the **BESS Frequency** leaves off the **Slip Frequency Window** (either because of **BESS Frequency**, **Mains/Bus Frequency** or setpoint **Slip Frequency Window** changes) the controller will reactivate frequency regulation loop and try to reach the target value again. The **Synchronization Timeout** timer runs regardless of this while whole slip synchronization process is repeated. If the **BESS Frequency** reaches the target frequency again the regulations are frozen and if the **BESS Frequency** remains in the window for the time longer than setpoint **Dwell Time** the controller will continue in the standard sequence as seen in the previous case. *If the **Synchronization Timeout** elapses the controller will immediately stop synchronization and issue alarm **Stp Synchronization Fail**.

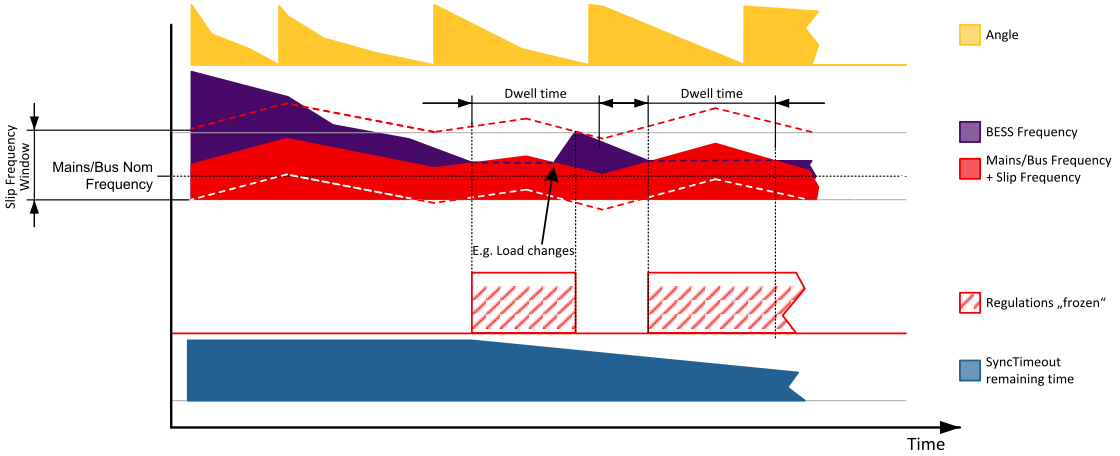


Image 6.51 Slip synchronization

The window is limited by the actual measured **Mains/Bus Frequency** if one of the window limits is below this value (e.g. for setting where setpoint **Slip Frequency** is set to 0.1Hz and setpoint **Slip Frequency Window** is set to 0.5Hz).

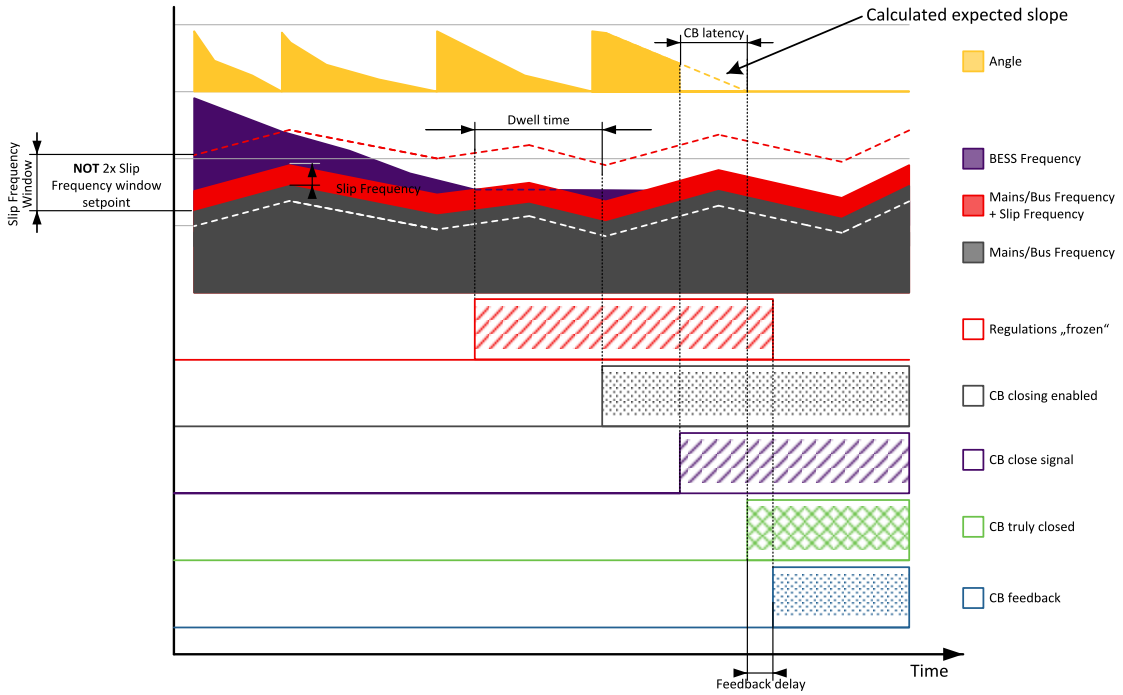


Image 6.52 Slip synchronization

Slip synchronization has a dead band. When the dead band is reached the frequency regulation is disabled. Once it is disabled it will be enabled again only when the frequency goes out of the slip frequency window. Dead band is introduced to allow the controller to detect the match.

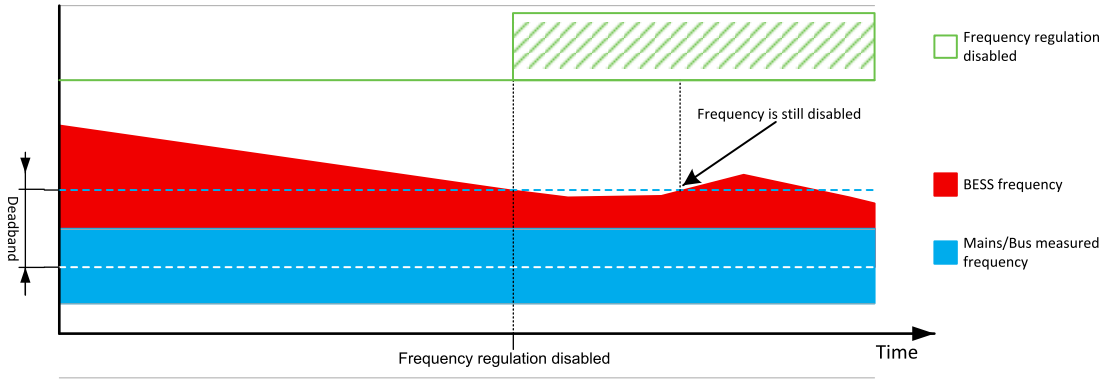
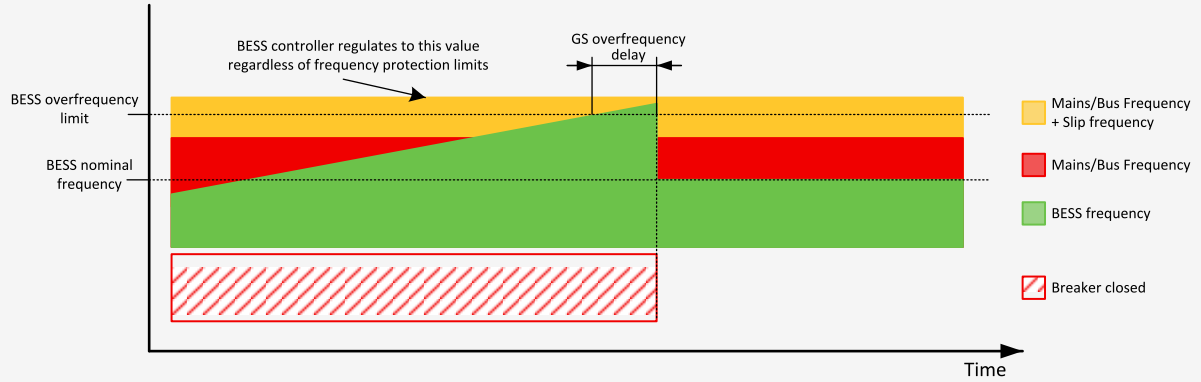


Image 6.53 Slip synchonization - deadband

Note: *Due to the nature of this function it is possible that in limit cases the controller will regulate the BESS frequency outside of protection limits. Example: Mains/Bus frequency is high but within its protection limits (e.g. 50.9 Hz, limit is 51 Hz).* ***Slip Frequency*** *is set to 0.5Hz. This will cause regulation loop of the controller can push the BESS frequency to 51.4 Hz and eventually the controller will issue overfrequency alarm. It is recommended to set the setpoint* ***Slip Frequency*** *as low as possible that still enables succesfull synchronization. This minimizes the risk of this problem happening. Furthermore when slip synchronization is used it is recommended to set Mains/Bus Frequency protection limits to more rigid values than the BESS frequency protection limits. In this case the setpoint* ***Slip Frequency*** *can be set to 0.1Hz and the Mains/Bus Frequency overfrequency protection limit is set to 50.9Hz instead of 51Hz. This will ensure that problematic state cannot be reached.*



back to Synchronization

6.2.15 Power ramping of the BESS

Connecting BESS to a dead bus

The situation where BESS connects to the load (to a dead bus) as the first and only Grid Forming source is very simple. The power for such a source changes abruptly, and BESS only regulates frequency and voltage.

Loading BESS

When BESS connects in parallel operation with other sources, its power is gradually ramped according to the **Soft Load Ramp**. During the power ramping period,the Soft Load state can be observed in the value **BESS state**. The loading state ends when BESS reaches the desired **BESS Required P Target** value or when the entire load ramp time elapses. At this moment, BESS transitions to the Loaded state.

BESS in Loaded State

The ramp defined by the **Load Ramp PTM** setpoint is then used for any load change during BESS operation in parallel with the grid.

The ramp defined by the **Load Ramp Island** setpoint is then used for any load change during BESS operation in Island.

Unloading BESS

Unloading BESS also occurs via a ramp, but this time via the **Soft Unload Ramp**. BESS is considered unloaded when its power enters the band around zero power defined by the **BESS Unload BCB Open Level** setpoint, or at the latest when the entire **Soft Unload Ramp** countdown elapses. Throughout the entire unloading process of BESS, the **BESS state** parameter can be observed in the Soft Unload state.

6.2.16 BESS SOC Control

The State Of Charge (SOC) is one of the most critical parameters of the BESS. It provides information on the extent to which the BESS is charged within its capacity. From the SOC, one can infer how much energy is stored in the BESS at any given moment.

InteliNeo requires this information, which is input through LAI **BESS 01 SOC**. This LAI is mandatory. If left not configured, an alarm **Sd BESS SOC Not Configured** will appear in the alarm list.

InteliNeo maintains the SOC of the BESS within the interval defined by the setpoints **SOC Low Target** and **SOC High Target**.

When the value **BESS SOC** reach limit given by the setpoint **SOC Low Target** the discharging process is stopped and the LBO **SOC DISCHARGE DISABLED** is activated. When the value **BESS SOC** reach limit given by the setpoint **SOC High Target** the charging process is stopped and the LBO **SOC CHARGE DISABLED**is activated. The charging/discharing process can be activated again after the value **BESS SOC** leave the hysteresis which are defined by the setpoints **SOC Low Hysteresis** and **SOC High Hysteresis**.

Note: *Charging and discharging is influenced all the time by the LBIs **BESS CHARGE ENABLE** and **BESS DISCHARGE ENABLE**.*

Note: *All relative setpoints/values are related to the LAI **BESS CAPACITY** respectively to value **BESS Nominal Capacity**.*

In the picture below you can see the red and orange (Sd and Wrn) alarm areas. The appropriate alarm is activated when SOC Actual trips the SOC alarm level given by setpoints in the **Subgroup: SOC Protection**. The green area is Safety Operation Area and SOC targets should be placed in it. The battery should cycle between these targets in the green area.

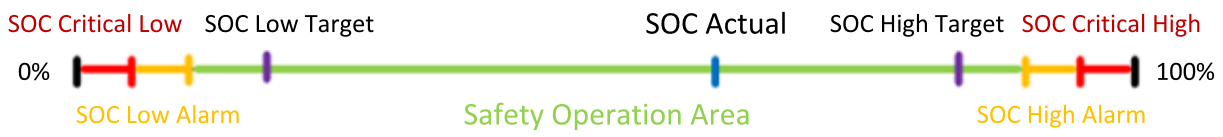


Image 6.54 State of charge

IMPORTANT: The SOC control algorithm can only manage the BESS output power if the BESS is not the only grid-forming source on the bus. There must be another grid-forming source connected to the bus, such as a genset, another BESS in grid-forming mode, or the grid must be connected to the mains. In scenarios where only the BESS and PV are connected to the bus and low PV production is occurring this can cause the battery to discharge beyond its targets, since the primary target of the system is to supply the load. The SOC of the BESS can then fall below the target value and even reach the BESS <<SOC limit. In such cases, the system will shut down due to Sd SOC Critical Low Protection".

Note: *When **Sd SOC Critical Low** protection is active, it causes the BESS to shut down and it must be charged above the **BESS <<SOC** limit again. This must be done through some form of manual control. The shutdown protection blocks the start of the BESS and its connection to the bus. The way to resolve this issue is to disable the SOC Critical Low protection using the setpoint **BESS <<SOC Protection** and activate the function of ignoring target control (**see Ignore Target Control on page 1**) or set the setpoint **SOC Low Target** to below the actual value.*

> **IMPORTANT: The LBIs BESS CHARGE ENABLE and BESS DISCHARGE ENABLE are crucial for BESS charging or discharging control. These inputs have absolute priority in deciding if the BESS is enabled to be charged or discharged and are considered in any mode of P control. These inputs must be used in the configuration and must be active. If not, the BESS output will be limited to zero for charging and discharging.**

6.2.17 BESS charging/discharging limitation

This function allows managing of the charging process (storage of energy from the bus = Mains / Gen-sets / renewables) and discharging process(providing stored energy to the load) of the BESS. There are two LBIs which can be used to Enable/Disable charging and discharging process: LBI **BESS CHARGE ENABLE** and LBI **BESS DISCHARGE ENABLE**. If both LBIs for charging and discharging are activated, the battery cycling is applied. The battery will be cycling between charging/discharging targets given by setpoints **SOC Low Target** and **SOC High Target**).

Note: *All sources are influenced by LBIs mentioned above. When LBI **BESS CHARGE ENABLE** is not active the Charge Request is unavailable. In case the LBI **BESS DISCHARGE ENABLE** is not active, the discharge request is not available. If both LBIs are activated at the same time, the discharge process has a higher priority.*

BESS CHARGE ENABLE	BESS DISCHARGE ENABLE	Charge/Discharge	BESS P Request Source
0	0	Blocked	0
0	1	Discharge	**BESS Discharge Power**
1	0	Charge	**BESS Charge Power**
1	1	Battery cycling	**BESS Discharge Power**

> **IMPORTANT: The LBIs BESS CHARGE ENABLE and BESS DISCHARGE ENABLE are crucial for BESS charging or discharging control. These inputs have absolute priority in deciding if the BESS is enabled to be charged or discharged and are considered in any mode of P control. These inputs must be used in the configuration and must be active. If not, the BESS output will be limited to zero from one or the other side.**

6.2.18 BESS AC values measured over LAIs

The standard integration of BESS into the system using InteliNeo assumes that the output AC values of BESS are obtained through AC measurements directly at the controller terminals, specifically the terminal group “1 and 16” (**Terminal Diagram**). Only in this hardware configuration is it possible to fully utilize functions based on AC measurements, such as synchronization through BCB or BESS protection.

In some applications, it is possible to integrate BESS into the system with partially limited AC values measurements, i.e., without AC current measurement or even completely without AC voltage measurement

at the controller terminals. Such a scenario naturally brings certain limitations, which are, however, acceptable for these scenarios.

The mode of AC measurement for BESS is determined by the setpoint **BESS AC Measurement**. BESS can be operated in the following modes:

- With fully functional AC voltage and current measurement - **BESS AC Measurement** = Onboard CU Measurement. All AC values are measured in the standard way, and none of the LAIs listed below are configured.
- Standard BESS voltage measurement, but current, i.e., P and Q, are measured through LAI - **BESS AC Measurement** = Current Analog Input.
- With both voltage and current measured through LAI - **BESS AC Measurement** = Current & Voltage Analog Input.

To better understand the function of measurement through LAI, it can be viewed that the information about the measured values in the controller is simply replaced by information/values obtained through LAI (most often through communication with BESS itself, e.g., over Modbus). This necessarily brings certain limitations to the application.

> **CAUTION: One of the most significant impacts of this function is its effect on protections. Protections are still evaluated in the standard way, but now based on values read through Modbus. Due to communication latency, it is difficult to maintain the required delays of individual protections. Some protections typically evaluated without delay are unable to fulfill their expected function at all, such as fast protections like BESS >>V Protection, Short Circuit Protection, IDMT BESS >A Protection, or IDMT Overload Protection. All critical protections must be ensured directly by the BESS control controller (PCS).**

	Expected format	BESS AC Measurement = Current Analog Input	BESS AC Measurement = Current & Voltage Analog Input	Target value
AC BESS Current L1	1 A	Optional	Optional	**BESS Current L1**
AC BESS Current L2	1 A	Optional	Optional	**BESS Current L2**
AC BESS Current L3	1 A	Optional	Optional	**BESS Current L3**
AC BESS Frequency	0,001 Hz	Not Configured	**Mandatory**	**BESS Frequency**
AC BESS P	According to selectd Power Format	**Mandatory**	**Mandatory**	**BESS P →BESS S,BESS Power Factor**
AC BESS Q	According to selectd Power Format	**Mandatory**	**Mandatory**	**BESS Q →BESS S,BESS Power Factor**

	Expected format	BESS AC Measurement = Current Analog Input	BESS AC Measurement = Current & Voltage Analog Input	Target value
AC BESS VOLTAGE L1	1 V	Not Configured	**Mandatory**	**BESS Voltage L1-N**
AC BESS VOLTAGE L2	1 V	Not Configured	**Mandatory**	**BESS Voltage L2-N**
AC BESS VOLTAGE L3	1 V	Not Configured	**Mandatory**	**BESS Voltage L3-N**

Note: *On the LAIs for voltage measurement there are expected values of the Ph-N voltage. The Values* ***BESS Voltage L1-L2, BESS Voltage L2-L3, BESS Voltage L3-L1*** *are internally calculated based on the Ph-N values.*

Note: *LAIs for current measurement are defined as "optional". The current at the BESS output is not critical for the application. As mentioned above, PCS overcurrent protections must be handled by the PCS controller. For InteliNeo, the BESS current information is used only for monitoring. Unconfigured LAIs for current measurement automatically show a value of 0 A.*

Note: *For all LAIs, if they are not configured or show an invalid value due to incorrect configuration or loss of communication, they will be filled with a value of "0". Loss of communication with BESS, i.e., loss of valid AC values during BESS operation, most often results in the activation of BESS voltage and frequency protections.*

6.2.19 MultiBESS Support

The MultiBESS function is not available in the basic mode. It is a premium feature. This function is conditioned by the installation of the SW key "Bank Controller Function in IN530". For more information **see List of SW Key Features on page 210**.

The MultiBESS function also requires the configuration to be based on a special configuration file. This base configuration is not part of the installation package for InteliNeo. If you are interested in this function, it is necessary to request cooperation from ComAp Technical Support service.

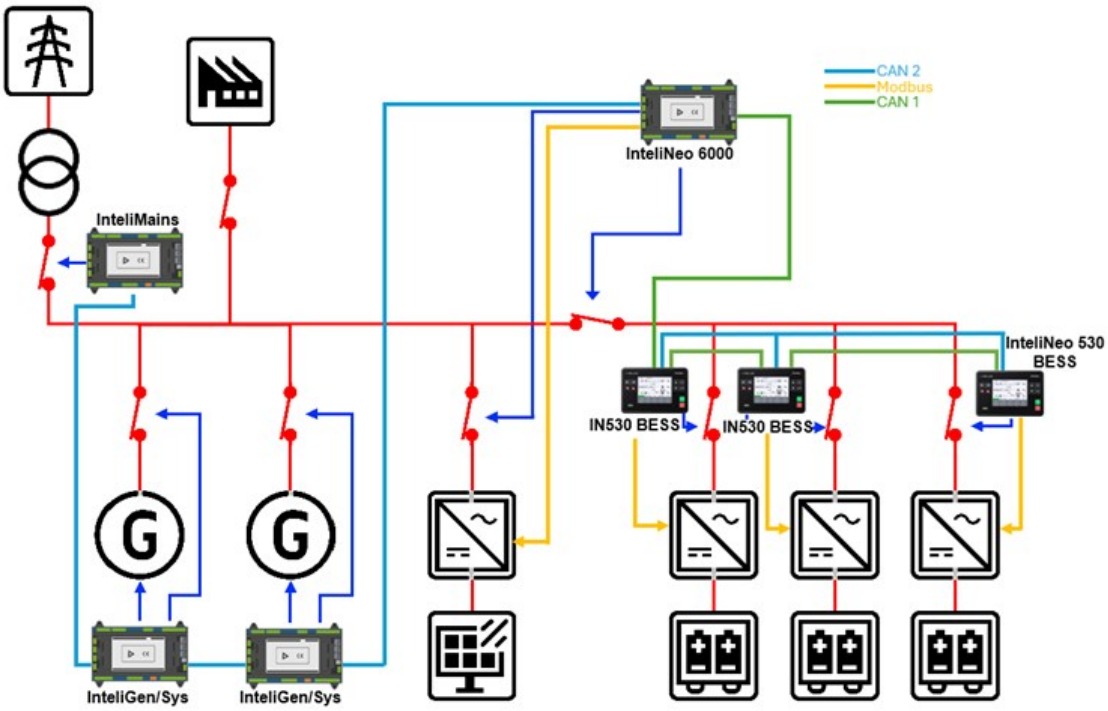


Image 6.55 MultiBESS Support overview

MultiBESS function purpose

The basic application of the MultiBESS function is the integration of a group of BESS units into very large installations, where a problem with an insufficient number of CAN addresses on the inter-controller line can be expected. The principle is similar to the **Bank Controller** application (which is intended for integrating and merging a larger number of gen-sets into one group and then integrating them into the system through a master controller).

The MultiBESS function primarily targets the integration of a group of BESS units operated by **InteliNeo 530 BESS** units into a system through a master controller **InteliNeo 6000**.

MultiBESS principles

The MultiBESS function is available in InteliNeo 6000 from FW version 2.1.0. On the InteliNeo 530 BESS side, FW version 2.0.0 or higher is required.

The configuration of InteliNeo 6000 for the MultiBESS function must be based on a special archive. The basic archive for InteliNeo 6000 does not contain the inputs and outputs which the MultiBESS function is based on.

Communication with InteliNeo 530 is based on the CAN1 communication line, so all units must be interconnected via CAN. On side of InteliNeo 6000 use terminals of "CAN1A"(**see Terminal Diagram on page 54**), in case of InteliNeo 530 BESS use terminals of CAN1. InteliNeo 530 BESS is configured as a subordinate ECU unit **InteliNeo 530 BESS**. Conversely, in the InteliNeo 530 BESS, the master unit InteliNeo 6000 is configured as ECU **InteliNeo 6000 MultiBESS**. This reciprocal configuration enables communication of basic signals between the master MultiBESS unit and its subordinate units via the J1939 protocol on the CAN1 communication line. The InteliNeo 6000 in MultiBESS mode can manage up to 32 subordinate InteliNeo 530 units – the configuration thus includes 32 configured modules, with the modules distinguished by the set *Device Address*. In the InteliNeo 530, it is then necessary to configure exactly one unit InteliNeo

6000 MultiBESS. By configuring the ECU units in the described way, all necessary signals are defined, including links to the corresponding signals in the configuration of both controllers (on LAI, LBI, Values, LBO).

Note: *The use of the MultiBESS function as described excludes the use of peripheral I/O modules on CAN1.*

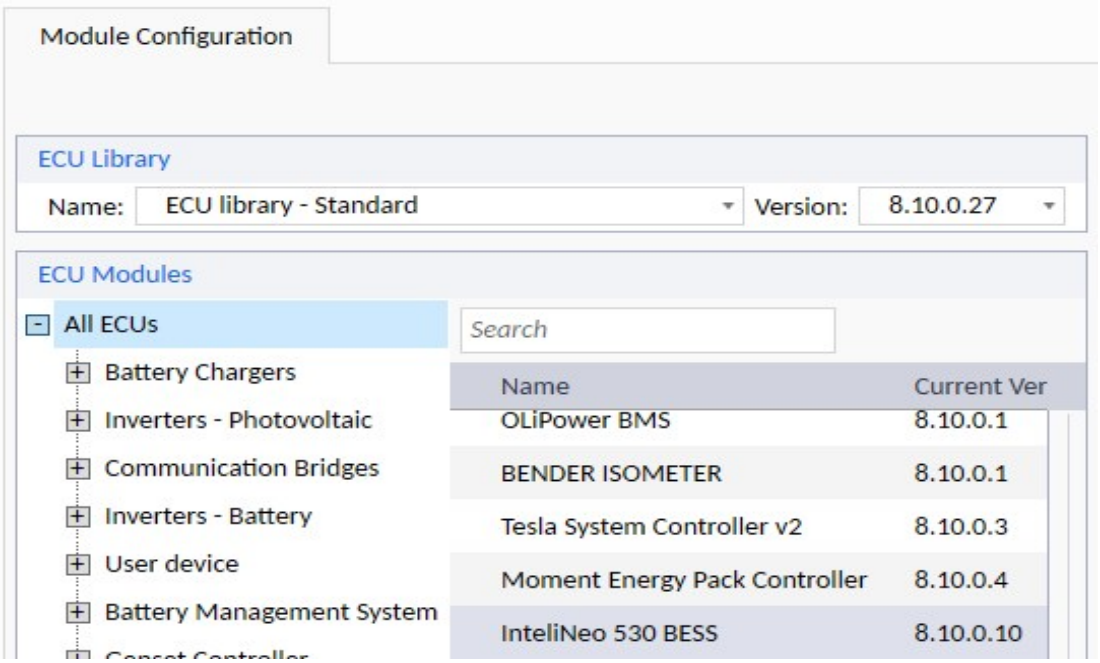


Image 6.56 Adding new module InteliNeo 530 BESS in configuration

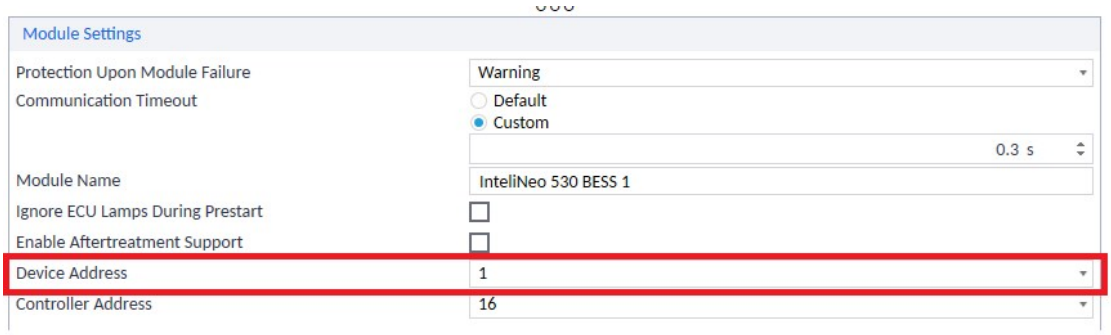


Image 6.57 The InteliNeo530 must be differentiated using the settings of the Device Address

Processing MultiBESS data in InteliNeo 6000

InteliNeo 6000 MultiBESS works with the group of subordinate BESS units as if it were a single BESS unit. From the inputs received from the subordinate units, InteliNeo 6000 in MultiBESS mode aggregates summary values - specifically "**MultiBESS P**" Nominal", "**MultiBESS P**", and "**MultiBESS Q**", along with a number of others, which are automatically configured in their corresponding positions in MultiBESS mode. For example, the value "**BESS SOC**" is aggregated as the average value of the SOC from all subordinate BESS units that are actively connected to the bus at that moment.

Some variables aggregated from individual BESS slots are used automatically, while others require manual configuration to the corresponding signals.

When aggregating shared variables, it is crucial whether a given subordinate BESS is currently connected to the common bus and whether it is capable of participating in the control process. Each BESS reports this status via the LBI signal "**BESS XX BCB Closed/Ready To Load**".

The following table describes the individual signals and the method of their processing in greater detail.

LAI 01 .. 32 in IntleiNeo 6000 MultiBESS	Source in InteliNeo 530 BESS	Aggregated Value in InteliNeo 6000 MultiBESS	Way of Aggregation	Aggregation condition by LBI BESS XX BCB Closed/Ready To Load	Configuration in InteliNeo 6000 MultiBESS
BESS XX Actual P	Value BESS P	MultiBESS P	Sum	✓	Value "MultiBESS P" must be manually configured to LAI AC BESS P.
BESS XX Actual Q	Value BESS Q	MultiBESS Q	Sum	✓	Value "MultiBESS Q"must be manually configured to LAI AC BESS Q.
BESS XX Charge kWh	Value BESS Charge kWh	BESS Charge kWh	Sum	✗	Automatically used - does not require manual configuration.
BESS XX Discharge kWh	Value BESS Discharge kWh	BESS Discharge kWh	Sum	✗	Automatically used - does not require manual configuration.
BESS XX Max Charging P	Value ES Max Charging Power	BESS Discharge kWh	Sum	✓	Automatically used - does not require manual configuration.

LAI 01 .. 32 in IntleiNeo 6000 MultiBESS	Source in InteliNeo 530 BESS	Aggregated Value in InteliNeo 6000 MultiBESS	Way of Aggregation	Aggregation condition by LBI BESS XX BCB Closed/Ready To Load	Configuration in InteliNeo 6000 MultiBESS
BESS XX Max Discharging P	Value ES Max Discharging Power	BESS Max Discharging P	Sum	✓	Automatically used - does not require manual configuration.
BESS XX Nominal P	Value BESS Nominal P	MultiBESS Nominal Power	Sum	✓	Must be manually configured as source of Forced Value upon the setpoint "Nominal Power" and "Samax". The Forced Value is configured to be active all the time.
BESS XX SOC	Value ES SOC	BESS SOC	Average	✓	Automatically used - does not require manual configuration.

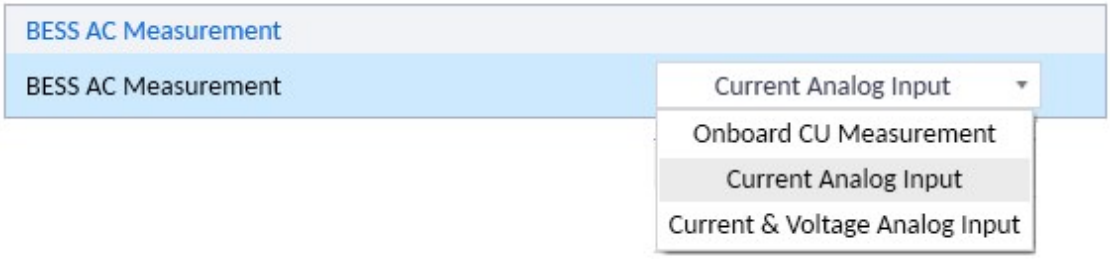


Image 6.58 The setpoint "BESS AC Measurement" must be set to position Current Analog Input.

P and Q Control in MultiBESS application

At this point we have all information from InteliNeo 530 BESS units collected and processed in InteliNeo 6000 in MultiBESS application. The next step is to set the control signals for subordinated InteliNeo530 properly.

From the perspective of correctly setting control signals, it is crucial whether the subordinate BESS units allow operation in the so-called Grid Forming mode or not. Based on this, it is necessary to correctly set the value of LBI **BESS Output Control Mode U-f/P-Q**.

In the first case, let us assume that all InteliNeo 530 units operate with BESS in P-Q control mode, meaning they do not support Grid Forming mode. LBI **BESS Output Control Mode U-f/P-Q** must be used in the configuration and must be set on Log1. Based on this setting, the InteliNeo 6000 recognizes that the subordinate units operate as a group in P-Q mode and directly controls the Active Power P and Reactive Power Q of the entire group. A key link for configuring this mode is the connection of the LBO **Parallel To GF Source** on the InteliNeo 6000 side to the LBI **MCB Feedback** on the InteliNeo 530 BESS side. Power control is then carried out based on the shared signals described in the following table. All mentioned signals are automatically preconfigured according to the definitions in the corresponding ESF files. The Group of InteliNeo 530 BESS must operate in the mode of Analog External System Baseload.

Value in InteliNeo 6000 MultiBESS	Value reconstructed in IN530	LAI in InteliNeo 530 BESS
BESS Required P	MultiBESS Required P	Load Control: ANEXT Baseload
BESS Required PF	MultiBESS Required PF	PF Control: ANEXT Base PF
BESS Required Q	MultiBESS Required Q	Q Control: ANEXT BASE Q

LBO in InteliNeo 6000 MultiBESS	Value reconstructed in IN530	LBI in InteliNeo 530 BESS
Precharge Request	MultiBESS Start Request	BESS Remote Start/Stop
Parellel To GF Source	Parellel To GF Source	MCB Feedback

In case that the Group of InteliNeo 530 BESS operates in U-f mode and enables the Grid Forming mode it can run in island operation where no other Grid Forming source is connected to the bus. It is ensured via configuration link of LBO **Parallel To GF Source** to LBI **MCB Feedback** in InteliNeo 530 BESS.

BCB Control and reverse synchronisation of the group of InteliNeo 530 BESS

The MultiBESS function assumes a situation where the InteliNeo 6000 does not control the BCB. In this case, the setpoint **BCB Type** is set to Fuse/Disc.

If the application requires the InteliNeo to control the BCB, this option is also possible, but it is not part of the default configuration. In such a case, it is necessary to properly configure the parameters that govern the startup sequence of both controllers, namely **Starting Sequence BCB Control** and **Start To Dead Bus**. Synchronization via BCB by InteliNeo 6000 is then possible in slip synchronization mode, i.e., **Synchronization Type** = SlipSynchr. In this case, it is important to correctly configure the sharing of active synchronization information and, based on that, trigger a nominal frequency offset using the Forced Value application on the setpoint **Nominal Frequency**.

6.2.20 Daily battery cycles control

The number of battery cycles per day can be limited by the setpoint **Max Battery Cycles Per Day**. In one day the statistic value **Batt. Charging Cycles** cannot be increased more times than the setpoint **Max Battery Cycles Per Day** specifies. If the daily number of battery cycles is reached the LBO **Daily Batt Cycles Reached** and **Daily Battery Cycles Reached** are activated and the battery cannot be discharged anymore. On the given day only battery charging is allowed. One day is counted from midnight to midnight, so the LBO and alarm are deactivated at the earliest midnight.

Note: *Usually one charging cycle is defined as complete discharge of fully charged battery or a series of partial drains equal to the battery's capacity.*

6.2.21 BESS kWh statistics

InteliNeo enables working with energy storage statistics from BESS systems.

There are two configuration modes:

Standard Mode (Single BESS)

In this mode, it is necessary to configure the LAI **BESS 01 DISCHARGE KWH** and **BESS 01 CHARGE KWH** based on the energy data obtained directly from the BESS unit. These values represent the total energy discharged from the BESS **Batt. Discharge kWh** and charged into the **Batt. Charge kWh** , respectively.

MultiBESS Mode

In this mode, each BESS instance used in the configuration must be linked with its own energy data, e.g. LAI **BESS 01 DISCHARGE KWH** and **BESS 01 CHARGE KWH**. InteliNeo automatically aggregates these values across all BESS units to generate overall statistics **Batt. Discharge kWh** and **Batt. Charge kWh** .

From these values, interval-based statistics are calculated, e.g. **Batt. Charge Annual kWh**, **Batt. Discharge Annual kWh** and next.

Note: *BESS statistics are based on reading the energy data directly from the BESS units. InteliNeo does not support calculating BESS energy values by integrating the current active power of the BESS system over time.*

6.2.22 PV support

InteliNeo integrates PV systems through the PV Inverter Slots function. Each slot includes a set of signals that must be populated with current values for the PV inverter to be correctly integrated into the system. Typically, each PV inverter in the system corresponds to exactly one PV slot.

InteliNeo 6000 supports up to 32 PV slots, allowing for the direct integration of up to 32 PV inverters within a single InteliNeo 6000 controller.

The set of signals from each inverter always has the same format for PV, as shown in the next figure.

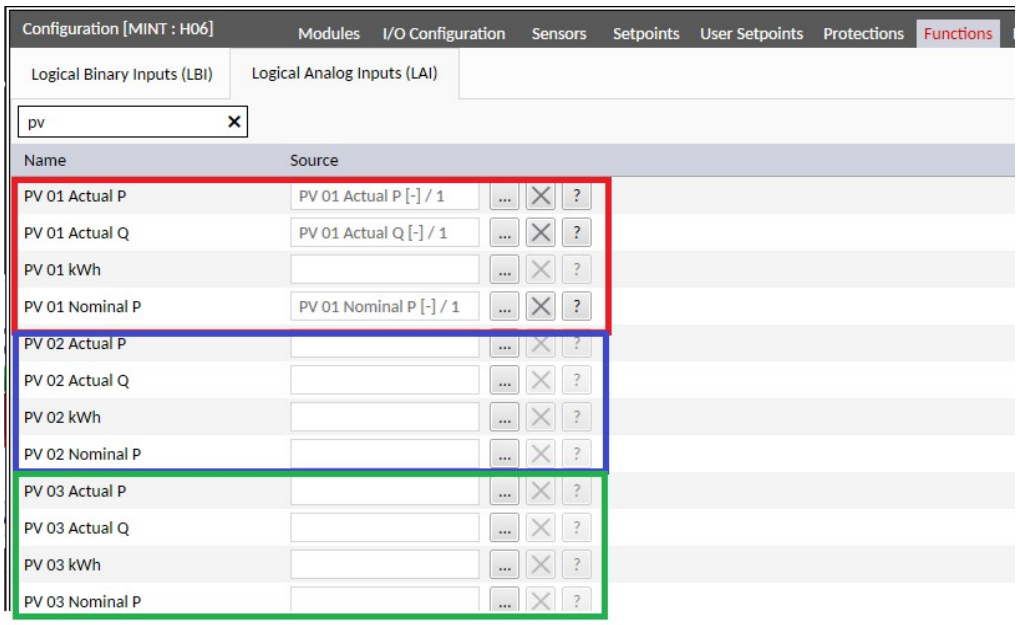


Image 6.59 PV Invertor Slots configuration

Each PV slot, i.e., inverter, is associated with information about its activity through the LBI **PV 01 OPERABLE** .. **LBI PV xx Operable**. The values of all LBIs are aggregated into the common value LBO **PV OPERABLE**. This value indicates that at least one PV inverter in the PV system is in an operable state. An operable state for a PV inverter means that the PV inverter is connected to the bus and actively contributing to PV production. If the PV is not in this state (for example, if the PV inverter has a fault preventing its operation), it is necessary to ensure that the corresponding LBI signal **PV 01 OPERABLE** .. **LBI PV xx Operable** is inactive. This information is crucial for the calculation/aggregation of the **PV Nominal P** value. The nominal power of an inverter that is not in an operable state is not included in the total nominal power. Only such a system configuration allows the proper functioning of the PV Curtailment function.

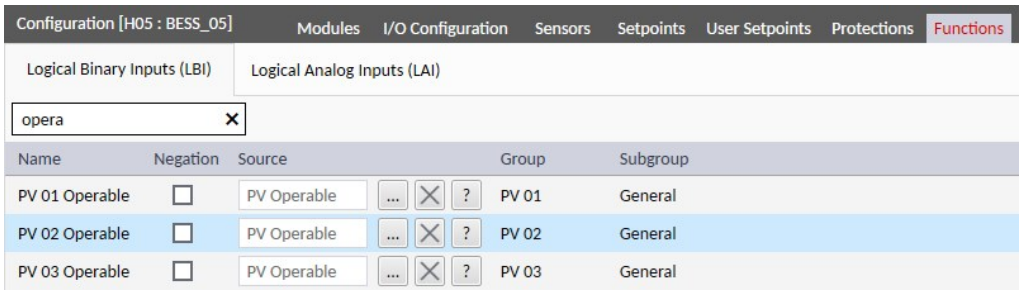


Image 6.60 LBI PV operable has to be correctly configured for each PV Inverter/Slot.

Data from all PV inverters within a single InteliNeo are aggregated into the **Group: PV** and the **Subgroup: PV Aggregated**.

A PV system integrated through InteliNeo operates independently within the system and is represented by the CAN address of the respective PV, as detailed in **System variability**.

Within a single system, there can be multiple InteliNeo controllers integrating PV.

6.2.23 PV Output control

PV P Control / Curtailment

The strategy for controlling PV is usually to extract as much energy as possible from the PV system. In the case of excessive PV production, the PV Curtailment function is available.

This function calculates the maximum allowable PV production, i.e., the power that the system can consume or store in the battery storage, considering the limits of other sources in the group. For example, the power of the genset should be maintained above a certain level. In on-grid application, emphasis is placed on the requirement that the imported power from the grid should not fall below a specified level (or export to the grid is not allowed).

The PV curtailment function can operate in several basic modes based on the configured setpoint **Curtailment**. It can run in automatic mode, manual mode, or be completely disabled.

In automatic mode, the function ensures the basic balance of the system and limits PV production so that the output of other sources in the system can be maintained within predefined limits. For example, the output of gensets should not fall below the level defined by **#Gen P Min**. When operating in parallel with the grid, curtailment helps maintain the grid power above the minimum import value.

The manual mode is primarily suitable for testing successful PV integration during commissioning. Manual curtailment offers a direct manual control mode ("Manual Control"). The value **Curtailment Output** directly adopts the manual value defined by the setpoint **Manual Curtailment**.

When the Manual Limit mode is set, the curtailment function operates in automatic mode, but the output **Curtailment Output** is limited by the value of **Manual Curtailment**.

Curtailment is implemented through the output value **Curtailment Output**. This value represents the maximum allowable PV production relative to the current nominal PV power expressed by the value **PV Nominal P**. A Curtailment Output value of 100.00% means that PV production is not limited, while a value of 0.00% means that PV production is completely stopped.

The Curtailment Output is ramped, meaning the rate of change of this request is limited by the ramp defined by the setpoints **PV Ramp Up** and **PV Ramp Down**. These ramps apply to any change in PV output. When connecting PV to the operation, the initial value of the **Curtailment Output** is zero, and the entire process of integrating PV into the system and increasing its power is limited by the **PV Ramp Up** ramp.

PV Output Saturation

PV as a non-dispatchable source is not able to follow the power demand of PV in every situation. The power is naturally limited by PV array irradiation. Therefore, there are situations where the current PV output is below the maximum allowed PV production level. In this case, the PV saturation detection function is applied. If the relative value of the current PV production, i.e., the current power **PV Actual P** relative to the value of the nominal PV power **PV Nominal P** does not follow the **Curtailment Output** demand and deviates by the **Max difference P** for longer than the **PV Saturated Delay**, the PV integrated within one InteliNeo as a whole is declared saturated. PV in saturation is perceived within the system as a constant source and thus does not participate in curtailment. The saturation information is further shared with other PV controllers across the system. Based on this information, their maximum production can be higher by the power that was not delivered by the PV system that is currently saturated.

During saturation, the **Curtailment Output** is maintained at the value of the current power **PV Actual P** (%) increased by the **Max difference P**.

The PV system returns from saturation to the curtailment function if the relative value of PV rises to 1/2 of the interval between **PV Actual P** (%) and **Max difference P**.

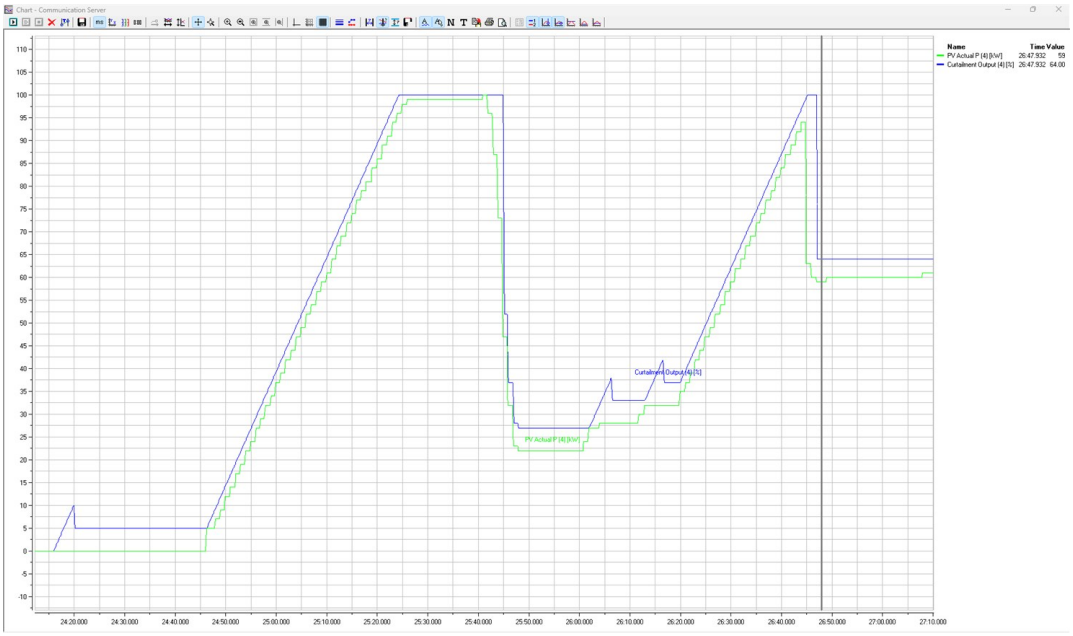


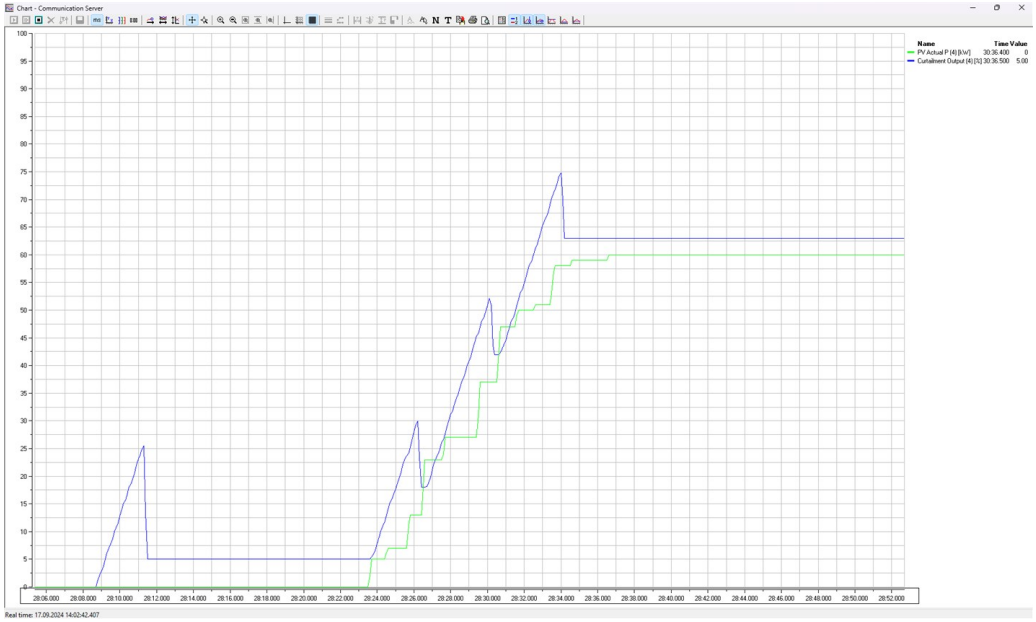
Image 6.61 Start-up of the PV system. The Curtailment outputs waits for PV contribution, then the PV output is ramped up. The Curtailment Output follows the actual PV production anytime it

drops due to the low irradiation.

Further Consequences of PV Saturation function

In the event that a cloud shades the PV field, the PV control will very likely switch to saturation mode. The **Curtailment Output** is held **Max difference P** above the current PV output value **PV Actual P**. When the cloud dissipates, the increase in PV production is limited by the **Curtailment Output** and its increase is ramped according to **PV Ramp Up**.

When the PV is put into operation by connecting to the bus via PVCB and starting production, the **Curtailment Output** increases along the **PV Ramp Up** ramp. If for any reason the PV output lags behind the demand by more than **Max difference P**, the PV startup stops until the PV responds and starts following the demand. This effect prevents a situation where the PV output demand would be ramped up without an apparent PV response, which would then deliver full production to the system without limitation. A slower PV inverter ramp in relation to the PV Ramp Up ramp can cause the PV output to not transition smoothly. The reason is that the PV system repeatedly enters saturation during PV startup. See the figure.



This phenomenon can be mitigated by appropriately setting the relationships between the length of the **PV Ramp Up** and the PV inverter ramp itself. Alternatively, by adjusting the speed of PV saturation detection **PV Saturated Delay**. The response can then look like this.

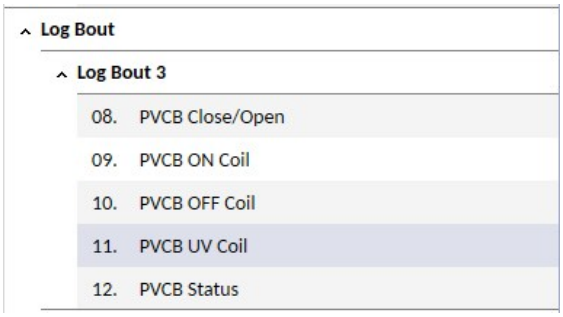
Participation of the PV in reactive power Q Control

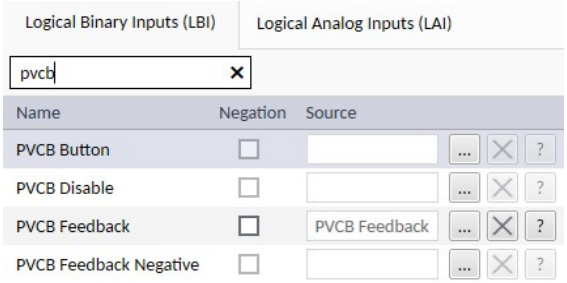
The principle of PV participation in Q sharing is very simple. PV only reduces the total Q value of the system based on the requirement to control its PF (Power Factor). The remaining Q is then distributed among the gensets and BESS according to the principles described above.

The PF requirement is set by the setpoint **PV Power Factor Request** in the ComAp1 format (see **Formats of Power Factor**) and transformed into the value **PV Power Factor Request** in the EEI format. This value is used as the source of the request sent to the PV inverters. Within a single system (one PV integration by one InteliNeo controller), this request is common to all PV inverters included in this system. For other PV systems integrated by another InteliNeo controller, the PF requirement can be set independently.

6.2.24 PVCB Control

InteliNeo is equipped with a PV Circuit Breaker (PVCB) operation function. This breaker connects the PV to the system or disconnects it based on a request or automatically when protection is triggered. The PVCB is supported as a fully functional motorized breaker. It is controlled by signals such as PVCB Close/Open, PVCB On Coil, PVCB OFF Coil, PVCB UV Coil, PVCB Feedback, and PVCB Feedback Negative.





The control of the PVCB depends on the current “Control Mode” of the controller, which can be OFF, MAN, or AUT.

Controller Mode = OFF

- The PVCB remains open regardless of the presence of healthy voltage on the bus. The PVCB cannot be controlled by the PVCB Close/Open buttons. In this state, PV power production is expected to be stopped. If the PV system is still operational and supplying power, this power will not be included in the aggregated PV values. The PV output will be considered zero and will appear in the system as a negative load. This also applies if the **PVCB Control Mode** is set to Not Installed.

Controller Mode = MAN

- The PVCB can be manually controlled using terminals, the PVCB Close/Open button, or via the LBI **PVCB BUTTON**. The command to close the PVCB is accepted only if healthy voltage is detected on the bus and the PV system is in an operable state, as indicated by LBO **PV OPERABLE**.

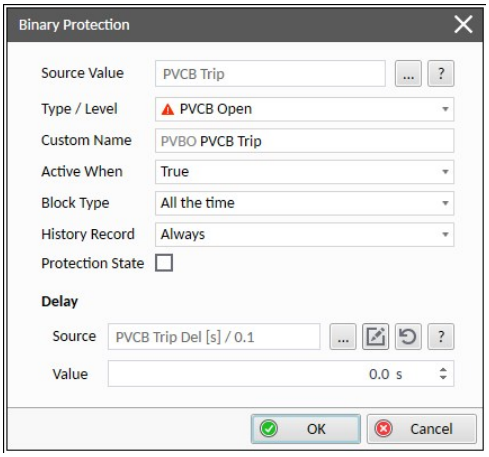
Controller Mode = AUT

- The PVCB is controlled based on automatic logic. In this mode, it does not respond to manual control. The PVCB automatically closes if healthy voltage is detected on the bus and the PV system is in an operable state, as indicated by LBO **PV OPERABLE**.

Note: *Some PV inverters are characterized by requiring a connection to the AC bus before they can be commissioned and establish communication. Such an inverter is clearly unable to provide a PV Operable signal if the PVCB is open. Using the* ***PVCB Pre-close****, it is possible to reverse the PV startup sequence.*

Note: *The PVCB can be blocked in all modes using the LBI* ***PVCB DISABLE****. An active LBI blocks only the closing of the PVCB. Activating the LBI while the PVCB is closed does not cause it to open. Blocking the PVCB closing can be used, especially in AUT mode, to delay the closing of the PVCB, for example, when the PV system requires some time for initialization.*

Note: *The PVCB can be opened based on any event using the PVCB Open protection. This protection can be configured as binary or analog protection. It is a 1st level protection that blocks the re-closing of the PVCB. The PVCB can be re-closed only after performing a Fault Reset action. This protection does not limit the functions of BESS and Universal Genset sources in any way.*



Note: *The closing of the PVCB marks the beginning of PV control, as described in* ***PV Output control****. The start of the PV power ramp is triggered by the closing of the PVCB. If the "PVCB Control Mode" is set to Not Installed, the start of the PV power ramp is triggered by the PV Operable signal, as indicated by LBO* ***PV OPERABLE****.*

Operation of the PV without PVCB

InteliNeo can also operate in a system where the PVCB is not installed at all, i.e., **PVCB Control Mode** = Not Installed, with the following consequences:

- In the HMI on all terminals, the PVCB is replaced by a simple bus connection, and the manual PVCB control button is also absent.
- There is no need to configure any signals related to PVCB control. PVCB Feedback does not need to be configured either.

To confirm the activation of the PV, the key input is LBI PV Operable, or the value LBO **PV OPERABLE** aggregated from all LBI PV Operable inputs. The active state of PV Operable serves as confirmation of the PV presence on the bus. PV control and ramping requests are based on this signal.

For proper integration of the PV into the system, the **Controller Mode** must be set to MAN or AUT.

Note: *During the closing of the PVCB, two attempts are made sequentially. If the controller does not receive the PVCB Feedback even after the second attempt, the PVCB control enters the error state* ***PVCB Fail****. A delay defined by the parameter* ***Delay Between Closing Attempts*** *is applied between the attempts. The maximum waiting time for the* ***PVCB FEEDBACK*** *is 5 seconds.*

6.2.25 PV kWh statistics

InteliNeo enables working with energy production statistics from PV systems.

To use this feature, it is necessary to link each PV inverter instance used in the configuration with information about the energy produced by each individual inverter, for example, LAI **PV 01 KWH**. InteliNeo automatically aggregates the total energy values produced by the PV system. Based on this, an overall statistic called PV kWh is generated.

From this value, interval-based statistics are then calculated: **PV Annual kWh**, **PV Monthly kWh**, **PV Weekly kWh**, and **PV Daily kWh**.

Note: *PV statistics are based on reading the energy production data directly from the PV inverter. InteliNeo does not support calculating PV energy production by integrating the current active power of the PV system..*

6.2.26 PV curtailment counter

The Curtailment Counter is a crucial component of the microgrid controller, tasked with quantifying and reporting energy losses attributed to curtailment in a photovoltaic (PV) system. Curtailment, in this context, refers to the controlled reduction of energy generation to prevent grid overload or under-utilization. This function calculates and reports the energy loss resulting from curtailment within the PV system.

How it Works:

1. Estimating Potential Energy: Using data from the irradiation sensors and the PV array area values, the controller calculates the area of each array. It then multiplies this area by the irradiation data from sensors 1 to 4 to determine the potential PV output of each array.
2. Measuring Actual Energy: The controller measures the actual energy produced by each PV array within the microgrid. This measurement typically relies on data from PV inverters or other monitoring devices.
3. Curtailment Energy Calculation: The energy lost due to curtailment is determined by calculating the difference between the potential energy output (calculated in step 1) and the actual energy output (measured in step 2) for each PV array.

Inputs

These sensors provide data on the amount of sunlight received at different points within the microgrid.
Irradiation of PV Array 1
Irradiation of PV Array 2
Irradiation of PV Array 3
Irradiation of PV Array 4

PV Arrays and Their Areas

The area of each array is determined by the respective setpoint value, and this area is further multiplied by the irradiation data from sensors 1 through 4 to calculate the potential PV output of each array.
PV Array Area 1
PV Array Area 2
PV Array Area 3
PV Array Area 4

Corrections

Output of Each particular PV Array in kW can be corrected using the offset which is defined setpoints:
PV Calib. Offset 1
PV Calib. Offset 2
PV Calib. Offset 3
PV Calib. Offset 4

Statistical Outputs

Maximal PV kWh
PV Total Curtailed kWh
PV Curtailed Annual kWh

PV Curtailed Monthly kWh
PV Curtailed Weekly kWh
PV Curtailed Daily kWh

Curtailed Power

PV Max P
PV Curtailed P
PV Curtailed P Relative

These statistical outputs provide valuable insights into the efficiency of the microgrid's PV system, enabling operators and system administrators to make informed decisions to optimize energy utilization and curtailment strategies within the microgrid.

Curtailment - Ramp Up / Down

The PV output request is directly influenced by the Value: **Curtailment Output**. This Value says what is the maximal allowed PV output. Normally it is kept on the value 100% if there is no need to limit the PV output. If the system needs to curtail the PV, then it does it using this value. The dynamic of the curtailment output change is given by the settings of regulation loops of curtailment function. However the maximal rate of change of Curtailment Output is limited by Setppoint: **PV Ramp Up** and Setpoint **PV Ramp Down**. These Setpoints says what is the duration of change from 0 to 100 % of the ramp.

6.2.27 Wind Turbine support

InteliNeo offers functions for integrating WT (Wind Turbine) into the system. It approaches integration very similarly to PV (Photovoltaic), using the same principles with some differences:

- InteliNeo 6000 supports 8 WT devices. The principle of WT configuration is identical to PV configuration, see **PV support**.
- WT does not have its own breaker; it shares a breaker with PV, namely the PVCB breaker. The control of PVCB is described in chapter **PVCB Control**.
- The performances WT Actual P, WT Actual Q, and WT Nominal P are aggregated from inputs related to WT integration and displayed among the controller's Values. However, they are passively included in the overall balance. The controller does not offer a direct way to control (curtail) WT.

For more specifics about WT integration into the ComAp system, please contact our Technical Support.

6.2.28 Universal Genset support

UniGen (Universal Genset Support) is a feature that allows for the integration of gensets with third-party generator controllers to operate in parallel with a microgrid controlled by InteliNeo 6000. This solution allows InteliNeo to recognize and observe gensets connected over Modbus to optimize the penetration of DER (distributed energy resources) to generators without the replacement of the original controller provided they meet the prerequisites of this function.

InteliNeo 6000 supports 16 genset controllers in the following applications:

- **Off-grid:** InteliNeo 6000 + UniGen
- **On & Off-Grid:** InteliMains + InteliNeo 6000 + UniGen

IMPORTANT: Combining third-party genset controllers via Universal Genset Support in InteliNeo 6000 and InteliNeo 5500 with InteliGen/InteliSys over CAN communication within one system is NOT RECOMMENDED.

- There can be only one control unit inside the system integrating UniGen . That is, single Neo with UniGen active within a system.
- For systems where UniGen is used with InteliMains, the slip synchronization method in InteliMains is required for reverse synchronization. Refer to InteliMains Global Guide for on-grid application.
- The total group power supported by UniGen is limited to 32.8 MW.
- All gensets must operate on a common bus.

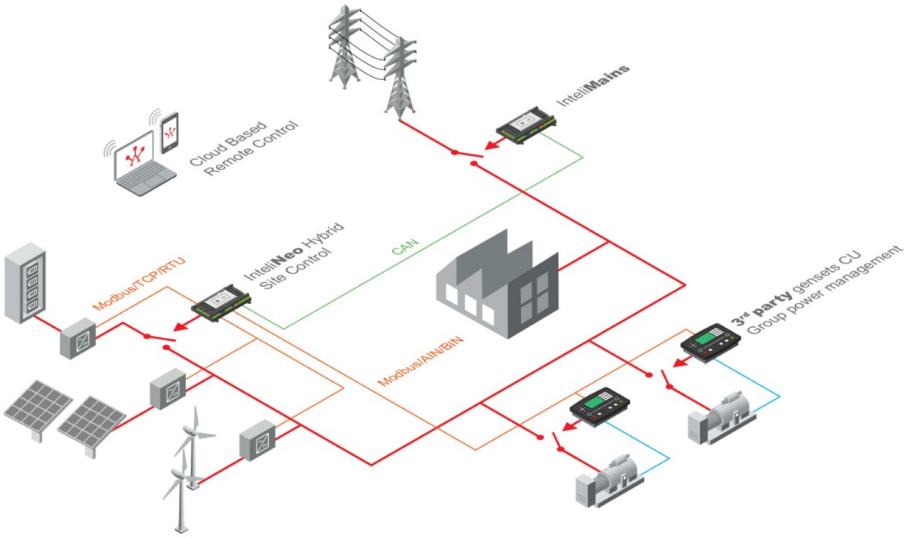


Image 6.62 Example of Universal Genset Support with InteliNeo 5500/6000 & InteliMains

Generator Controller Requirements

For the operation of Universal Genset Support in InteliNeo 5500 & 6000, the gensets are expected to have the following functionalities:

- Fitted with parallelling and synchronization controllers of the same model/ manufacturer.
- Must have grid forming capability when operating in Island-mode.
- Genset controllers must have their own load-sharing and VAr-sharing capability in Island-mode.
- Genset controllers must respond to communication signal via AIN/BIN or Modbus TCP/ RTU (preferred)

Ability to conduct forward synchronization - genset incomer must be fitted with a Generator Circuit Breaker (GCB) with control for synchronizing if paralleling with another VF source such as BESS.

Communication

InteliNeo 6000 controllers have a Modbus client onboard that can interface over RTU or ethernet to third-party generator controllers, which will operate in a Modbus server position.

IMPORTANT: For UniGen , values need to be written periodically and repeatedly by InteliNeo Modbus client to genset controllers. Users must check that the relevant Modbus registers can be written long-term without damage to the device memory.

For communication between third-party genset controller and InteliNeo 6000, the genset controller can be integrated into the configuration of InteliNeo via the ECU library as a User Defined Modbus device or selected from the list of available devices.

Once the generator controller is set up as an ECU module for communication over Modbus or CAN bus, manually assign logical input and output as below based on your desired application.

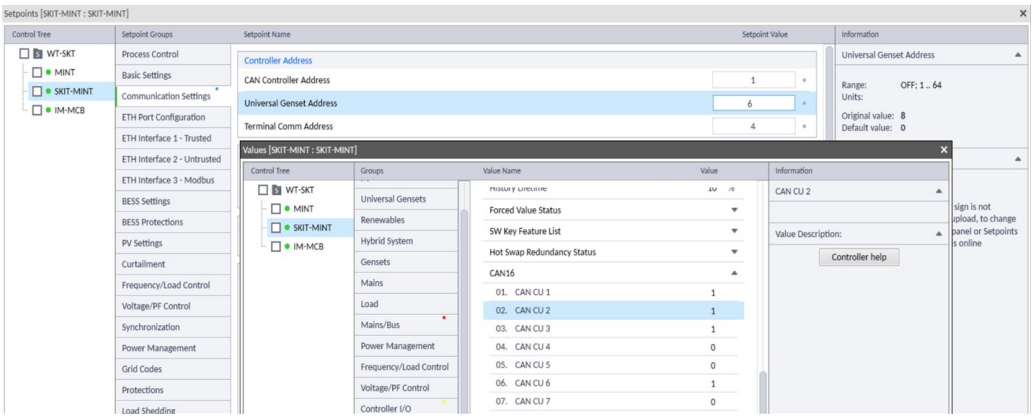
Off-grid: Refer to table **Off-Grid Logical Input/Outputs** below.

On & Off-Grid: Refer to tables **Off-Grid Logical Input/Outputs** and **On-Grid Logical Input/Outputs** below.

Setpoints

When the Universal Gensets (UG) are connected to InteliNeo with setpoint **Universal Genset Address**, UG is recognized as a virtual source in the system. The information about this virtual genset, recognized as a singular group, can be seen in all genset related information inside the system like CAN 16, CAN 32, GL 16, GL 32, Reg 16, Reg 32 Values.

Setpoint Group	Setpoint Name	Description
Communication Settings	Universal Genset Address	A unique numerical value must be set for UGS function to be active and recognized as virtual genset by InteliNeo.Values> Universal Gensets will only be visible once this setpoint ≠ OFF.



Note: *For InteliNeo 5500, if SW key is missing and Universal Genset Address setpoint ≠ OFF, there will be a warning in InteliConfig.*

Off-Grid Logical Input/Outputs

Value	Read/ Write	Signal Type	Connected To	Description
Actual Active Power P, kW	R	Analog	LAI: Uni Gen 1…16 Actual P	The format (resolution) of this value must correspond to the Power Format selected in InteliNeo (0,1 kW, 1kW, 0,01 MW).
Actual Reactive Power Q, kVar	R	Analog	LAI: Uni Gen 1…16 Actual Q	The format (resolution) of this value must correspond to the Power Format selected in InteliNeo (0,1 kVAr, 1kVAr, 0,01 MVAr).
Nominal Power Rating, kW	R	Analog	LAI: Uni Gen 1…16 Nominal P	The format (resolution) of this value must correspond to the Power Format selected in InteliNeo (0,1 kW, 1kW, 0,01 MW).
GCB closed - GCB Connected to the bus and Loaded (in load sharing)	R	Binary	LBI: Uni Gen 1…16 GCB Closed	This is information about the UG GCB status. This signal is supposed to be active anytime the GCB is closed.
Genset Loaded - GCB Connected	R	Binary	LBI: Uni Gen	This signal notifies InteliNeo that UG loading process has

Value	Read/ Write	Signal Type	Connected To	Description
to the bus but genset is not in soft load/soft unload process.			1…16 Loaded	finished or is not in unloading process.
Closing GCB to dead bus	R	Binary	LBI: Uni Gen 1…16 GCB Closing	This signal is crucial for safe operation if the UG is supposed to perform energizing of the dead bus. In InteliNeo it is used as signal blocking closing of the BCB to the dead bus. InteliNeo propagates this information to all other controllers in the system. The closing of the breaker to the dead bus is blocked in all the controllers within the system until this signal is active.Important: InteliNeo does not propagate this information towards to other UGS. UGS must manage this function themselves within the group. It is strongly recommended to use the hard wiring of this signal between InteliNeo and UG.
UG Run Request	W	Binary	Value: Uni Gen 1…16 Run Request	UG Run Request is influenced by Power Management (Load demand start/Stop) in AUTO mode and is issued only if the system needs to start UGS to cover the requested load reserve. This signal is connected to LBI Universal Genset Start/Stop must be configured.
Block GCB from closing	W	Binary	Value: Uni Gen 1…16 Stop GCB Closing	This signal is crucial for safe operation in case that UGS is enabled to close its GCB to the dead bus and make it energized. The InteliNeo generates a 200ms long pulse any time when any controller in the system is about to close the CB to the dead bus. This information must be used in UGS to prevent the closing of the GCB to the dead bus. It is strongly recommended to hardwire this signal between InteliNeo and UGS. This signal is connected to LBI Uni Gen 1...16 GCB Closed.
Run-time, kWh	R	Analog	LAI: Uni Gen 1…16 kWh	This value is aggregated to the Gen kWh statistic and all other interval statistical values: Gen Annual kWh, Gen Monthly KWh, Gen Weekly KWh, Gen Daily kWh.
Fuel	R	Analog	LAI: Uni Gen 1…16 Fuel	This value is aggregated to the Fuel Used statistic and all other interval statistical values: Fuel Annual, Fuel Monthly, Fuel Weekly, Fuel Daily.
Start/Stop Request	R/W	Binary	LBI: BESS Remote Start/Stop LBI: Universal Genset Start/Stop	Allow to starting/stopping the BESS and UGs independently via InteliNeo.

On-Grid Logical Input/Outputs

Value	Read/ Write	Signal Type	Connected To	Description
MCB Status Feedback – inform genset it is in parallel to mains and operate in P-Q mode	W	Binary	LBO: MCB Status	This signal requests UG to switch to P/Q control mode based on MCB status signaling on-grid operation. In the UG it should be connected to the MCB feedback input.
Frequency offset request/nominal frequency setpoint	W	ANA/BIN	LBO: Reverse Synchronization in InteliMains	This LBO is used if UGS is to be reversely synchronized to the Mains. InteliMains cannot influence UGS directly, so we need to use the slip synchronization process.LBO Reverse Sync in InteliMains makes the UGs run with certain slip frequency, and InteliNeo writes offset to the Nominal Frequency setpoint or sends Binary input to switch the nominal frequency to the offset value. Configuration must be via DISTIN/DISTOut modules for sharing this information between InteliMains and InteliNeo.
Requested P (rel. % / abs kW)	W	Analog	Value: Uni Gen Requested P or Uni Gen Relative Requested P	This value is to be used as total baseload active power request for the group of universal gensets. This value is also distributed to all universal genset channels as baseload P for each genset e.g. Uni Gen 1 Requested P. Alternatively, it can be associated with the relative value: Uni Gen Relative Requested P.
Requested Q (rel. % / abs kW)	W	Analog	Value: Uni Gen Requested Q or Uni Gen Relative Requested Q	This value is to be used as total baseload reactive power request for the group of universal gensets. This value is also distributed to all universal genset channels as baseload Q for each genset e.g. Uni Gen 1 Requested Q. Alternatively, it can be associated with the relative value: Uni Gen Relative Requested Q.

Values & Statistics

Values of UniGen are collected through each separate channel and displayed as values in Universal Genset Group. InteliNeo makes an aggregation of the data from each channel to aggregated values - available in Values in the Group Universal Gensets.

6.2.29 Regulation Loops

Regulation loops overview

Loop type	Related applications	Related setpoints	Scenario
Frequency	MINT, MPTM	**Frequency Gain** **Frequency Int**	Unloaded Run Synchronization
Voltage	MINT, MPTM	**Voltage Gain** **Voltage Int**	Unloaded Run Synchronization
Angle regulation	MINT, MPTM	**Angle Gain**	Phase Match Synchronization
Load	MINT, MPTM	**Load Gain** **Load Int**	Parallel To Mains

Loop type	Related applications	Related setpoints	Scenario
PF control	MINT, MPTM	**PF Gain** **PF Int**	Parallel To Mains
Load sharing	MINT	**Load Sharing Gain** **Load Sharing Int** **Frequency Balancing Weight**	Load Sharing loop and Isoc Frequency control loop in single and multiple island operation
VAr sharing	MINT	**VAr Sharing Gain** **VAr Sharing Int** **Frequency Balancing Weight**	VAr Sharing loop and Isoc Voltage control loop in single and multiple island operation

Voltage, PF, VAr sharing have one common output = **Voltage Request**. The value of this output is always composed from the contribution of each of the regulation loop.

Each of the regulation loops is active in some certain time during the process, which is given by the state of the electronic state machine. If no regulation loop is active the **Frequency Regulator Output** and **Voltage Regulator Output** are kept on the levels given by setpoints **Frequency Governor Bias** and **Voltage Regulator Bias**.

Note: *All regulation loops are PID, but only PI components are visible as setpoints.*

MINT Regulation Loops

Loop type	Description
Frequency	The frequency loop is active in the first phase of synchronization when the BESS frequency is regulated to match the Mains/bus frequency and in single-island operation. The loop can be also active all the time (while the BESS is running without load at nominal frequency), see the setpoint **Frequency Regulation Loop**. The frequency regulation loop can be active after the **Minimal Stabilization Time** elapsed in case of start with opened BCB or after BESS is loaded in case of start with closed BCB to energized bus.
Voltage	The voltage regulation loop is active while the BESS is running unloaded or during synchronization. The Voltage loop take control after **Minimal Stabilization Time** has elapsed.
Angle regulation	The differential angle control loop is active during the second phase of synchronization to match the gen/bus angle when phase match synchronization type is used.
Load	The load regulation loop is active when BESS is running in parallel to Mains and during load transfers from Mains to BESS or vice versa.

Loop type	Description
PF control	The PF/Q regulation loop is active anytime BESS is running in parallel with Mains.
Load sharing	The Load Sharing control loop takes a control anytime when the BESS is loaded or in soft load or soft unload process in MINT application. No matter if the BESS is running in single island operation or if it is running in parallel to other BESS or Gensets. The parameters of Load Sharing control loop influence the regulation process of Load Sharing itself after that it influence the iscochronous control of the frequency in island operation. The freqency iscoc control participates on the control proccess as feed forward component. The default weight of this component related to the Load Sharing control is set internally and can be influenced by the setpoint **Frequency Balancing Weight**. Default value 1,000 should ensure the good stability and balance between both components. However isoc control of the frequency can be accelerated or decelerated using settings of this parameter in range 0,000 .. 10,000. The value has the meaning of multiplication of the defaul iscoc control loop response.
VAr sharing	The parameters of VAr Sharing control loop influence the regulation process of VAr Sharing itself after that it influence the iscochronous control of the voltage in island operation. The voltage iscoc control participates on the control proccess as feed forward component. The default weight of this component related to the VAr Sharing control is set internally and can be influenced by the setpoint **Voltage Balancing Weight**. Default value 1,000 should ensure the good stability and balance between both components. However isoc control of the voltage can be accelerated or decelerated using settings of this parameter in range 0,000 .. 10,000. The value has the meaning of multiplication of the defaul iscoc control loop response.

MPTM Regulation Loop

Loop type	Description
Frequency	The frequency control loop takes a control anytime when the BESS is running unloaded or islanded and during the synchronisation but only if the setpoint **Frequency Regulation Loop** = All The Time.
Voltage	The voltage control loop takes a control anytime when the BESS is running unloaded or islanded and during the synchronisation.
Angle regulation	The differential angle control loop is active during the second phase of synchronization to match the gen/bus or Mains/bus angle when phase match synchronization type is used.
Load	The load regulation loop is active when BESS is running in parallel with Mains and during load transfers from Mains to BESS or vice versa.
PF control	The PF control loop is active when BESS is running in parallel with Mains and during load transfers from Mains to BESS or vice versa.

Adjustment of regulation loops

The regulation loops have two adjustable factors: P-factor and I-factor (except angle regulation loop, which has P-factor only). The P-factor (gain) influences the stability and overshoot of the regulation loop and the I-factor (int) influences the steady-state error as well as the settling time. See the picture below for typical responses of a PI regulation loop.

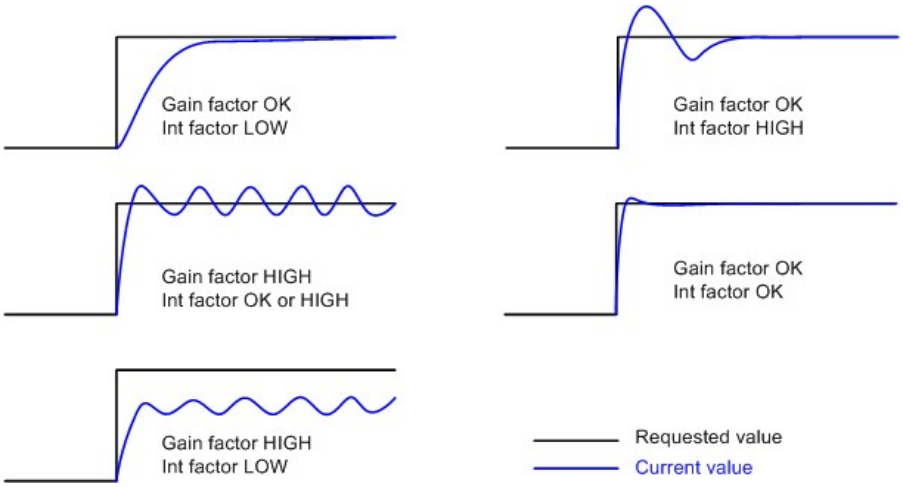


Image 6.63 Typical responses of PI regulator

For manual tuning of a control loop use following method:

- Set both the I-factor and P-factor to 0.
- Increase the P-factor slightly until the system starts to oscillate.
- Adjust the P-factor back to approx. one half of the value where the oscillations started.
- Increase the I-factor slightly to achieve optimal resulting response.

IMPORTANT: Be ready to press emergency stop button in case the regulation loop would start to behave unacceptable while it is being adjusted.

6.3 Multiple source-types operating in MINT application

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The following chapter explains how individual resources contribute to meeting load requirements and the principles of their mutual interaction.

It also describes the basic performance management strategies for different types of resources.

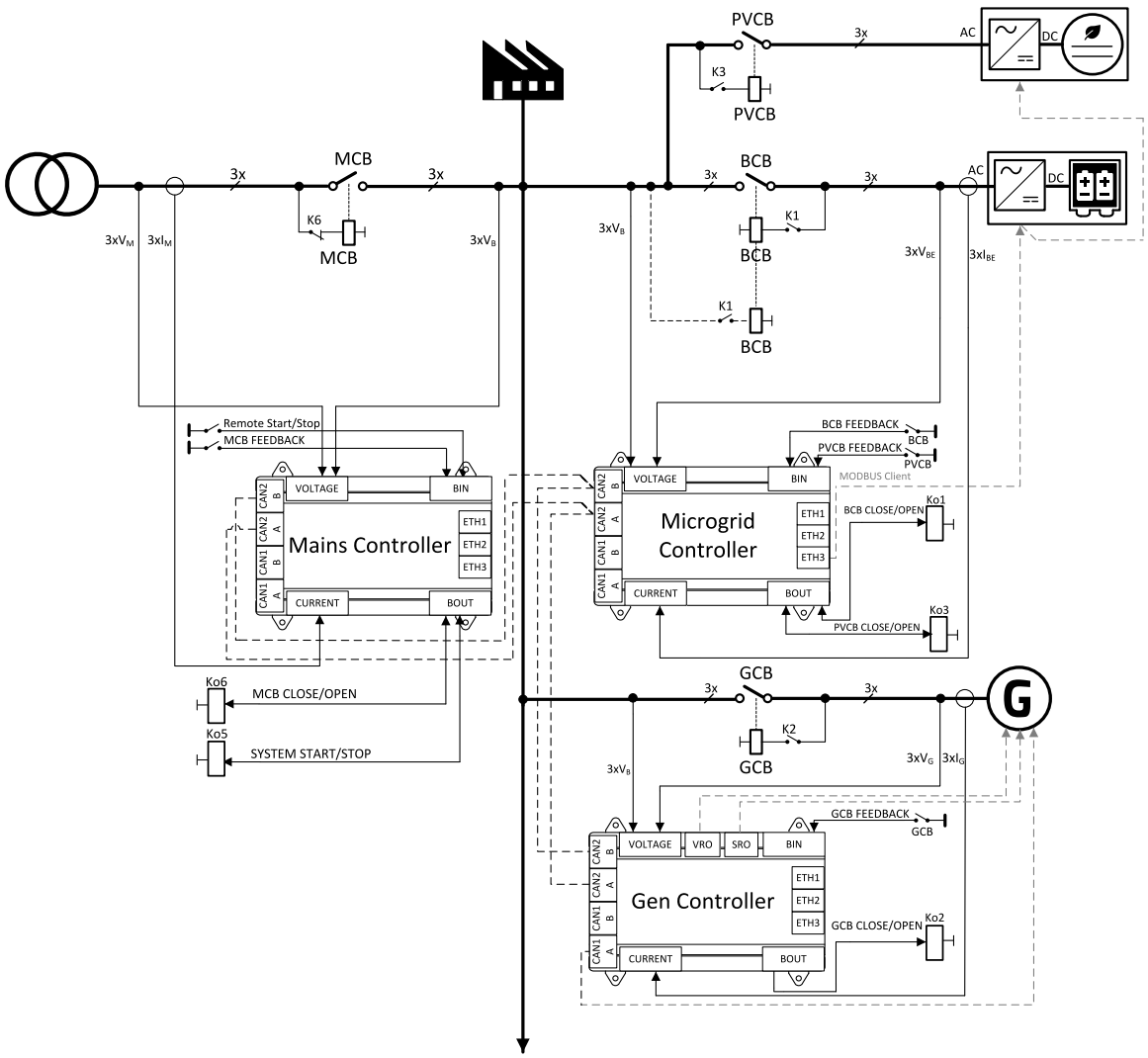


Image 6.64 Multiple island-parallel application with mains

6.3.1 System start-up

Individual sources within the system can be operated in **Controller Mode** MAN or AUTO.

In MAN mode, the start-up and connection of the source to the common bus is at the user's discretion. In AUTO mode, the sources are automatically started according to preset rules. The typical configuration for controlling the start-up of individual sources in AUTO mode is described in the following chapter.

Automatic Start Sequence in a System with Different Types of Sources

For the basic configuration of controlling the start-up of individual sources in the system, the function of the automatically shared System Start/Stop signal on the inter-controller line can be used. This principle is described in chapter **Distributed Power Management Signals**.

The Controller Mode has to be set to AUTO mode.

In short, each controller can be the one that activates this shared signal based on its own LBI **Universal Genset Start/Stop**. This can be a genset controller, an InteliMains controller, or an InteliNeo. If another controller in the group does not have its own LBI **Universal Genset Start/Stop** configured, it will accept the System Start/Stop signal shared via inter-controller communication as a valid start command.

Unlike genset controllers such as the IG1000, InteliNeo uses two signals intended for starting the sources it integrates.

- LBI **Universal Genset Start/Stop**: This function corresponds to the same-named signal used in all controllers. It activates the internal **System Start/Stop** command, to which all gensets and BESS within the group respond, provided they do not have their own LBI configured.
- LBI **BESS Remote Start/Stop**: This is used to start the BESS integrated by a single InteliNeo controller. It does not propagate further to other BESS or other sources in the group. If InteliNeo has this LBI configured, it does not respond to the shared **System Start/Stop** on inter-controller communication.

This solution assumes a situation where BESS and gensets within the group are to be started based on different conditions, allowing separate handling of start signals for BESS and gensets. For example, standard operation of load power supply from the grid, with optimization of consumption using PV and BESS in combination with AMF function of the genset.

Note: *The connection of PV to the bus and the start of PV operation is independent of the above-mentioned LBIs. PV starts and connects to the bus completely automatically in AUTO mode. See chapter* ***PVCB Control****.*

Note: *A Universal Genset integrated by the InteliNeo behaves like a standard genset within the system and is to be put into operation according to the same rules as a standard ComAp genset.*

6.3.2 Power management in a system combining BESS, PV and Gensets

Under the term Power Management, we understand a set of functions and rules by which the system:

- Maintains the required load reserve
- Decides which sources (gensets) are running and which are stopped
- Overall optimizes system consumption and balances the run hours of gensets

The goal of this chapter is to describe primarily how different types of sources contribute to the Power Management function.

Load Reserves

The basic criterion describing a system where multiple sources cooperate is the reliability of supply and system efficiency.

To ensure a reliable supply of electrical energy (especially in Island Operation), it is necessary to maintain a sufficient load reserve of the system, **Actual Reserve**, which is the difference between the nominal power value of all dispatchable sources connected to the bus, **Running Nominal Power In PM**, and the current load, **Total Running P**.

The purpose of this chapter is primarily to describe how sources like BESS and PV (or possibly WT) participate in this function.

BESS Participation in Load Reserve Calculation

Each BESS within the system can contribute its free capacity to the total load reserve of the system. The extent of this contribution depends on the current conditions of the BESS and is governed by the following rules:

- The BESS contributes power equal to the difference between **Nominal power** and **BESS P**. If the BESS is in charging mode, it contributes the entire nominal power of the BESS plus the power with which it is being charged.

- If the BESS uses the **BESS 01 MAX DISCHARGING P** dynamic range function, the BESS options are replaced by the **BESS Max Discharging P** power. The contribution to the BESS load reserve can then be expressed as the difference between **BESS Max Discharging P** and **BESS P**. See chapter **Max. charging/discharging power of the BESS**.
- If the BESS does not enable the discharge mode either based on the LBI **BESS DISCHARGE ENABLE** or the **BESS SOC Control** function (i.e., the BESS discharge power is limited to zero), the contribution of the BESS to the system's current load reserve is expressed as the difference between 0 and **BESS P**. The BESS therefore contributes power up to the amount of its current charging power.

PV Participation in Load Reserve

PV cannot be considered a dispatchable resource and therefore does not contribute to the load reserve of the system with its capacity.

On the contrary, PV can be considered to a certain extent as a source with a high probability of a sudden decrease in its power, which is an equivalent phenomenon for the rest of the system to a sudden increase in power of the load.

The system can be prepared for this situation using the Dynamic Spinning Reserve function.

Dynamic Spinning Reserve

The Dynamic Spinning Reserve (DSR) function helps define the size of the required load reserve of the system by adding to the fixed values of the required start and stop reserves given by the setpoints, thus increasing the final values of the **Start Reserve** and **Stop Reserve**.

The size of the DSR can be directly monitored as the **Dynamic Spinning Reserve** value. This value is available in both InteliNeo and any other InteliMains or InteliGen controllers connected to the same group.

The **Dynamic Spinning Reserve** value is calculated as **PV Actual P * PV Coverage Ratio**" / 100. The setpoint **PV Coverage Ratio** defines the degree of reliability of electric energy supply from a given PV system integrated by one InteliNeo controller. This setpoint value can be dynamically adjusted, for example, based on predictions from the outputs of a cloud camera. The dynamic value created in this way can be applied to the setpoint using the **Forced Value** function".

If there are multiple InteliNeo controllers integrating multiple independent PV systems in the system, the resulting DSR value is aggregated as the sum of the contributions of the individual PV systems to the total DSR.

The partial DSR value is sent to the inter-controller communication for each PV system automatically and is calculated according to the above definition. The resulting DSR value can be further adjusted by a contribution defined by user logic. Each InteliNeo can additionally send a contribution to the total DSR defined by the LAI **DYNAMIC SPINNING RESERVE**.

The resulting **Stop Reserve** value can also be adjusted using the value entered via LAI **DYNAMIC SPINNING RESERVE OFFSET**.

All described LAIs expect a value in the currently used Power Format.

The DSR processing and evaluation function can be enabled or disabled using the **Dynamic Spinning Reserve** setpoint. This setpoint should be set to the same Enable or Disable value in all controllers over the site.

Note: *The wind turbine (WT) can contribute to the dynamic spinning reserve in the same way like the PV. The value of contribution of each WT system is calculated as* ***WT Actual P* WT Coverage Ratio*** */100.*

Priorities of sources in power management

The setting of priority and the value of automatically assigned priority of sources in the system applies exclusively to gensets. It is based on this priority that the system decides which gensets will run within a given power band, given the load and required load reserves. More details can be found in the InteliGen 1000 Global Guide.

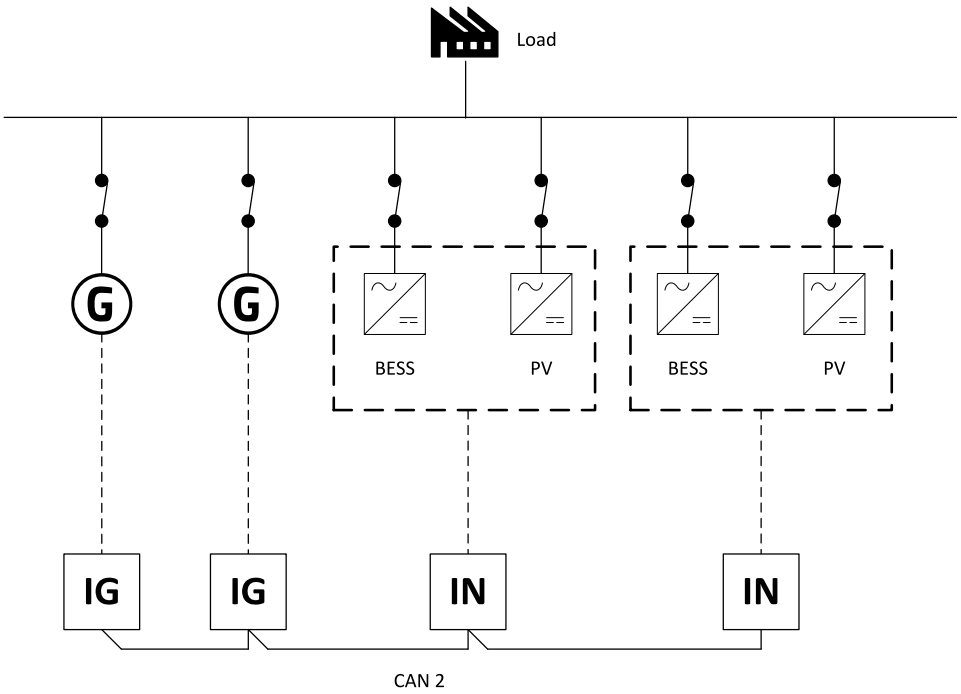
The setpoints of the **Group: Power Management**, especially the **Subgroup: Power Management Control**, apply exclusively to the virtual genset integrated using the **Universal Genset support** function. The start or stop of BESS is governed exclusively by the **BESS REMOTE START/STOP** signals, or according to the activity of the shared **System Start/Stop** signal on inter-controller communication see **System start-up**. In other words, BESS within the system have absolute priority; in AUTO mode, their start is governed only by the activity of these signals. The size of the load reserve and the setting of mutual priorities between gensets play no role in this.

6.3.3 Active power control in Off-grid operation

Control of the genset power to a constant value.

The basic mechanism of power control, i.e., the redistribution of power among individual sources, involves controlling the power of gensets in the group to a constant value corresponding to the setpoint **#Gen P Min**.

In systems where Battery Energy Storage Systems (BESS) are present and have sufficient flexibility for charging and discharging, the gensets operate at a constant power level defined by the setpoint **Gen P Optimal**. This value represents the target power output that all gensets in the group aim to maintain during normal operation.



The basic mechanism of power control involves distributing the total system demand among individual sources. In this configuration, the BESS power control mode is set to **Balance** (**BESS P Control** = Balance) in all InteliNeo controllers. This ensures that any surplus power from PV is used to charge the BESS, while any deficit is compensated by discharging the BESS.

All gensets participate in even load sharing and none are configured in Local Baseload mode. Their relative load is maintained at the level defined by **Gen P Optimal**, ensuring stable operation and predictable contribution to the system.

The setpoint **#Gen P Min** defines the minimum acceptable power level for gensets. If PV production increases and BESS charging reaches its maximum capacity (either due to internal limits or SOC saturation), the system begins curtailing PV output. This curtailment is triggered only when the genset power would otherwise drop below the threshold defined by **#Gen P Min**.

PV curtailment is applied evenly across all PV systems in the group, relative to their nominal output. Under specific conditions, the PV saturation function may also be activated ((see **PV Output control** for details).

Note: *The source of the request for minimal genset power can be alternatively switched to LAI* ***Gen P Min****. In this case, the setpoint requirement is replaced by the analog value from the LAI* ***Gen P Min****.*

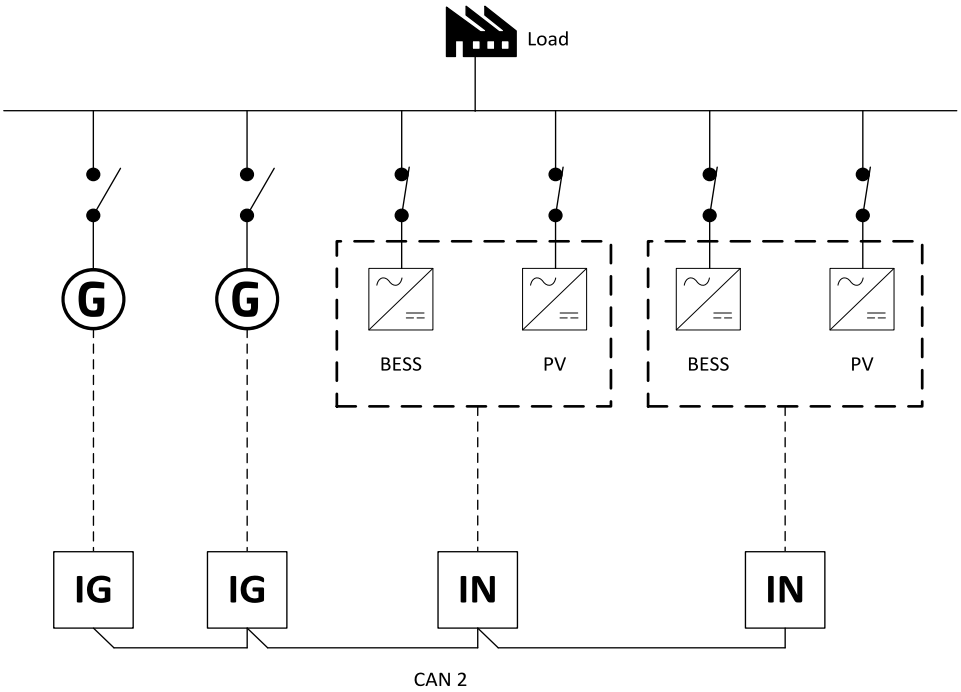
Note: *Both charging and discharging power are evenly distributed among individual BESS.*

Note: *Any BESS can be set to constant power mode see* ***BESS P and Q control strategies****(see . Such a BESS does not directly participate in the Balance function). In case of excess PV production, the BESS does not leave the constant power requirement, and PV curtailment is prioritized.*

Note: *Any genset can be set to Local Baseload mode. Such a genset is excluded from the load sharing function and operates at a constant power value. This mode is governed by the Force Power Conditions rules (see InteliGen 1000 Global Guide).*

System in Diesel-Off Mode - BESS and PV

Under certain conditions, the described system can switch to a mode where the load is powered solely by BESS and PV.



This scenario requires at least one BESS in the system to operate in Grid Forming mode, see **BESS output control methods P-Q / U-f**.

The primary goal of BESS in Grid Forming mode is to stabilize the system's frequency and voltage. Its current power output is therefore based on this strategy.

Collaboration with BESS in P-Q mode is not excluded. A BESS in this mode contributes constant power to the system or, in Balance mode, follows the requirements of the BESS in Grid Forming mode and contributes to system stability by evenly sharing power with this (or these) BESS.

The PV Curtailment function must be enabled (see **PV Output control**). PV Curtailment protects the system from overproduction of power from PV.

6.3.4 Reactive Power Control in Off-grid operation

The basic principle for redistributing reactive power Q in island operation is called VAr Sharing, which means the even distribution of Q among individual sources.

Regarding gensets, the principle of Q distribution among gensets directly depends on the method by which these gensets share active power. The following rules apply for Q distribution among gensets:

- Gensets controlling their P in Load Sharing mode distribute Q evenly among themselves relative to their nominal powers, meaning the relative Q of all gensets in Load Sharing mode is the same.
- A genset controlling its P in Local Baseload mode takes on Q that corresponds to its relative load in the active axis. The remaining Q is evenly distributed among the gensets in Load Sharing mode.

BESS in constant Q

BESS can be switched to constant Q control mode, when the BEES Q follows the value obtained via LAI BESS Q Request. The requested value is limited so that the BESS Q always stays within **BESS operating area**.

BESS Q Control	
#BESS Q Control	Analog
#Genset PF Required	1.000

IMPORTANT: Risk of Reactive Power Overload in Systems with BESS

When operating in reactive power control mode, a BESS may unintentionally overload other sources — especially gensets or other BESS units working in **Var Sharing** or **Balance** mode. This can lead to current overloads or activation of protection mechanisms, such as **Excitation Loss Protection** in gensets.

Note: *In this mode,* ***InteliNeo does not consider the reactive power limits of other sources****. It regulates its own output independently, which may push other units beyond their safe operating range.*

Safe operation under these conditions is entirely the responsibility of the system integrator or operator. Proper coordination and protection settings are essential.

BESS in VAR Sharing

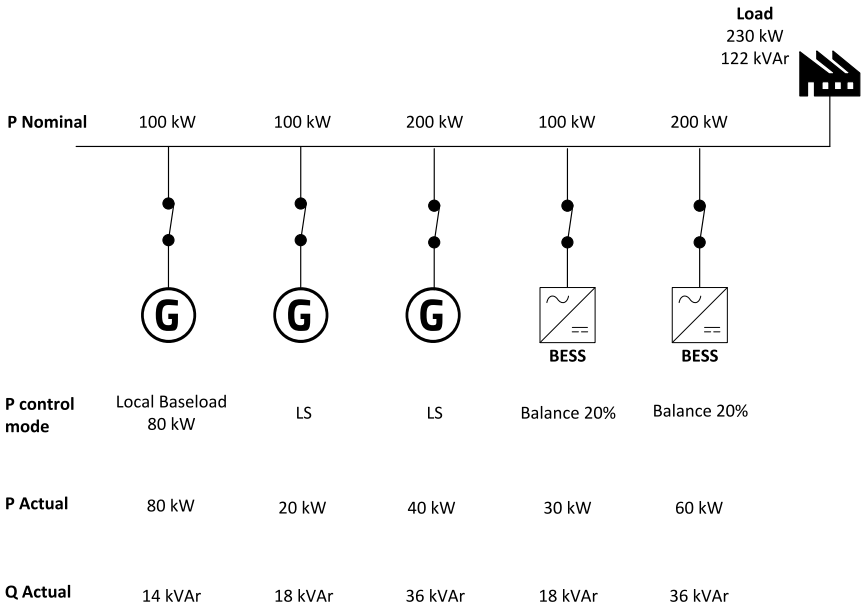
BESS can operate in various modes in collaboration with gensets. The basic mode is again VAR Sharing, with the setpoint **#BESS Q Control** = VAr Sharing.

BESS Q Control	
#BESS Q Control	VAr Sharing
#Genset PF Required	1.000

In this mode, BESS and gensets operating in VAr Sharing mode share the total Q that belongs to them (the remainder after subtracting the Q of gensets operating in Local Baseload mode) evenly relative to their nominal powers.

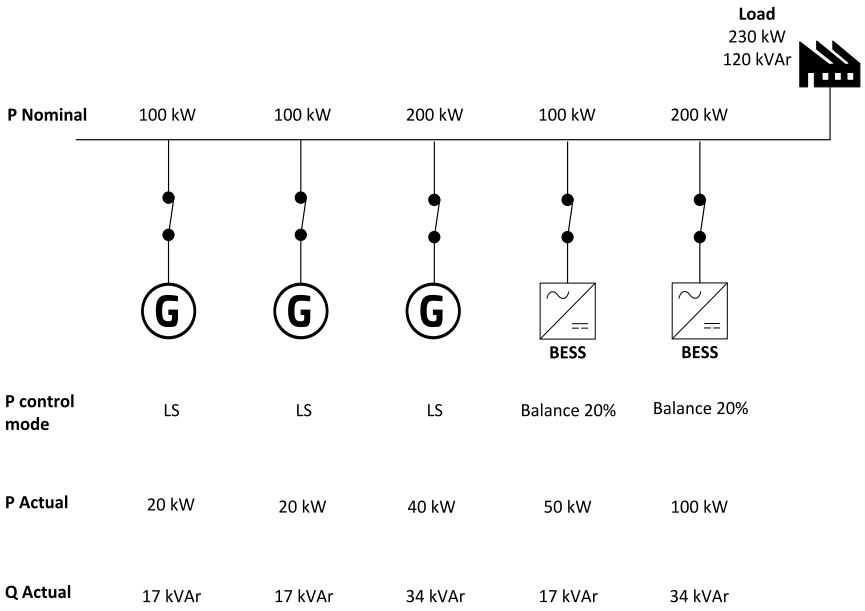
Example 1:

3x Genset in Load Sharing and 2x BESS balancing the P of the gensets (BESS P Control = Balance, Gen P Optimal = 20% (#BESS Q Control Mode = VAr Sharing)).



Example 2:

3x Genset in Load Sharing, 2x BESS balancing P of the gensets (BESS P Control = Balance, Gen P Optimal = 20% (#BESS Q Control Mode = VAr Sharing)).



Note: *The option **#BESS Q Control** = Analog does not take an effect in Island operation. It is only accepted in Ongrid application. If "Analog" option is selected in Island operation, the BESS automatically does the Var Sharing.*

BESS balancing PF of the gensets

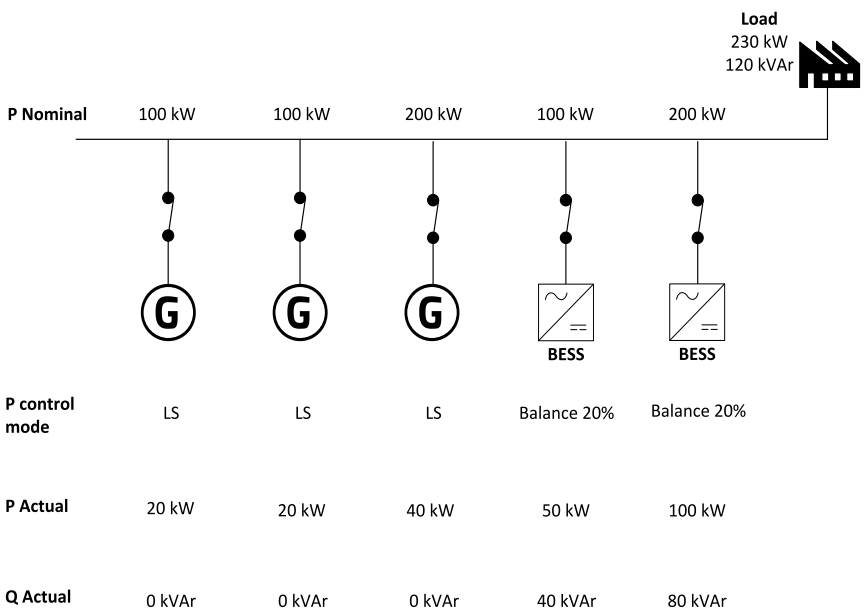
Another mode in which BESS can operate is Balancing of the genset to constant PF (Power Factor).

BESS Q Control	
#BESS Q Control	Balance
#Genset PF Required	1.000

BESS will take on enough reactive power Q to maintain the power factor (PF) of all gensets in the group at a constant value. The individual BESS within the group will then distribute the reactive power Q evenly among themselves relative to their nominal power.

The above example in this case looks like this:

Example 3:
3x Genset in Load Sharing, 2x BESS balancing P of the gensets (BESS P Control = Balance, #Gen P Min = 20%) and balancing the PF of the genset on value 1,000 (#BESS Q Control = Balance, #Genset PF Required = 1,000).



Participation of the PV in reactive power Q Control

The principle of PV participation in Q sharing is very simple. PV only reduces the total Q value of the system based on the requirement to control its PF (Power Factor). The remaining Q is then distributed among the gensets and BESS according to the principles described above.

The PF requirement is set by the setpoint **PV Power Factor Request** in the ComAp1 format (see **Formats of Power Factor** and transformed into the value **PV Power Factor Request** in the EEI format. This value is used as the source of the request sent to the PV inverters. Within a single system (one PV integration by one InteliNeo controller), this request is common to all PV inverters included in this system. For other PV systems integrated by another InteliNeo controller, the PF requirement can be set independently.

6.3.5 Dynamic Isochronous Frequency and Voltage Control

The **Dynamic Isochronous Voltage and Frequency Control** function allows setting the degree to which each individual source (BESS or genset) contributes to maintaining the common system frequency in island mode. In island mode, the key regulation loops are **Load Sharing (LS)** and **VAr Sharing (VS)**. The regulation aims for an even distribution of kW and kVAr loads according to current demands. In the background, however, isochronous frequency and voltage regulation operates. Its basic effect, in relation to the LS and VS loops, is set at the FW level.

However, this weight can be user-adjusted by setting the **Frequency Balancing Weight** and **Voltage Balancing Weight** setpoints. The default value of 1.000 corresponds to the situation before this function was introduced. By setting the setpoint, the contribution of isochronous regulation can be enhanced (weight >1.000) or completely suppressed (weight = 0).

The contribution of isochronous regulation can be further adjusted as a function of the current P and Q power or the current frequency and voltage of the BESS if needed. These dependencies are defined through application curves:

- **Dynamic f Balance Weight - P**
- **Dynamic f Balance Weight - f**,
- **Dynamic U Balance Weight - U**,
- **Dynamic U Balance Weight - Q**.

The output of these application curves is a coefficient that further multiplies the weight defined by the **Frequency Balancing Weight** or **Voltage Balancing Weight** setpoint. The resulting weight can then be monitored in the values **Frequency Balancing Weight** or **Voltage Balancing Weight**.

Isochronous frequency regulation: The Frequency Balancing Weight value is calculated as the minimum value output from the **Dynamic f Balance Weight - P** curve and **Dynamic f Balance Weight - f** curve, multiplied by the value of setpoint **Frequency Balancing Weight**.

Isochronous voltage regulation: The **Voltage Balancing Weight** value is calculated as the minimum value output from the **Dynamic U Balance Weight - Q** curve and **Dynamic U Balance Weight - U** Curve, multiplied by the **Voltage Balancing Weight** setpoint value.

Note: *The value of this parameter is updated only in the regulation mode when the controller actually uses it, i.e., in island mode in the Loaded state.*

6.3.6 Active Power Control in On-grid application

The term **On-Grid applications** refers to the cooperation of individual sources in parallel connection with the grid (Mains).

From the controller's perspective, the critical information is the status of the MCB (Mains Circuit Breaker). The controller is informed about the MCB status via the LBI **MCB FEEDBACK** input. Alternatively, the information about parallel connection with the grid is automatically shared directly by the InteliMains controller (see chapter **Distributed Power Management Signals**). A controller operating in parallel with the grid always displays the status MultParOp (Multiple Parallel Operation) in its **Breaker state** value.

The power P contributed by all sources in the group during parallel operation with the grid is not determined by the system load itself but by a requirement derived from a combination of related setpoints. Essentially, there are these options:

0 – Baseload	Request for constant power delivered to the Point of Connection (POC) by the sources. Power is distributed among sources according to their configuration. The requested value input the system either via setpoint **#System Baseload** or LAI **LOAD CONTROL: ANEXT BASELOAD**, depends on **Load Request Source** settings.
1 –Import/ Export	Request for constant power from the grid. The requested value input the system either via setpoint **Import Load** or LAI **LOAD CONTROL: ANEXT IMP/EXP LOAD**, depends on **Load Request Source** settings.
2 – Zero Import	The goal is zero power import from the grid. Power is supplied exclusively by local sources.
3 – Min Import	Grid import is constant and equal to the value of **Mains Import Min**.
4 – Max Import	Grid import is constant and equal to the value of **Mains Import Max**.

5 – Mains preference	In this mode, the load consumption is primarily covered by the grid, with maximum utilization of PV output. The grid power is maintained within the defined range between **Mains Import Min** and **Mains Import Max**. › When the grid power remains within this range, the power delivered by the BESS is zero. › **Charging of BESS** begins when the grid power reaches the **Mains Import Min** limit, utilizing any excess power. › **Discharging of BESS** starts when the grid power reaches the **Mains Import Max** limit. › **Curtailment of PV** occurs only when the grid power is pushed below **Mains Import Min** and BESS is already charging at its maximum capacity. › If a **genset** is present in the system, its power is maintained at the level defined by **Gen P Optimal**. › In case of PV overproduction, the genset power gradually decreases down to **#Gen P Min**, after which PV curtailment begins.
6 – BESS Max Charging	This mode closely resembles **Mains Preference**, with a key difference in the behavior of the BESS. › In this mode, **the BESS charges at maximum possible rate**, determined both by its internal limits and the upper grid limit defined by **Mains Import Max**. › This charging occurs while maintaining maximum PV production. › The genset operates at the **Gen P Optimal** level, providing a stable contribution to the overall power balance.
7 – BESS Max Discharging	This mode is similar in structure to **Mains Preference**, but focuses on maximizing the discharging of the BESS. › In this mode, **the BESS discharges at maximum possible rate**, determined by its internal limits and system demand › The grid power is maintained above the lower limit defined by **Mains Import Min**. › The genset operates at **Gen P Optimal**, ensuring a stable baseline contribution. › All of this occurs while maintaining **maximum possible PV production**, meaning the BESS discharges only to the extent necessary to avoid curtailing PV output.

IMPORTANT: This settings is part of the InteliMains settings which the power request come from. The Setpoint of the same name in InteliNeo is related to the MPTM application only and for the MINT application is not applied.

Parallel operation with the grid is possible in cooperation with the InteliMains controller, and in certain situations, even without it. We will primarily focus on the application of Multiple Parallel Operation driven by InteliMains.

The value of the required power P of all sources in the group generated by the InteliMains controller can be monitored as the value **BESS Required P Target** in InteliMains.

Principle of Power Distribution Among Individual Sources

The method (rules) by which the power requirement P is distributed among individual sources is the same as during island operation. It is determined by the power control modes of the individual sources. InteliMains does not influence this strategy in any way.

Unless otherwise required, gensets operate in Load Sharing mode, meaning they share the load evenly.

BESS can operate in constant power mode or in Balance mode (balancing the genset power according to the requirement **Gen P Optimal**, see **BESS P and Q control strategies**. Only in Balance mode can BESS follow the requirement coming from InteliMains. BESS in constant power mode (Setpoint or Analog) does not follow the requirement from InteliMains but only contributes in the system by taking the constant P.

PV essentially operates in constant power mode and only switches to controlled production mode due to the active Curtailment function.

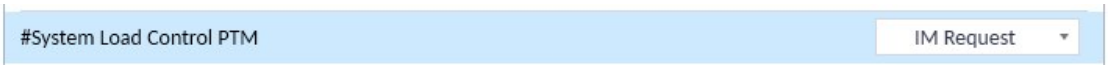
Any source can be set to constant power mode during parallel operation with the grid. Other sources always try to meet the requirement. These sources may hit their current limits, meaning the power requirement coming from InteliMains will not be met.

In parallel operation to the grid all sources are allowed to operate in constant power mode. In this case, there is no source in the group that follows the requirement, and the requirement remains unmet.

IMPORTANT: To ensure full compatibility of all participating controllers, it is necessary to operate all controllers with at least the versions specified in the following table:

InteliNeo 6000	v. 2.0.0
InteliNeo 5500	v. 2.0.0
InteliNeo 530	v. 2.0.0
InteliGen 1000	v. 3.3.0
InteliMains 1010	v. 3.3.0
InteliSys 2000	v.1.6.0
InteliGen 500 G2	v.2.4.0.
InteliMains 510	v 1.2.0
InteliGen 4 200	v 2.3.0
InteliMains 210 G2	v 3.2.0

IMPORTANT: The setpoint #System Load Control PTM must be set to the value IM Request.



Baseload

The power of sources running in parallel operation with the grid is constant.

Load Control	
Load Control PTM Mode	Baseload
Load Request Source	Setpoint
#System Load Control PTM	IM Request
Import Load	20 kW
#System Baseload	20 kW
Import/Export Limitation	Disabled

#System Load Control PTM must be set to the value **IM Request**.

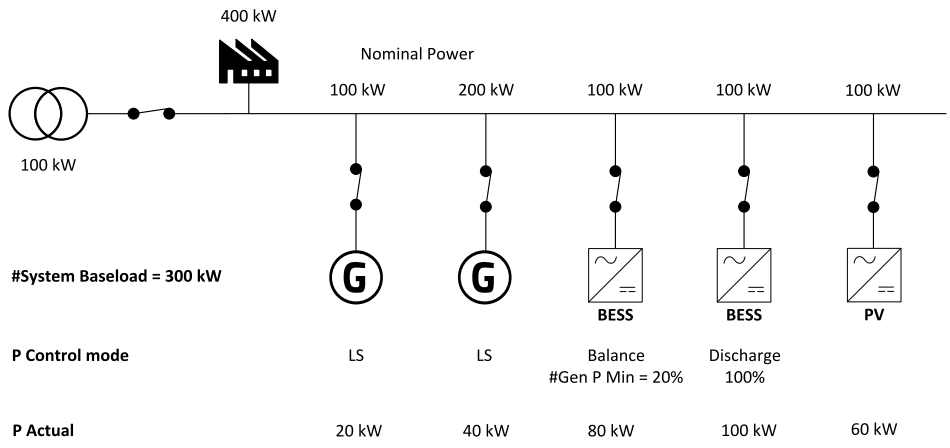
Load Control PTM Mode = Baseload. The setpoint determines that the chosen control strategy is Baseload.

#System Baseload is the required baseload value, which is the sum of all the power outputs of the individual sources participating in the parallel operation.

Note: *This is an arithmetic sum, meaning that BESS (Battery Energy Storage System) in charging mode is calculated with its negative power output. For example, a Baseload requirement of 40 kW can correspond to the following distribution: Gen P = 20 kW, PV P = 100 kW, BESS P = -80 kW.*

Note: *The source of the System Baseload requirement can be a setpoint, as in the given example, or an analog value that enters InteliMains through LAI* ***LOAD CONTROL: ANEXT BASELOAD****, see InteliMains 1010 Global Guide.*

Example: 2x Genset in Load Sharing, 2x BESS in Balancing (#Gen P Min = 20%), 1x PV.

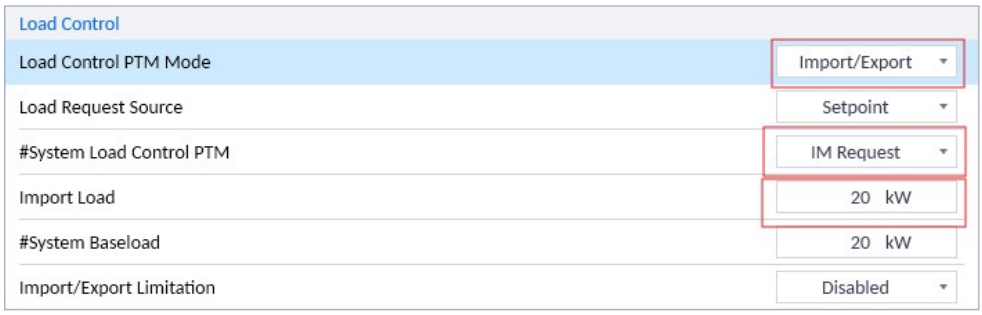


Note: *The* ***Import/Export Limitation*** *can be used in combination with the Baseload / Import/Export / Zero Import mode. The power output of all sources is still controlled according to the selected method, but if the requested value results the mains operating out of the operation range (****Mains Import Min****and* ***Mains Import Max****) the request is rescricted to keep the value of the Mains Import within this range*

Note: *In a simple application without InteliMains, the system can also operate with the* ***#System Load Control PTM*** *setting adjusted to the* ***Baseload*** *value. In this mode, individual sources calculate their power output independently without the involvement of InteliMains. However, it is not possible to ensure the* ***Import/Export Limitation*** *function.*

Import/Export

The grid power is controlled to a constant value.



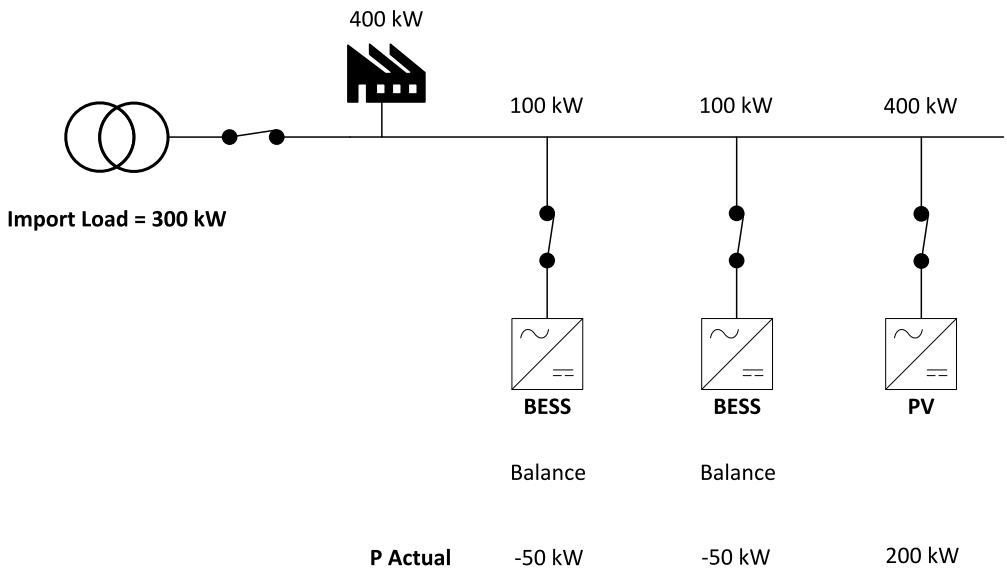
#System Load Control PTM must be set to the value **IM Request**.

Load Control PTM Mode = Import/Export. The setpoint determines that the chosen control strategy is Import/Export.

Import Load is the desired value of import from the grid (e.g., 100 kW corresponds to a demand for import from the grid, -100 kW corresponds to a demand for export to the grid).

Note: *The source of the Import/Export requirement can be a setpoint, as in the given example, or an analog value that enters InteliMains through LAI* ***LOAD CONTROL: ANEXT IMP/EXP LOAD****, see InteliMains 1010 Global Guide.*

Example: 2x BESS in Balance mode (**BESS P Control** = Balance), 1x PV. The grid power is controlled to a value of 100 kW. InteliMains requests the sources to supply 300 kW to the system. The current PV output exceeds this requirement, so the excess power is distributed evenly between both BESS units, which then switch to charging mode.



Note: *If the PV production exceeds the charging capacity of the BESS, or if the BESS reach their maximum charge* ***SOC High Target****, it is necessary to limit the PV production to maintain the constant grid power requirement. This means setpoint* ***Curtailment*** *should be set to Enabled. In the above case, after both BESS units are fully charged, the PV production will be limited to 100 kW.*

Note: *In this mode, it is possible to apply the* ***Import/Export Limitation*** *function to maintain grid import within defined boundaries. If the limitation function is active — that is, the setpoint* ***Import/Export Limitation*** *set as Enabled — the request for Import Load is automatically shifted so that the grid power does not exceed the specified limits defined by* ***Mains Import Min*** *and* ***Mains Import Max****.*

Zero Import

The goal is zero power import from the grid. Power is supplied exclusively by local sources.

Note: *In this mode, it is possible to apply the* ***Import/Export Limitation*** *function to maintain grid import within defined boundaries. If the limitation function is active — that is, the setpoint* ***Import/Export Limitation*** *set as Enabled — the request for Zero Import is automatically shifted so that the grid power does not exceed the specified limits defined by* ***Mains Import Min*** *and* ***Mains Import Max****.*

Min Import

Grid import is constant and equal to the value of **Mains Import Min**.

Max Import

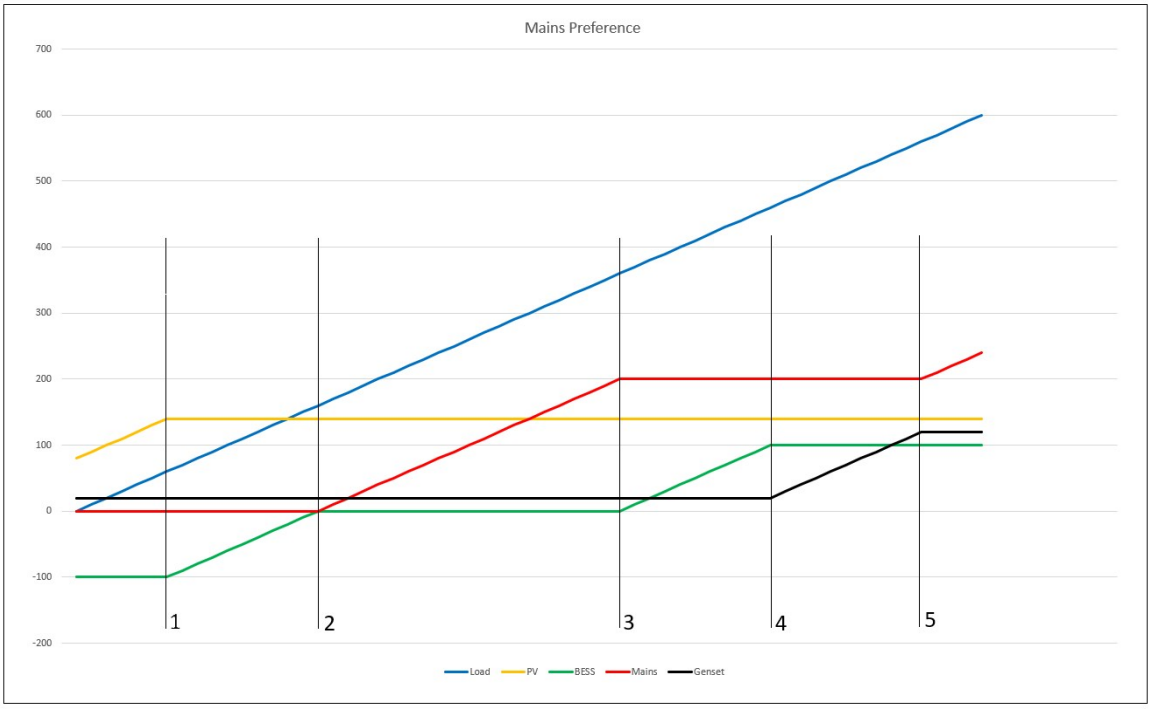
Grid import is constant and equal to the value of **Mains Import Max**.

Mains Preference

In this mode, the load consumption is primarily covered by the grid, with maximum utilization of PV output. The grid power is maintained within the defined range between **Mains Import Min** and **Mains Import Max**.

- When the grid power remains within this range, the power delivered by the BESS is zero.
- **Charging of BESS** begins when the grid power reaches the **Mains Import Min** limit, utilizing any excess power.
- **Discharging of BESS** starts when the grid power reaches the **Mains Import Max** limit.
- **Curtailment of PV** occurs only when the grid power is pushed below **Mains Import Min** and BESS is already charging at its maximum capacity.
- If a **genset** is present in the system, its power is maintained at the level defined by **Gen P Optimal**.
- In case of PV overproduction, the genset power gradually decreases down to **#Gen P Min**, after which PV curtailment begins.

Example: Source dispatch order for Mains Preference function



The **Mains Preference** function can be most easily demonstrated using a theoretical example where the load increases linearly and the potential output from PV is constant. In the following diagram, you can see how the individual sources contribute to the load supply. For completeness, the parameters of each source are as follows:

- **PV max** = 140 kW
- **Mains Import Min** = 0 kW
- **Mains Import Max** = 200 kW
- **BESS Max Charge / Discharge Power** = 100 kW
- **Genset P Min** = **Genset P Optimal** = 20 kW
- **Genset Nominal Power** = 120 kW

The gradual engagement of sources in supplying the load has several phases:

1. **Initial Phase**: The load is too low. The BESS charges at its maximum rate. The mains is limited from below by the Mains Import Min. PV curtailment limits PV output to maintain balance. The genset runs at Gen P Optimal.
2. **Point "1"**: The load reaches a level where PV delivers its maximum. The BESS charging power is gradually reduced. Mains remains at Mains Import Min.
3. **Point "2"**: BESS power reaches zero and remains at this level. Grid import is preferred. The increasing load is covered by the grid.
4. **Point "3"**: Grid import reaches Mains Import Max. Further load increase is covered by BESS discharge. The genset remains at Gen P Optimal.
5. **Point "4"**: BESS reaches its maximum discharge power. Further load increase is covered by the genset.
6. **Point "5"**: The genset reaches its nominal power. Any further load increase is covered by the grid. This is a boundary case — the system should be designed so that this point is never reached (either the load never gets this high, or another genset is dispatched in advance).

BESS Max Charging

This mode closely resembles **Mains Preference**, with a key difference in the behavior of the BESS.

- In this mode, **the BESS charges at maximum possible rate**, determined both by its internal limits and the upper grid limit defined by **Mains Import Max**.
- This charging occurs while maintaining maximum PV production.
- The genset operates at the **Gen P Optimal** level, providing a stable contribution to the overall power balance.

BESS Max Discharging

This mode is similar in structure to **Mains Preference**, but focuses on maximizing the discharging of the BESS.

- In this mode, **the BESS discharges at maximum possible rate**, determined by its internal limits and system demand
- The grid power is maintained above the lower limit defined by **Mains Import Min**.
- The genset operates at **Gen P Optimal**, ensuring a stable baseline contribution.
- All of this occurs while maintaining **maximum possible PV production**, meaning the BESS discharges only to the extent necessary to avoid curtailing PV output.

6.3.7 Reactive Power Control in On-grid application

In the context of On-Grid applications, we understand it as the cooperation of individual sources in parallel connection with the grid.

From the controller's perspective, the crucial information is the status of the MCB (Mains Circuit Breaker). The controller is informed about the MCB status through the LBI input **MCB FEEDBACK**. Alternatively, the information about the parallel connection with the grid is automatically shared directly by the InteliMains controller, see chapter **Distributed Power Management Signals**. A controller operating in parallel with the grid always displays the status MultParOp (Multiple Parallel Operation) in its **Breaker state** value.

The reactive power Q contributed by all sources in the group during parallel operation with the grid is not determined by the system load itself but by the requirement arising from the combination of related setpoints.

Reactive power Q can be controlled directly as a Q requirement or indirectly through the desired PF value. The PF control mode is determined by the setpoint **PF/Q Control PTM Mode** in the InteliMains controller. For more information, refer to the InteliMains 1010 Global Guide.

Regarding the distribution of Q power between the grid and sources, there are two control principles:

- **Base Q / Base PF**: The total Q / PF of all sources in the group during parallel operation with the grid is constant, and the remaining load is covered by the grid.
- **Import/Export Q / Import/Export PF**: The Q / PF of the grid is constant, and the remaining load is covered by the sources running in parallel with the grid.

Parallel operation with the grid is possible in cooperation with the InteliMains controller, and in certain situations, even without it. We will primarily focus on the application of Multiple Parallel Operation driven by InteliMains.

The value of the required Q power of all sources in the group generated by the InteliMains controller can be monitored as the value **Required Q** in InteliMains.

Principle of Q Distribution Among Individual Sources

The method (rules) by which the Q requirement is distributed among individual sources is the same as during island operation. InteliMains does not influence this strategy in any way.

The total Q supplied by the sources, unlike in island mode, is not directly determined by the load but by the requirement coming from InteliMains.

Unless otherwise required, gensets operate in VAr Sharing mode, meaning they evenly distribute the Q assigned to them.

BESS can operate in constant Q mode, balance the PF of gensets in the group to a constant value, or actively participate in the VAr Sharing function. See setpoint **#BESS Q Control**.

PV operates in constant Q or PF mode. The PF requirement is set by the setpoint **PV Power Factor Request** in ComAp1 format, see **Formats of Power Factor** and transformed into the value **PV Power Factor Request** in EEI format. This value is used as the source requirement sent to the PV inverters. Within a single system (one PV integration by one InteliNeo controller), this requirement is common for all PV inverters included in this system. For other PV systems integrated by another InteliNeo controller, the PF requirement can be set independently. The current Q value produced by the PV system is always included in the total Q of the group of sources. PV then reduces (adjusts) the Q value that the group of sources supplies according to the requirement.

Any source can be set to constant Q mode during parallel operation with the grid. Other sources always try to meet the requirement. These sources may encounter their current limits, so the requirement for the Q / PF they supply will not be met.

In constant Q mode, all sources can even operate in parallel with the grid. Then there is no source in the group that follows the requirement, and the requirement remains unmet.

IMPORTANT: To ensure full compatibility of all involved controllers, it is necessary to operate all controllers with at least the versions according to the following table:

InteliNeo 6000	v. 2.0.0
InteliNeo 5500	v. 2.0.0
InteliNeo 530	v. 2.0.0
InteliGen 1000	v. 3.3.0
InteliMains 1010	v. 3.3.0
InteliSys 2000	v.1.6.0
InteliGen 500 G2	v.2.4.0.
InteliMains 510	v 1.2.0
InteliGen 4 200	v 2.3.0
InteliMains 210 G2	v 3.2.0

IMPORTANT: The setpoint #System Load Control PTM must be set to the value IM Request.

Additional Q/PF Control Modes

The system can also operate in parallel with the grid without the InteliMains controller, though without the benefits provided by the InteliMains controller functions.

These are the following modes selected by the setpoint **#System PF Control PTM**:

Base PF

- Each source independently produces Q to maintain its PF at a constant value.
- The requirement is controlled by the setpoint **#System Power Factor** or the analog input LAI **PF CONTROL: ANEXT BASE PF**. This LAI is configured independently in all controllers, and it is necessary to ensure that it is configured to the same source value in all controllers, shared, for example, via user-distributed signals.
- If all sources operate in VAr Sharing mode, the resulting PF of all sources aligns with the Base PF requirement. If there is a source in the system operating in constant Q mode, it does not participate in PF control. The resulting PF of all sources may not meet the Base PF requirement.
- PV does not participate in PF control according to this requirement. The Q/PF of the PV system is still controlled only by the **PV Power Factor Request**.

Base Q

- The total Q production of all sources in the group is controlled according to the requirement and maintained at a constant value.
- The requirement is controlled by the setpoint **#System Base Q** or the analog input LAI **Q CONTROL: ANEXT BASE Q**. This LAI is configured independently in all controllers, and it is necessary to ensure that it is configured to the same source value in all controllers, shared, for example, via user-distributed signals.

- Some sources in the group may operate in constant Q mode. For BESS, the Q value is determined by the analog input (see **BESS P and Q control strategies**), and for gensets, it is the choice of Local **Base Q** or **Local Base Power Factor**", see InteliGen 1000 Global Guide. In such cases, their current Q is subtracted from the requirement and does not directly participate in Q control.
- PV does not participate in PF control according to this requirement. The Q/PF of the PV system is still controlled only by the **PV Power Factor Request** .
- Other sources distribute Q among themselves to ensure the total Q of all sources in the group meets the required Q. BESS either balances the gensets in the group to a constant PF (**#BESS Q Control** = Balance) or shares Q evenly with the gensets (**#BESS Q Control** = VAr Sharing).

6.4 MPTM application

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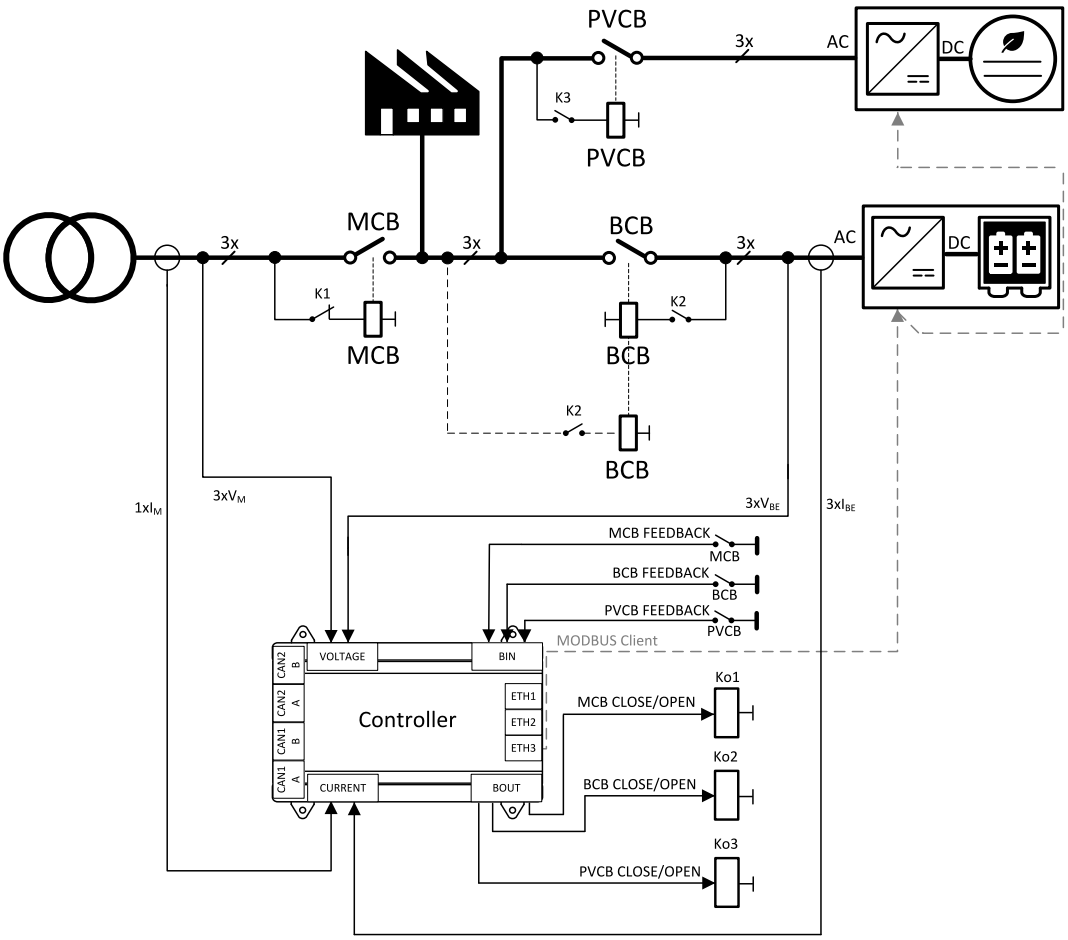
6.4.5 Mains Import Measurement 299

The application is designed to integrate exactly one BESS and one PV (WT) system into parallel operation with the grid, as shown in the following diagram.



This scenario can be implemented using the MPTM application with just one InteliNeo controller.

Note: *The MPTM application does not support scenarios involving a genset or gensets, either through a standard ComAp controller or using the Universal Genset Support function. These scenarios must be implemented using the MINT application.*

6.4.1 Power Management Strategies in the MPTM Application

In most scenarios, BESS and PV operate in parallel with the grid. Island operation of BESS and PV is, of course, possible and follows practically the same rules as in the MINT application, except for parameters affecting frequency and voltage regulation (see **Regulation Loops**).

PV generates energy with zero operating costs. It logically follows that the requirement to utilize the energy produced by PV to the maximum extent makes sense. The most efficient scenario involves direct consumption of PV production by the load. The surplus PV production can then be used to charge the BESS or be exported to the grid. This decision depends on many other aspects.

The most common BESS power management strategy involves charging the BESS with PV surpluses and subsequently discharging the BESS when PV production falls below the system load level. The goal is to minimize grid import.

Another strategy is time-shifting grid consumption or distributing grid consumption over time (known as Peak Shaving), or the Spot Price Dispatch strategy, which involves managing grid import/export based on current electricity prices.

There are countless strategies, but they all use the principles of P and Q power management for BESS and PV that InteliNeo offers.

6.4.2 Active power control

From the controller's perspective, the critical information is the status of the MCB (Mains Circuit Breaker). The controller is informed about the MCB status via the LBI **MCB FEEDBACK** input. A controller operating in parallel with the grid always displays the status Parallel Operation (Parallel Operation) in its Breaker State value.

The power P contributed by BESS and PV during parallel operation with the grid is not determined by the system load itself but by a requirement derived from a combination of related setpoints. Essentially, there are these options:

0 – Baseload	Request for constant power delivered to the mains. The requested value input the system either via setpoint **#System Baseload** or LAI **LOAD CONTROL: ANEXT BASELOAD**, depends on **Load Request Source** settings.
1 –Import/ Export	Request for constant power from the grid. The requested value input the system either via setpoint **Import Load** or LAI **LOAD CONTROL: ANEXT IMP/EXP LOAD**, depends on **Load Request Source** settings.
2 – Zero Import	The goal is zero power import from the grid. Power is supplied exclusively by local sources.
3 – Min Import	Grid import is constant and equal to the value of **Mains Import Min**.
4 – Max Import	Grid import is constant and equal to the value of **Mains Import Max**.
5 – Mains preference	In this mode, the load consumption is primarily covered by the grid, with maximum utilization of PV output. The grid power is maintained within the defined range between

	Mains Import Min and **Mains Import Max**. › When the grid power remains within this range, the power delivered by the BESS is zero. › **Charging of BESS** begins when the grid power reaches the **Mains Import Min** limit, utilizing any excess power. › **Discharging of BESS** starts when the grid power reaches the **Mains Import Max** limit. › **Curtailment of PV** occurs only when the grid power is pushed below **Mains Import Min** and BESS is already charging at its maximum capacity.
6 – BESS Max Charging	This mode closely resembles **Mains Preference**, with a key difference in the behavior of the BESS. › In this mode, **the BESS charges at maximum possible rate**, determined both by its internal limits and the upper grid limit defined by **Mains Import Max**. › This charging occurs while maintaining maximum PV production.
7 – BESS Max Discharging	This mode is similar in structure to **Mains Preference**, but focuses on maximizing the discharging of the BESS. › In this mode, **the BESS discharges at maximum possible rate**, determined by its internal limits and system demand › The grid power is maintained above the lower limit defined by **Mains Import Min**. › All of this occurs while maintaining **maximum possible PV production**, meaning the BESS discharges only to the extent necessary to avoid curtailing PV output.

Note: *The **Import/Export Limitation** can be used in combination with the Baseload / Import/Export / Zero Import mode. The power output of all sources is still controlled according to the selected method, but if the requested value results the mains operating out of the operation range (**Mains Import Min** and **Mains Import Max**) the request is rescricted to keep the value of the Mains Import within this range.*

6.4.3 Reactive power control

Q/PF Power Control

Total system Q /PF/P

To describe the following chapters, it is necessary to introduce these terms.

Total System P

Total System P = BESS P + PV Actual P + WT Actual P, i.e. sum of active power P of all so

Total System Q

Total System Q = BESS Q + PV Actual Q + WT Actual Q, i.e. sum of reactive power Q of all sources running in parallel to Mains integrated under InteliNeo

Total System S

Total System S = vector sum of BESS S, PV Actual S and WT Actual S, i.e. sum of apparent power S of all sources running in parallel to Mains integrated under InteliNeo.

Total System PF

Total System PF = Total System P / Total System S, i.e. PF of all sources running in parallel to Mains integrated under InteliNeo.

Note: *PV, or alternatively WT, contributes passively to the Total System Q. PV/WT produces Q according to the requirement, see* ***PV Output control****. BESS, through its operation, tries to balance the resulting Q/PF according to the requirement corresponding to the control mode.*

Principles of Q/PF Control

Reactive power Q can be controlled directly as a requirement for Q or indirectly through the value of the required PF. The control mode for Q or PF is determined by the setpoint setting **PF/Q Control PTM Mode**. The setpoint can be set to the basic control mode PF Control or Q Control, or to other modes related to the functionality of Grid Codes.

The power Q contributed by BESS and PV during parallel operation with the grid is not determined by the system load itself but by a requirement derived from a combination of related setpoints. Essentially, there are two basic principles of control:

Base Q / Base PF - The total Q / PF of BESS and PV during parallel operation with the grid is constant, and the grid covers the remaining Q.

Import Q / Import PF - The grid Q / PF is constant, and the BESS and PV cover the remaining Q.

Base Q / Base PF

Setpoint **PF/Q Regulation Type** = Base PF/Q Control, i.e. constant Q/PF of the BESS and PV.

PF/Q Control PTM Mode = Q Control - The total reactive power Q of the sources - **Total System Q**, i.e., **BESS Q + PV Actual Q**, is regulated to a constant value according to the requirement for Q / PF.

PF/Q Control PTM Mode = PF Control - The total power factor (PF) of the BESS and PV sources - **Total system Q /PF/P** - is constant and is regulated according to the requirement for Q / PF.

The requirement for Total System Q / PF enters the controller either as a setpoint **Base Q** or **Base Power Factor** or through LAI: **Q CONTROL: ANEXT BASE Q** or **PF CONTROL: ANEXT BASE PF**. The choice between setpoint or LAI is determined by the setpoint setting **PF/Q Request Source** = Setpoint or Analog External Value.

Import/Export Q / Import/Export PF

Setpoint **PF/Q Regulation Type** = Import/Export PF/Q Control, i.e. constant Q/PF of the Mains.

- **PF/Q Control PTM Mode** = Q Control - Total System Q, i.e., **BESS Q + PV Actual Q** is regulated to achieve a constant Mains Q as required.
- **PF/Q Control PTM Mode** = PF Control - Total System Q, i.e., **BESS Q + PV Actual Q** is regulated to achieve a constant Mains PF as required.

The requirement for Mains Q / PF enters the controller either as a setpoint **Import Q** or **Import Power Factor** or through LAI: **Q CONTROL: ANEXT IMP/EXP Q** or **PF CONTROL: ANEXT IMP/EXP PF**. The choice between setpoint or LAI is determined by the setpoint setting **PF/Q Request Source** = Setpoint or Analog External Value".

PF/Q control based on grid codes requirements

In connection with the set of **Grid Codes** functions, it is required to control Q in a more sophisticated manner, taking into account additional system parameters. In other words, the required value for controlling Q/PF is a function of certain operational values of the system.

PF(Pm)

Setpoint **PF/Q Control PTM Mode** = PF(Pm)

Base PF(Pm)

Total System Q is controlled so that the total PF of the sources running in parallel with the grid, i.e., **Total System PF**, corresponds to the required value according to the **PF(P)** curve. The input parameter for the Px curve is **Total System P** ."

Import/Export PF(Pm)

Total System Q is controlled so that the **Mains PFMains PF** corresponds to the required value according to the **PF(P)** curve. The input parameter for the Px curve is **Mains Import P**.

Note: *For both scenarios the setpoint **PF/Q Request Source** must be set as Setpoint. The settings Analog External Value is not accepted and causes the alarm **Wrn PF(Pm) Fail**.*

Q(Um)

Setpoint **PF/Q Control PTM Mode** = Q(Um)

Base Q(Um)

Total System Q is controlled to match the required value according to the **Q(Um)** curve. The input parameter for the Um curve is the mains voltage.

Note: *The definition of the curve can be adjusted or offset by the value given by the setpoint **Q(Um) 0 Reference** or according to the LAI **Q(Um): 0 Ref ANEXT Base Q** based on the setting **PF/Q Request Source**.*

Import/Export Q(Um)

Total System Q is controlled so that**Mains Import Q** corresponds to the required value according to the **Q (Um)** curve. The input parameter for the Um curve is the mains voltage.

Note: *The definition of the curve can be adjusted or offset by the value given by the setpoint **Q(Um) 0 Reference** or according to the LAI **Q(Um): 0 Ref ANEXT Imp/Exp Q** based on the setting **PF/Q Request Source**.*

Q(P)

Setpoint **PF/Q Control PTM Mode** = Q(P)

Base Q(P)

Total System Q is controlled to match the required value according to the **Q(P)** curve. The input parameter for the Px curve is **Total System P** .

Import/Export Q(P)

Total System Q is controlled so that **Mains Import Q** corresponds to the required value according to the **Q (P)** curve. The input parameter for the Px curve is **Mains Import P**.

Note: *For both scenarios, the setpoint **PF/Q Request Source** must be set as Setpoint. The setting Analog External Value is not accepted and causes the alarm **Wrn PF(Pm) Fail***

Qref/Ulim

Setpoint **PF/Q Control PTM Mode** = Qref/Ulim

Base Qref/Ulim

Total System Q is controlled to match the required value according to the **Qref/Ulim** curve. The input parameter for the Ulim curve is the mains voltage.

Note: *The definition of the curve can be adjusted or offset by the value given by the setpoint **Qref/Pnom Shift** or according to the LAI **QREF/ULIM: ANEXT QREF/PNOM B Q** based on the setting **PF/Q Request Source**.*

Import/Export Qref/Ulim

Total System Q is controlled so that **Mains Import Q** corresponds to the required value according to the **Qref/Ulim** curve. The input parameter for the Ulim curve is the mains voltage.

Note: *The definition of the curve can be adjusted or offset by the value given by the setpoint **Qref/Pnom Shift** or according to the LAI **QREF/ULIM: ANEXT QREF/PNOM I/E Q** based on the setting **PF/Q Request Source**.*

6.4.4 AMF Function

IMPORTANT: This chapter is relevant only for MPTM application.

For the InteliNeo the AMF function is used only for automatic Mains failure and healthy detection. There is no emergency start related to the technology when Mains fails because it is expected that renewables and BESS are already running.

Related setpoints are:

AMF Timers

- **Mains Stabilization Delay**
- **MCB Close Delay**

AMF Settings

- **MCB Logic**

Mains failure detection

The Mains is considered as faulty when one or more of the following conditions are valid:

- The Mains voltage is out of the limits given by the setpoints **Mains <V** (**Mains <<V**) and **Mains >VMains >V**(**Mains >>V**) for a time period longer than **Mains <V Delay** respectively **Mains >V Delay** (**Mains <<V Delay**, **Mains >>V Delay**).
- The Mains voltage unbalance is out of limit given by setpoint **Mains V Unbalance** for a time period longer than **Mains V Unbalance Delay**.
- The Mains frequency is out of the limits given by the setpoints **Mains <f** (**Mains <<f**) and **Mains >f** (**Mains >>f**) for a time period longer than **Mains <f Delay** respectively **Mains >f Delay** (**Mains <<f Delay**, **Mains >>f Delay**).
- The MCB close command was not successful and the alarm **Wrn MCB Fail** is present in the alarmlist.
- Alarm **ALI Mains Ph Rotation Opposite** is active.

Healthy Mains detection

The Mains is considered to be healthy when all of following conditions are valid:

- The Mains voltage is within the limits given by the setpoints **Mains <V** (**Mains <<V**) and **Mains >VMains >V**(**Mains >>V**).
- The mains voltage unbalance is within the limits given by the setpoint **Mains V Unbalance**.

- The Mains frequency is within the limits given by the setpoints**Mains <f** (**Mains <<f**) and **Mains >f** (**Mains >>f**).
- The alarm **Wrn MCB Fail** is not present in the alarmlist.
- Alarm **ALI Mains Ph Rotation Opposite** is not active.

6.4.5 Mains Import Measurement

This functionality is available only when the **Application Mode** = MPTM. The Mains measurement can be measured by dedicated CT terminals or by analog inputs, and it is divided to **Mains Measurement P** and **Mains Measurement Q**. The Mains Measurement P has to be enabled for proper work of active power Import/Export. The both measurements has to be enabled for proper work of reactive power Import/Export and power factor control.

> **IMPORTANT: The Earth Fault Current Protection and Mains Import Measurement shares same physical input ⑰ AUX CURRENT . At one moment this input can be used only for one purpose. The protection will work only if Mains Measurement P and Mains Measurement Q != Mains CT.**

Note: *The default configuration of InteliNeo does not have Mains Import measurement defined. Both the setpoints **Mains Measurement P** and **Mains Measurement Q** are set to None. If the configuration uses functions that require information about the Mains Import value, it is necessary to ensure that the Mains power is measured either directly using the voltage and current inputs of the controller, or indirectly through LAI **MAINS MEASUREMENT P** and **MAINS MEASUREMENT Q**.*

In the case of selecting **Mains Measurement P** = Mains CT or **Mains Measurement Q** = Mains CT, it is further possible to choose whether the Mains current will be measured on one or three phases. This choice is made using the setpoint **3Ph CT Location** = BESS / Mains. The default BESS setting means that the BESS current is measured on three phases through the terminals ⑯ **BESS CURRENT**, while the Mains current is measured single-phase on the terminals ⑰ **AUX CURRENT** . The choice **3Ph CT Location** = Mains means that the Mains current is measured on three phases, and the BESS current is measured on only one phase. From the perspective of the InteliNeo connection terminals, this involves the set of terminals, see **Terminal Diagram**.

Mains Measurement P

- If **Mains Measurement P** = Mains CT then **Mains Import P** is counted from the current which is measured on ⑰ **AUX CURRENT** .
- If **Mains Measurement P** = Analog Input then **Mains Import P** is taken from LAI **MAINS MEASUREMENT P**. Mains current can still be measured if **Mains Measurement Q** = Mains CT.
- If **Mains Measurement P** = None then **Mains Import P** is not counted because there is no current measurement. This affects load transferring.

MainsMeasurement Q

- If **Mains Measurement Q** = MainsCT then **Mains Import Q** is counted from the current which is measured on ⑰ **AUX CURRENT** .
- If **Mains Measurement Q** = Analog Input then **Mains Import Q** is taken from the LAI **MAINS MEASUREMENT P**. Mains current can be still measured if **Mains Measurement P** = Mains CT.
- If **Mains Measurement Q** = None then **Mains Import Q** is not counted because there is no current measurement. This affects load transferring.

7 PLC - Programmable Logic Controller

7.1 Programmable Logic Controller 302
7.1.1 PLC Editor 303

The Programmable Logic Controller (PLC) built into the ComAp controllers is generally a simple process unit used for the automation of processes. The major benefit of the PLC is you don't need any extra control devices in your control system. The PLC is tightly integrated with the standard line of controllers. That allows the PLC editor to be a seamless experience directly in the programming software. Flexibility is at the core of ComAp's software design and the PLC meets both simple and complex application requirements while using the same intuitive interface. PLC Editor is a powerful tool that helps you to create your own PLC scheme. It has a user-friendly graphical interface which makes it easy to use.

ComAp PLC Editor has been developed to help you deal with even the most demanding applications. It allows you to add control logic, additional alarm functions, or even new features to meet complex or unique requirements. This easy-to-use PLC Editor means you can customize the way the controller works to match the application precisely without compromise or limitation.

- Intuitive design, visual programming, and easy modification.
- All PLC function blocks can be moved both horizontally and vertically.
- Color-coded and linked to relevant functions.
- Blocks can be organized to reflect the real process flow.
- Groups of blocks can be separated on each sheet to form sub-sets within the design.
- Detailed descriptions of inputs and outputs come complete with useful hints

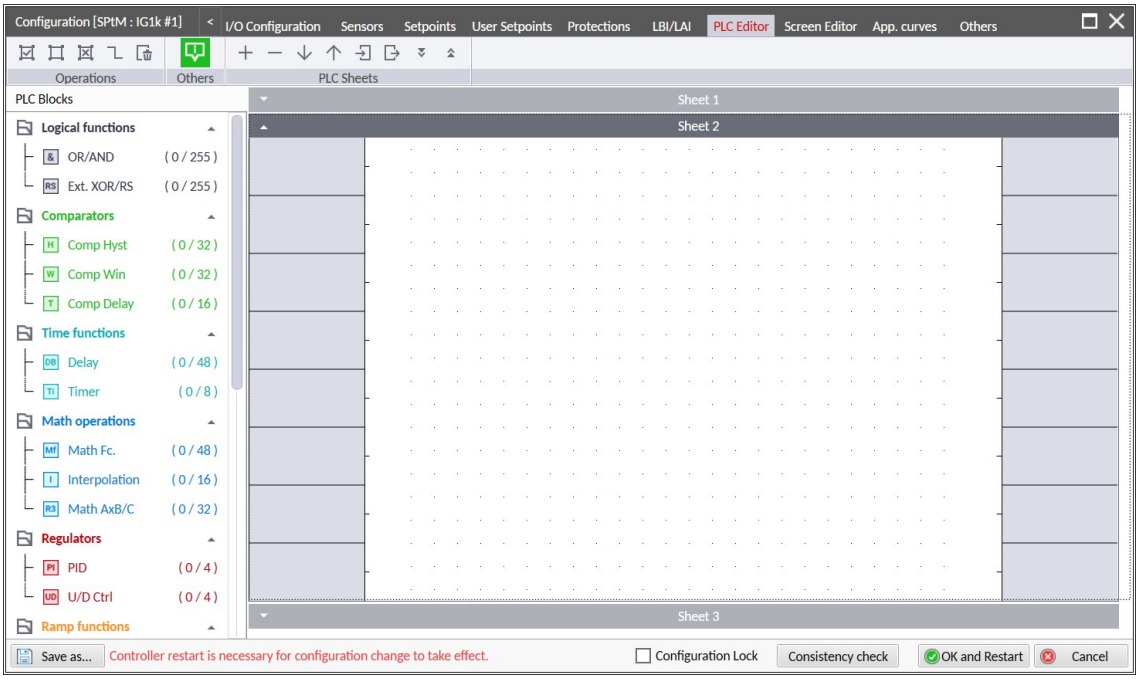


Image 7.1 PLC Editor - main page

7.1 Programmable Logic Controller

7.1.1 PLC Editor 303

The Programmable Logic Controller (or PLC), which is built into the ComAp controllers, is generally a simple process unit used for automation of processes. The major benefit with the PLC is you don't need a lot of extra control devices in your control system.

ComAp's has tightly integrated the PLC into the standard controller range; this has allowed the PLC editor to be seamlessly integrated directly into the InteliConfig configuration tool. Flexibility is at the heart of ComAp's software design, allowing the PLC to meet the requirements of simple or complex applications while using the same intuitive interface.

The PLC Editor is a powerful tool that helps you create your own PLC schematic.It has an intuitive graphical interface to give the user an easy-to-use interface to create PLCs efficiently.

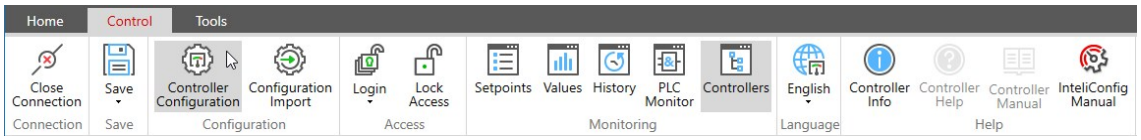
ComAp PLC Editor has been developed to help you deal with even the most demanding applications. It allows you to add control logic, additional alarm functions or even new features to meet complex or unique requirements. This easy-to-use PLC Editor means you can customize the way your controller operates to fit the exact application - without compromise or limitation.

ComAp's key PLC features:

- Intuitive design, visual programming and easy modification.
- All PLC function blocks can be moved both horizontally and vertically.
- Colour-coded and linked to relevant functions.
- Blocks can be easily arranged to reflect the real process flow.
- Groups of blocks can be separated on each sheet to form sub-sets within the design.
- Detailed descriptions of inputs and outputs are accompanied by helpful hints.

7.1.1 PLC Editor

The PLC Editor is available in InteliConfig Control tab: use Control → Controller Configuration → PLC Editor



sequence to entry to the PLC Editor tab:

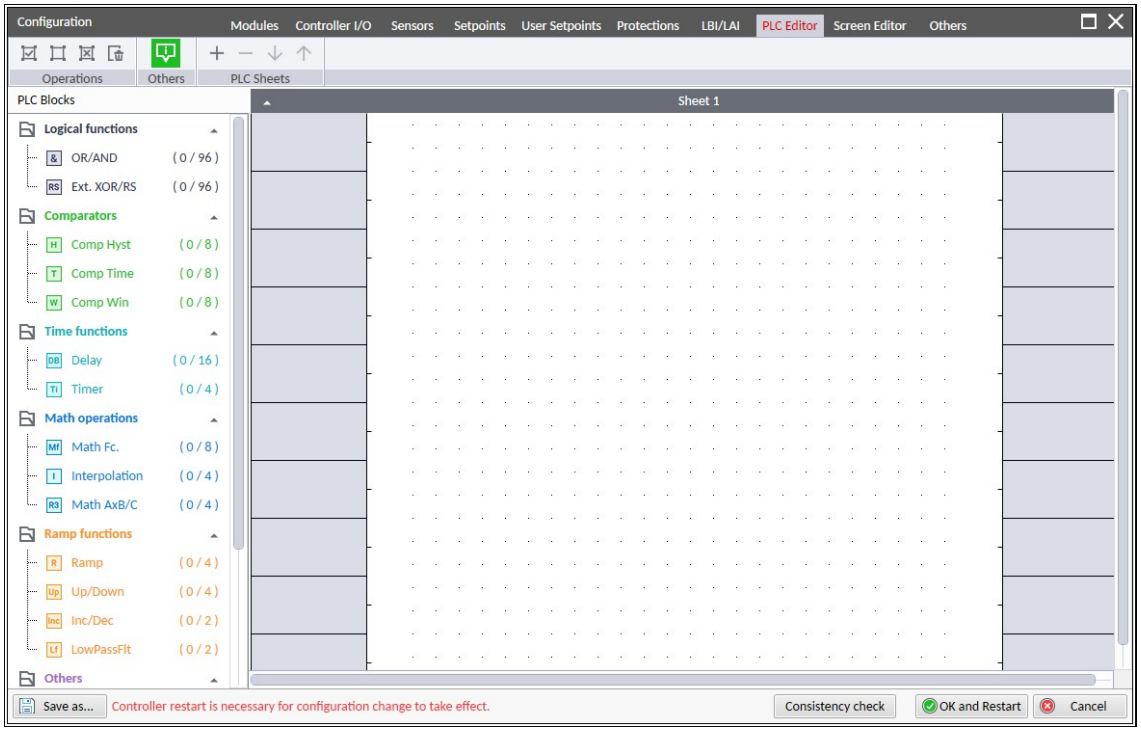
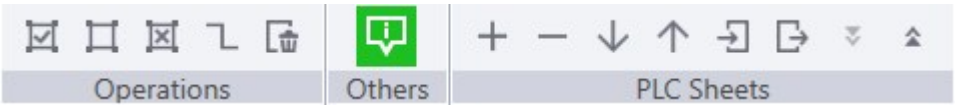


Image 7.2 PLC Editor tab

PLC Editor Toolbar

In the upper part of the editor panel there is a toolbar with buttons for working with PLC blocks and PLC sheets.



Select all elements on actual sheet.

Unselect all elements.

Delete selected elements.

Re-route selected wires.

	Delete whole sheet.
	Add a PLC sheet.
	Delete selected PLC sheet.
	Show/hide PLC block hints.
	Move PLC sheet down.
	Move PLC sheet up.
	Import PLC sheet.
	Export PLC sheet.
	Expand all PLC sheets.
	Collapse all PLC sheets.

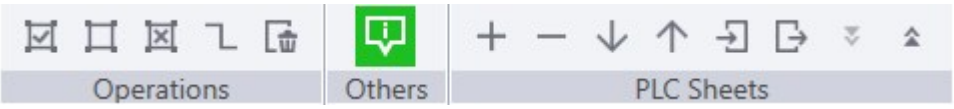
PLC Editor Sheets

PLC editor supports working with multiple sheets, if the diagram does not fit on one sheet (it becomes cluttered), it can be continued on another sheet.

IMPORTANT: The number of PLC blocks on one PLC sheet is limited to 30 blocks.

Working with sheets

In the upper part of the PLC editor panel there is a toolbar with buttons for working with sheets.



You can add or delete sheets by pressing "+" and "-", you can also move each sheet up and down by arrows up and down in menu PLC Sheets.

Every sheet can be also renamed by double-click on sheet number (e.g. "Sheet 1") and annotation up to 512 characters could be added.

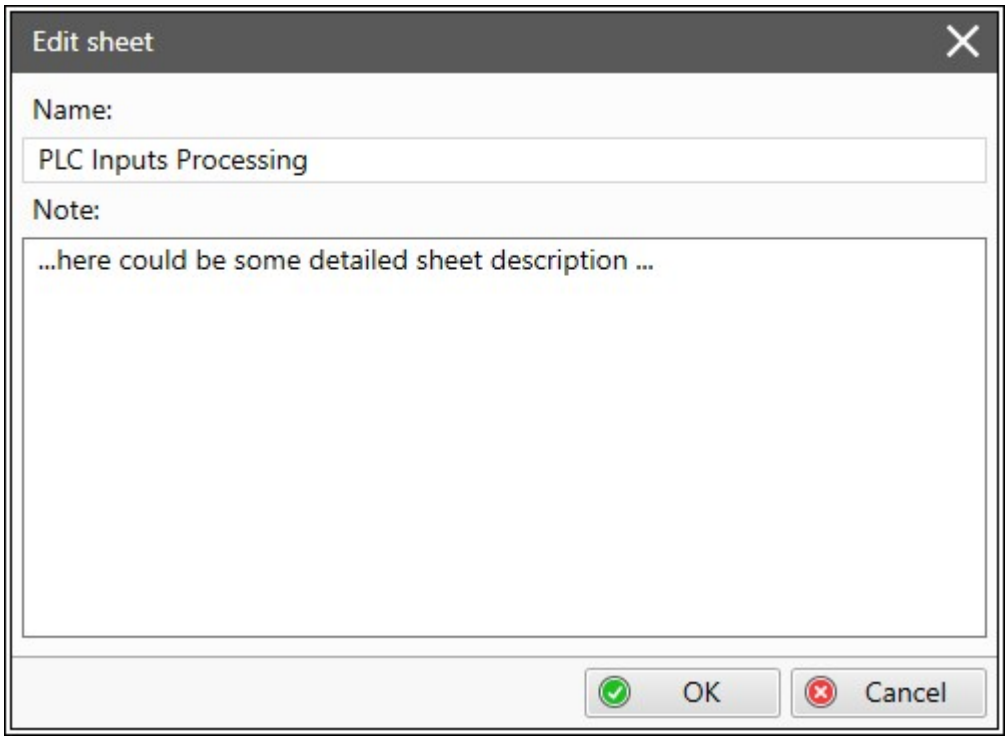


Image 8.1 Annotation of PLC sheet

Each sheet can be re-sized according to your needs by dragging the sheet edges.

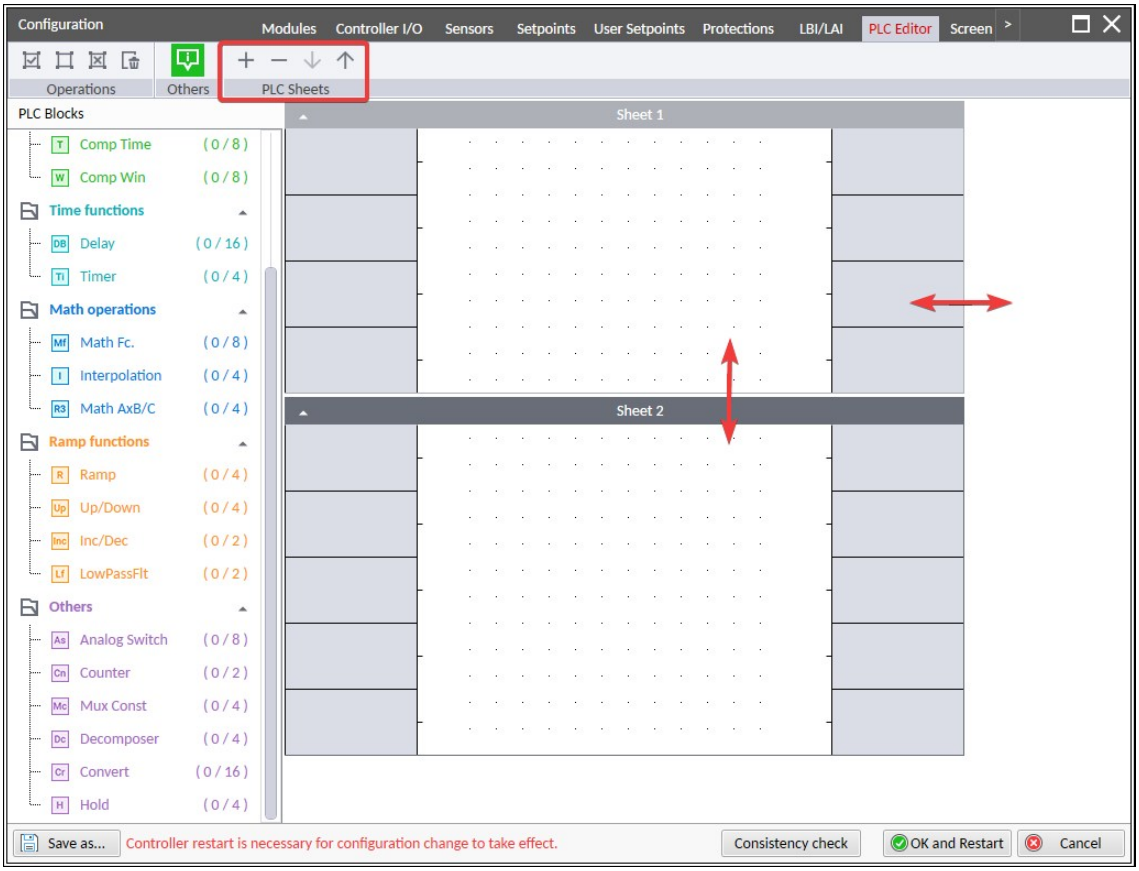


Image 8.2 Adjusting PLC sheet size

Drag the sheet edges to re-size the sheet according to your needs.

PLC Blocks

PLC Blocks Selection Tree

The PLC block selection tree is available on the left side of the PLC Editor panel.

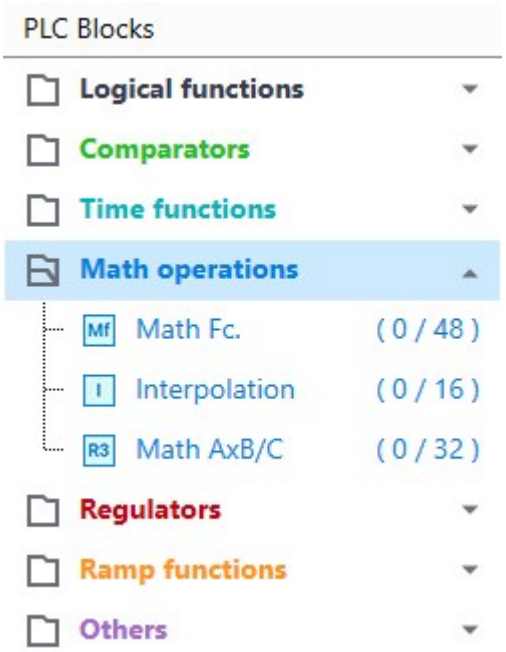


Image 9.1 PLC blocks selection tree

Blocks are grouped into groups of similar functionality, next to the name of each block the number of used / available blocks of that type is given in brackets.

Note: *For more information about blocks, see* ***Groups of PLC Blocks*** *and further chapters.*

Adding PLC blocks

Adding PLC block is simple and intuitive. Follow the procedure below to add PLC block:

- Select the required block from the list of available PLC blocks list on the left side and drag-and-drop it into the sheet.
- Double-click on the block and adjust its properties.
- Connect the block inputs and outputs by drawing wires in the sheet. Inputs and outputs can also be connected by using the properties of the selected PLC block.

Note: *For more information abou connections, see* ***PLC Variables*** *and onwards.*

Note: *To delete a PLC block, just click on it (select it) and press the delete key. You can also use the Delete selection button in the top Operation toolbar.*

IMPORTANT: The Undo/Redo editing action is not available when adding PLC blocks.

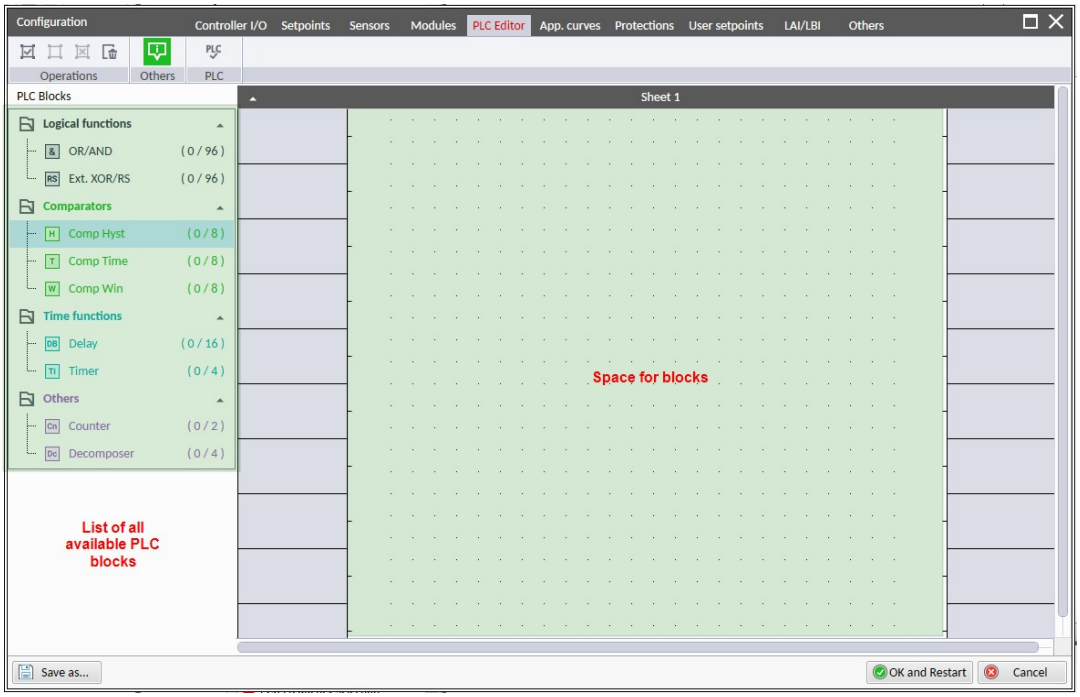


Image 9.2 Adding PLC blocks

Note: *To see context help for selected PLC block just press F1 button.*

PLC Block Configuration

Double click on selected PLC block to invoke the configuration panel specific for each block type. In general, the definition of the block inputs and outputs is accompanied by some settings of block properties (e.g. block mode, binary input or output inversion, etc.) - see description of the specific block.

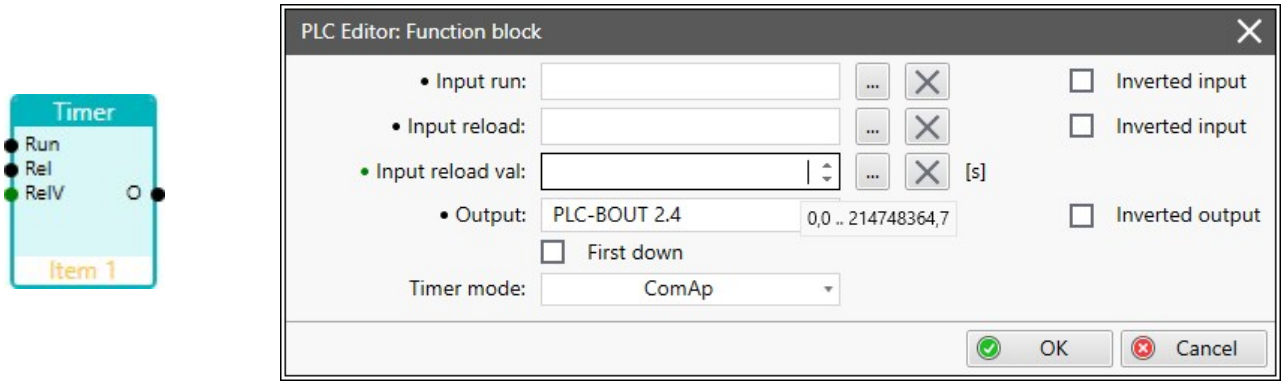


Image 9.3 Example of block configuration panel (Timer block)

Note: *Please note the decimal places resolution [0,0 .. 214748364,7] on the hover tooltip on the Input realod val.*

Selecting the **Inverted input** checkbox means using negated input when evaluating the block.

Selecting the **Inverted output** check box means issuing a negated output value after the block has been internally evaluated.

The binary values can be either controller Values, Setpoints or PLC binary outputs.

Analog values can be either controller Values, Setpoints, PLC analog outputs or entered as direct constant block values. Non-numeric Setpoint values (e.g. IP address) cannot be used.

If a variable (binary signal) is connected via wire, the connection appears directly in the field - otherwise the variable (binary signal) can be set using the dialog invoked by the '...' button.

Specific properties of the block (e.g. function type, mode of operation, etc.) can be set in the corresponding panel object (listbox, checkbox).

Note: *If the constants are used (i.e. set by block configuration dialog) they cannot be changed dynamically during PLC execution.*

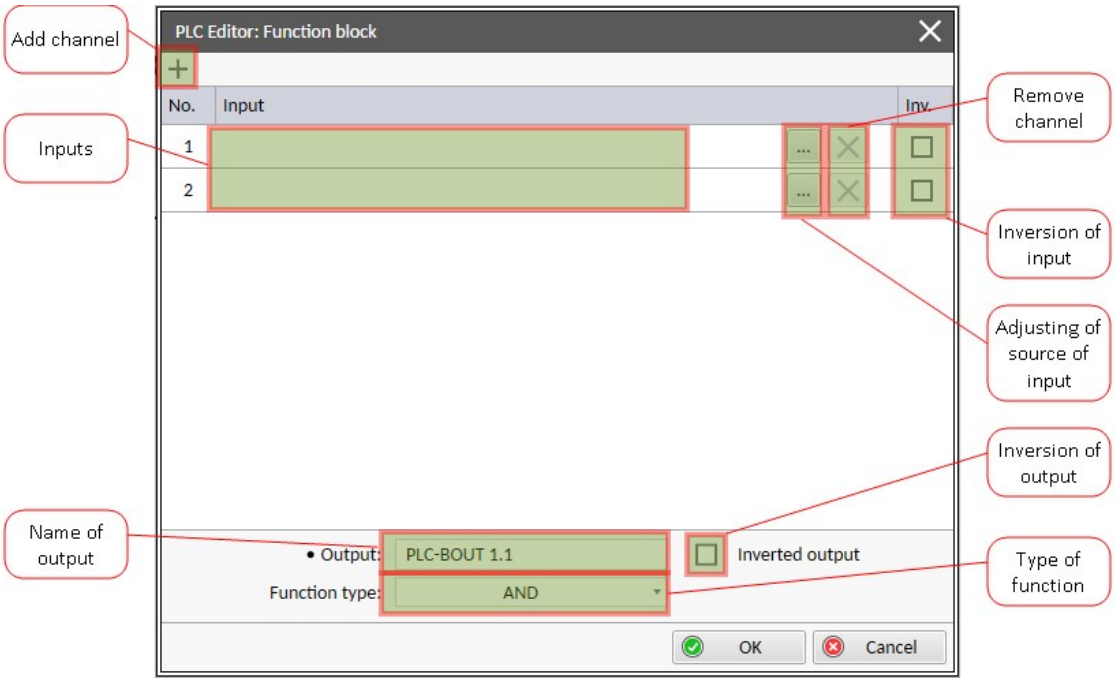


Image 9.4 Example of block configuration panel with variant number of inputs

If the block has a variable number of inputs, the '+' button (in the upper left corner) adds an additional input (channel) up to the maximum number of channels. Use 'X' button to remove a channel.

Note: *Description of the functionality of a specific block (see list of blocks here* ***Groups of PLC Blocks****) - e.g. "The Output is set when ..." - assumes that no input or output inversion is selected - otherwise the meaning of the description should be reversed accordingly.*

PLC Variables

There are two types of PLC signals - PLC Inputs and PLC Outputs. As PLC inputs could be used any available variables from current configuration - Values, Setpoints.

The PLC Outputs are of two types:

- PLC Binary Outputs - PLC BOUT
- PLC Analog Outputs - PLC AOUT

The number of avaiable outputs of both types is limited and given by the archive (configuration).

Internally, the PLC interpreter also requires additional internal resources for PLC blocks that need internal values to be stored during execution (e.g. Delay block).

Note: *If the controller is switched off, the current PLC values (PLC Outputs) are not saved for further use!*

Define Inputs and Outputs

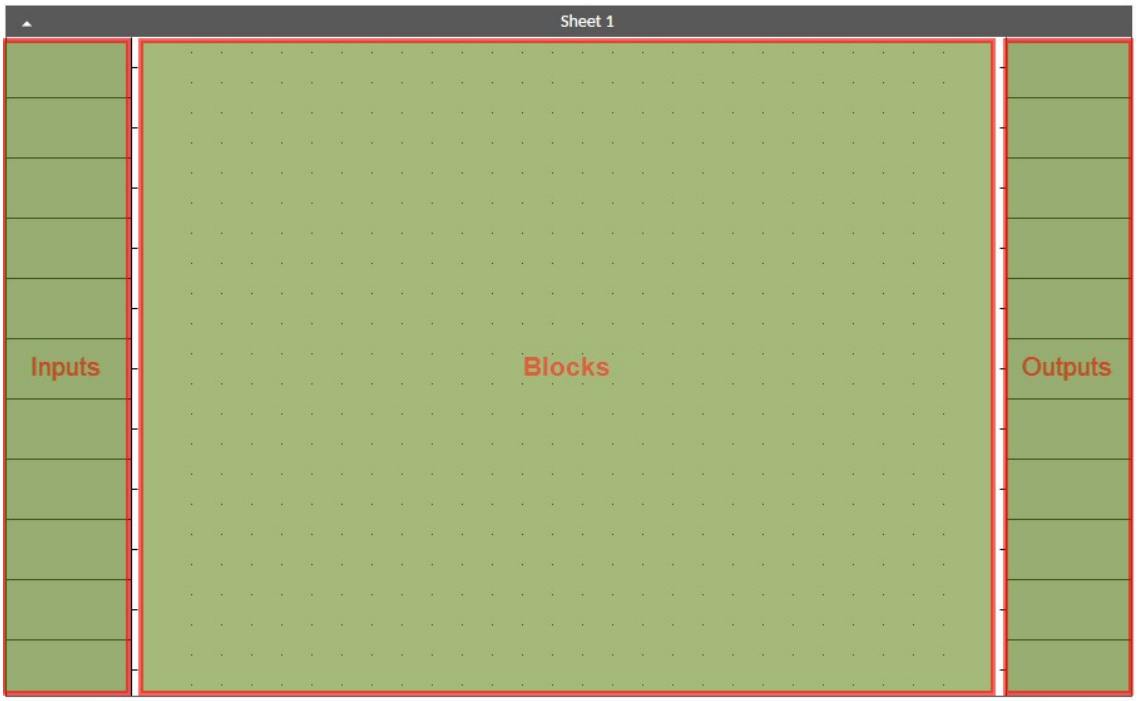


Image 10.1 Blank sheet of PLC editor

Inputs

Sheet inputs are located at the left side of a sheet. Follow the procedure below to add or edit an input.

- Double click on a free input position to add new input or just double click on an existing input.
- Select the source for the input:
  - If you create a binary input, you can select a source from following categories:
    - Bin. Values - this category contains all binary values available in the controller as binary inputs, logical binary outputs etc.
    - PLC Binary Outputs - you can connect any PLC Binary Output to another PLC Binary Input.

» If you create an analog input, you can select a source from following categories:

- Ana. Values - this category contains all analog values available in the controller as analog inputs, electrical values, values from ECU etc.
- All Setpoints - this category contains all setpoints of the controller except the dedicated User setpoints. Names, resolutions and dimensions of these setpoints can not be modified.
- PLC Analog Outputs - you can connect any PLC Analog Output to another PLC Analog Input.

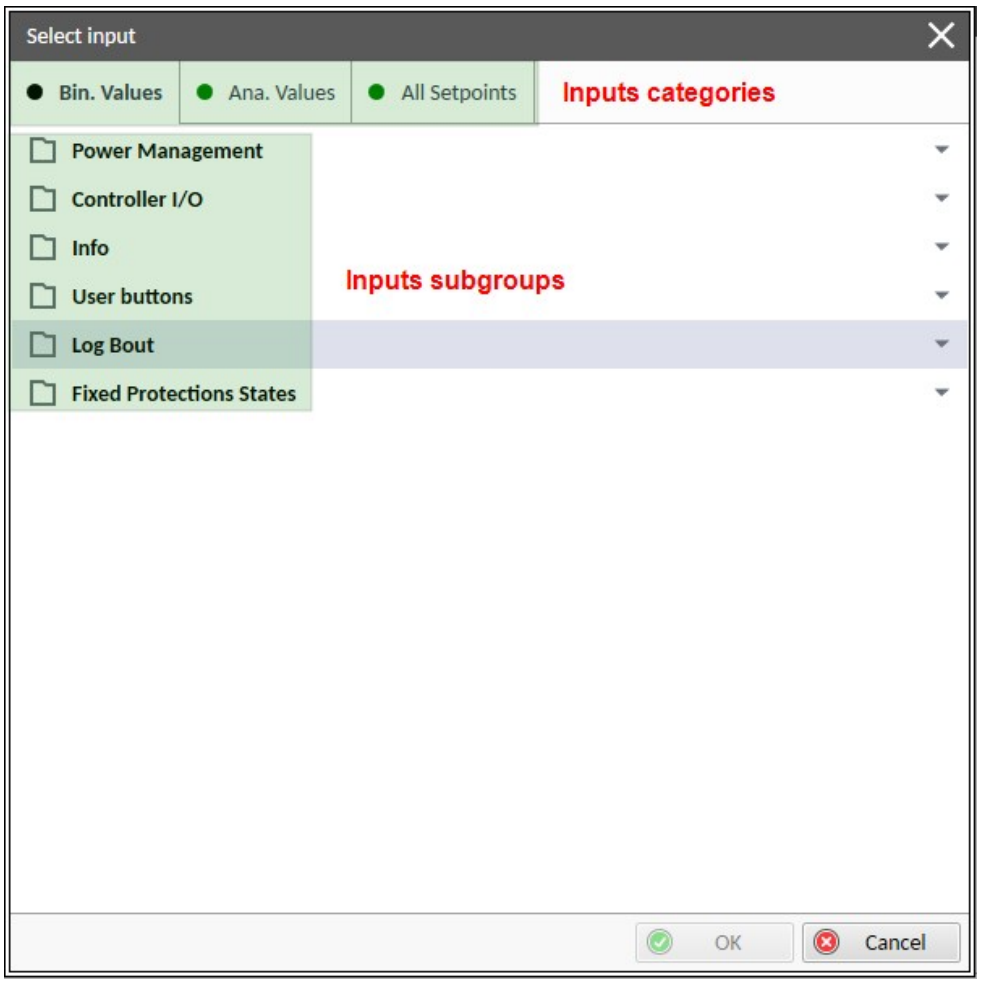


Image 10.2 PLC inputs

Outputs

Sheet outputs are located at the right side of a sheet. Follow the procedure below to add or edit an PLC output.

- Double click on a free output position to add new sheet (binary or analog) output.
- Draw the wire from the PLC block output to the right side of the sheet and drop the end point here.

To connect the PLC output to a controller output, you must connect the PLC output to the desired output:

- Double click on an already created output to configure the output to a controller (physical) output terminal or to a logical binary input.
- Confirm the selected connection by clicking the Connect button

IMPORTANT: After selecting the output, you must click the "+ Connect" button. Otherwise, the PLC output remains unconnected, only selected!

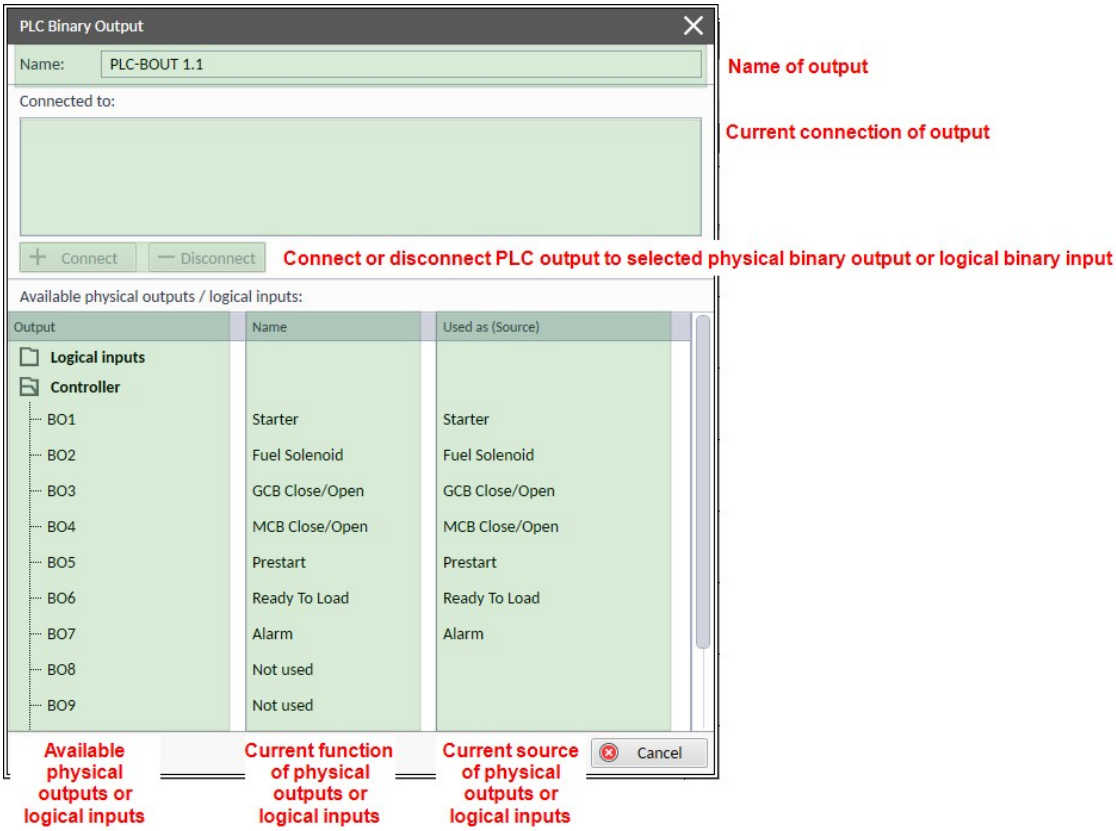


Image 10.3 PLC outputs

Internal Resources

For the following PLC blocks:

- Counter
- Timer
- Inc/Dec

the PLC Resource variable is used internally to maintain the actual count value. The PLC Resource variable is an array of length given by sum of available number of the above mentioned blocks.

The PLC Resource index of corresponding PLC block (Counter, Timer or Inc/Dec type) depends on the current execution order of these blocks.

> **Example:** If the execution order of the blocks is as shown in the table below, the PLC Resource indices will be as follows:

Item 1 →	Item 2 →	Item 3 →	Item 4 →	Item 5 →	Item 6
COUNTER 1	AND 1	TIMER 1	COUNTER 2	XOR 1	INC/DEC 1
PLC Resource 1		PLC Resource 2	PLC Resource 3		PLC Resource 4

> **IMPORTANT: If the controller is switched off, the current PLC Resource values are not saved for further use!**

PLC Wiring

Creating Wires

Connection wires can be created between PLC inputs and blocks, between blocks or blocks and PLC outputs.

Note: *The connection can only be made between outputs and inputs with the same type of value (binary or analog).*

Follow the procedure below to create a wire (connection):

- Move the mouse pointer over the starting point of the wire. If the area below the mouse pointer is the connection point, the shape of the connection point will change to a small enlarged circle.
- Press and hold the left mouse button and drag the wire to the desired connection point. If you hover over a valid connection point, the connection point will be marked with a small enlarged circle..
- Release the left mouse button to create a wire between the two points.
- The wire is routed automatically.

Note: *Binary values are marked by black circle pointer, analog values are marked with green circle pointer.*

IMPORTANT: If the values on the block inputs have different decimal places (Resolution) or dimensions (Dimension) than required, the values are marked as invalid and the block name is displayed in red in the PLC Editor and/or PLC Monitor. We strongly recommend to correct the configuration = use signals/values with the same dimension and decimal numbers (Resolution).

Note: *To delete a connection wire, just click on it and press the delete key. You can also use the Delete selection button in the upper Operation toolbar.*

IMPORTANT: The Undo/Redo editing action is not available when adding / routing connection wires.

PLC Execution

The PLC program is executed every 100 ms (this time is given by the PLC controller system integration) and cannot be changed. PLC execution starts automatically after the ComAp controller is powered on and the firmware initialization is completed. Of course the PLC program can only be executed with valid configuration and/or valid SW key(s) for using the Extended PLC blocks.

The inital values for PLC inputs are given by the respective signals (e.g. actual power value) or determined by the specific PLC block settings.

PLC Logic Execution Rules

Blocks are executed in the order of the block numbers (Item numbers), that appear in each block. Block numbers are assigned automatically according to the block position on the sheet based on the following scheme.

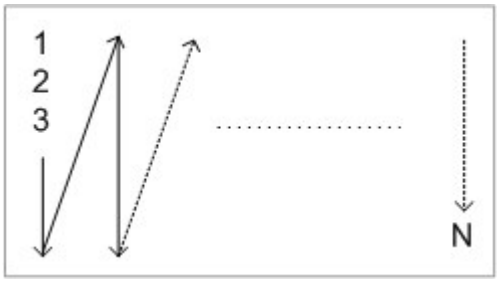
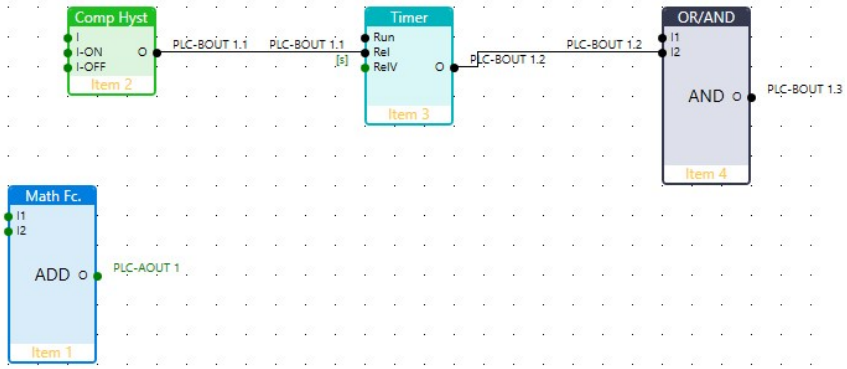
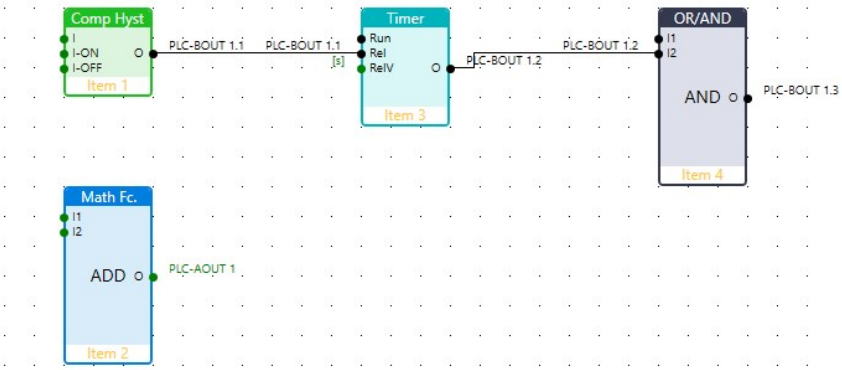


Image 12.1 PLC execution order

The order of execution can be affected by the precise placement of a particular block - see ADD block location below.



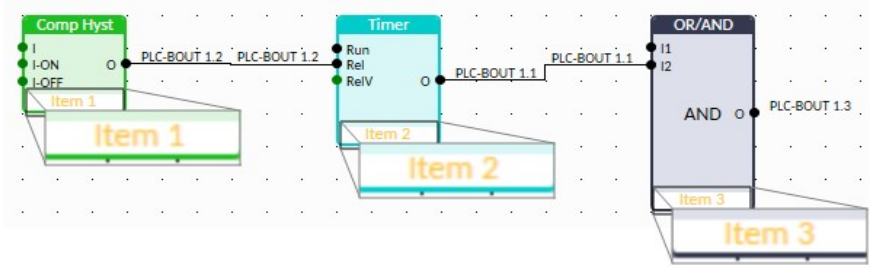
Order	Block type
Item 1	**ADD**
Item 2	Comp Hyst
Item 3	Timer
Item 4	AND

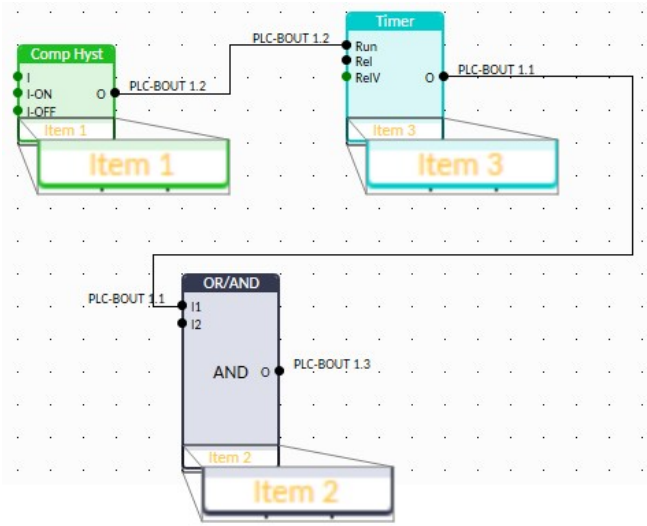


Order	Block type
Item 1	Comp Hyst
Item 2	**ADD**
Item 3	Timer
Item 4	AND

IMPORTANT: Please always check that the blocks are ordered correctly, especially if you use direct feedbacks from outputs to inputs within one sheet. Wrong order may lead to incorrect results!!!

The execution order is Item 1 → Item 2 → Item 3, so in the second case the AND block evaluation will use Timer block output before the update.





PLC Standard and Extended Set

There are Standard and Extended set of PLC blocks. The Extended PLC set have extra PLC blocks and extended number of PLC blocks.

The number of PLC blocks for the Standard and Extended version is shown in the table in the next chapter.

The number of blocks and which blocks will be available is defined by the archive.

Note: *The Extended PLC blocks are only availablewhen using the "PLC-extended" archive (e.g. InteliGen1000-GC-PLC-extended-version archive)* ***and*** *have a correct and valid SW key.*

Extended PLC - SW key

The correct SW Key must be inserted to the relevant setpoint.

If the correct SW key is not applied and the PLC schematic contains some PLC blocks that are only available for Extended PLC or contains more blocks than allowed, the **Wrn SW Key PLC Extended Error** and **Wrong PLC Configuration** alarms are activated.

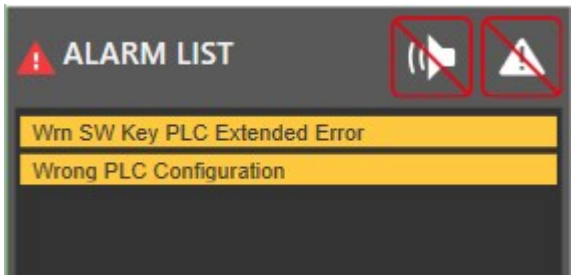


Image 13.1 Not valid SW key for Extended PLC used

The PLC will not continue to operate until the incorrect blocks are removed and the configuration is written to the controller or the valid SW key is entered.

Consistency check

This performs a check of the PLC schematic:

- for the validity of the block interconnection = all inputs that are in internal design rules marked as mandatory are connected and/or configured properly;
- for the consistency of the dimensions (setting attribute Dimension) and the number of decimal places (setting attribute Resolution) at both ends of the interconnection wire

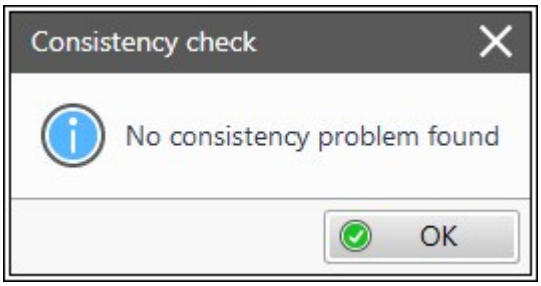


Image 14.1 Consistency Check valid output

Use this function during the design phase to check if all inputs and outputs of PLC block are connected properly, and the design is consistent. The check is also performed automatically when the configuration may be written to controller.

If the Consistency Check detect any problems, all findings will be displayed in the message window.

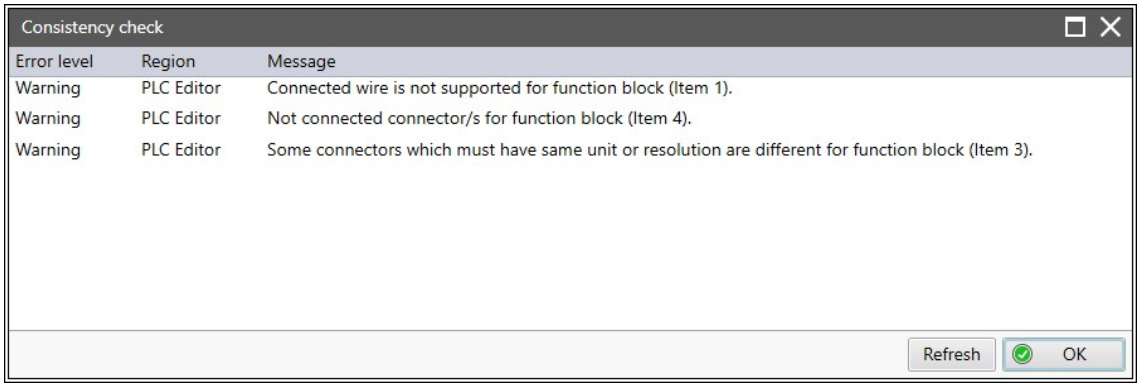


Image 14.2 Consistency Check report output

Message	Meaning	Remedy
Connected wire is not supported for function block (Item X)	Probably Resolution and/or Dimension mismatch on the wire	Use correct Resolution and/or Dimension on both ends of wire
Not connected connector/s for function block (item X)	Mandatory inputs of the block are not connected / configured	Connect and/or configure all mandatory inputs
Some connectors which must have same unit or resolution are different for function block (Item X)	Probably Resolution and/or Dimension mismatch on the wire or on Inputs and/or Output	Use correct Resolution and/or Dimension on both ends of wire of between block inputs and output

Note: *The Consistency Check could also report findigns outside the PLC configuration (e.g. MODBUS register (s) problem(s)) - these findings then need to be addressed in the relevant part of the overall configuration.*

Other functions

Delete whole content of sheet

Use this function to delete the whole content of sheet (including blocks, wires, inputs, outputs, etc...).

> **IMPORTANT: The sheet content is deleted immediately, without confirmation dialog (and there is not any Undo)!**

Hints

Use this function to enable or disable quick hints for blocks (controller help is not affected by this function).

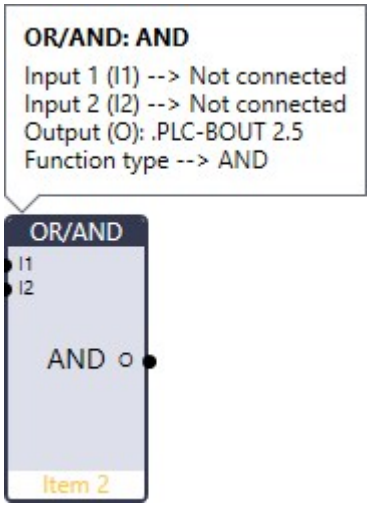


Image 14.3 PLC OR/AND block with its hint displayed

List of available PLC blocks

Here is an example of list of available PLC blocks.

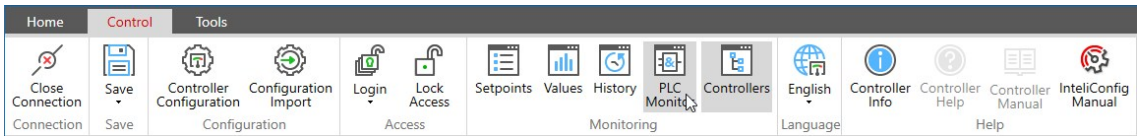
Group	PLC block	Number of blocks (Standard) IG1k/IM1k	Number of block (Extended)
Logical	**OR/AND**	96/128	255
	XOR/RS	96/128	255
Comparators	**Comp Hyst**	8/16	32
	Comp Win	8/16	32
	Comp Delay	8	16
Time functions	**Delay**	16	48
	Timer	4	8
Math Operations	**Math Fc.**	16	48
	Interpolation	4/8	16
	Math AxB/C	4	32
Regulators	**PID**	0	4
	Up/Down Ctrl	0	4
Ramp functions	**Ramp**	4	8
	Up/Down	4	8
	Inc/Dec	2	4
	LowPassFlt	2	4
Others	**Analog Switch**	4/8	32
	Analog Switch 8	4/8	32
	Bit Sum	0	4
	Comp. 4	8	8
	Comp. 16	0	8
	Convert	16	16
	Counter	2/4	8
	Decomp. 4	8	8
	Decomp. 16	0	8
	Hold	4	8
	Heartbeat	0	16

IMPORTANT: For the current list and number of available blocks for each type, refer to the current and valid Global Product Guide for that product.

7.1.2 PLC Monitor

PLC monitor is a powerful tool for monitoring your PLC. Just click on PLC Monitor button on main InteliConfig page to see you PLC in the run time. The refresh rate is given by the system integration.

The PLC Monitor is available in InteliConfig Control tab main toolbar:



To access the PLC Monitor panel, use the sequence Control → PLC Monitor.

PLC Monitoring

PLC monitor supports working with multiple controllers - on the left side of the panel there is a selection tree for choosing the desired controller for PLC monitoring.

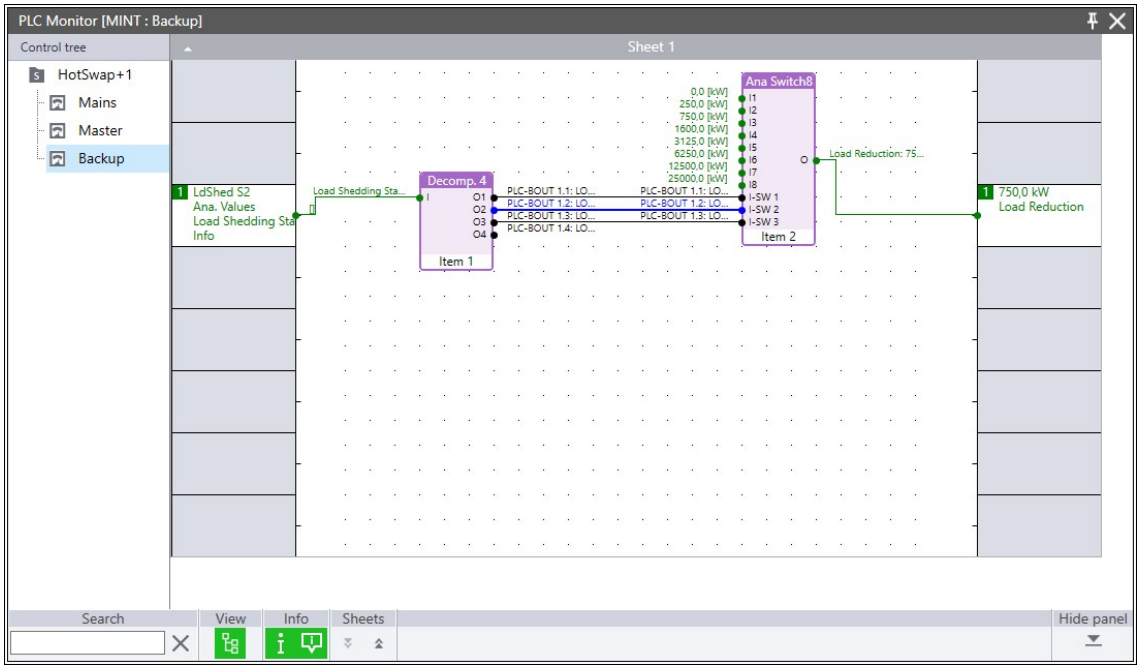


Image 15.1 PLC Monitor panel with multiple controllers

> **IMPORTANT: In the PLC Monitor it is not possible to modify the PLC, not even the position of the blocks.**

Active binary inputs, outputs and wires are blue, analog inputs, outputs and values are green. The values of analog signals (as well as constants set in the blocks configuration) are also visible.

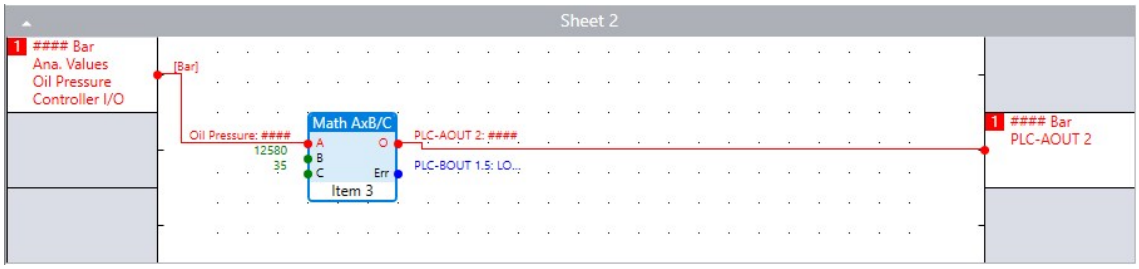


Image 15.2 PLC Monitor sheet with invalid value

Note: *If the analog signal have an invalid value, the red "####" string is displayed and the connecting wire is also red.*

The PLC monitor also supports multi-sheet monitoring - individual sheets can be hidden/expanded using the button in the top title bar.

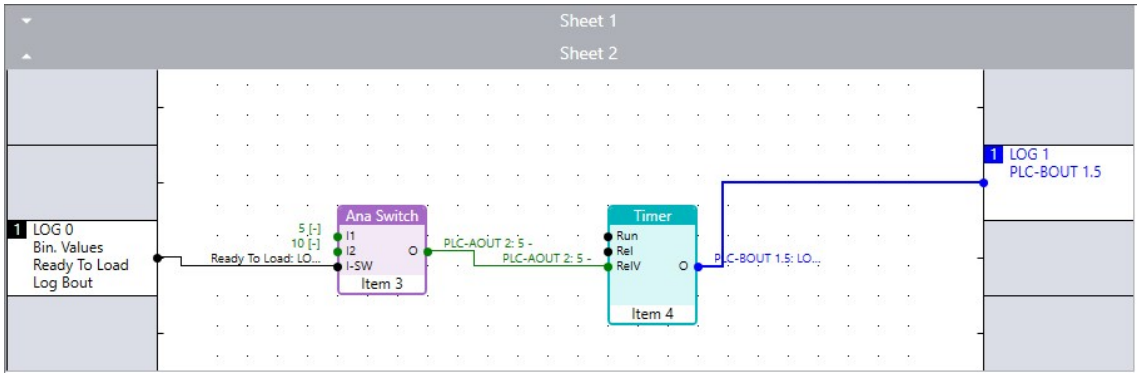


Image 15.3 PLC Monitor with multiple sheets

7.2 Groups of PLC Blocks

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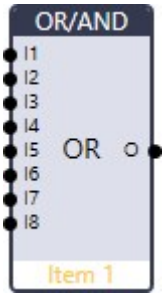
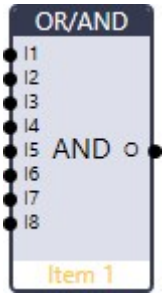
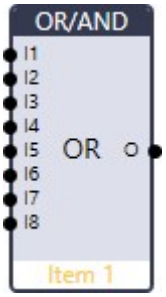
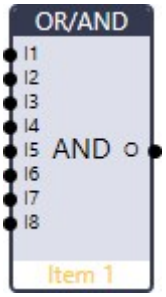
7.2.6 Regulators 356

7.2.1 Logical functions

PLC Block	OR/AND	 
Block icon	&	
PLC Set	Standard	
The block performs logical operation AND / OR of 2 - 8 binary operands.		

PLC Block	XOR/RS	
Block icon	RS	
PLC Set	Standard	
The block provides logical function of two values - XOR or several variants of RS flip-flop.		

OR/AND

PLC Group	Logical functions	 
PLC Set	Standard	
PLC Block ID	1	

Inputs

Input	Abbr.	Type	Range	Function
Input 1	I1	Binary	0/1	Input 1
Input 2	I2	Binary	0/1	Input 2
Input 3	I3	Binary	0/1	Input 3 (optional)
Input 4	I4	Binary	0/1	Input 4 (optional)
Input 5	I5	Binary	0/1	Input 5 (optional)
Input 6	I6	Binary	0/1	Input 6 (optional)
Input 7	I7	Binary	0/1	Input 7 (optional)
Input 8	I8	Binary	0/1	Input 8 (optional)

Note: *At least first two inputs must be used, however up to 8 inputs can be configured.*

Outputs

Output	Abbr.	Type	Range	Function
Output	O	Binary	0/1	Result of the logical operation

Description

The block performs logical (boolean) OR/AND operations of 2 to 8 binary operands. Both **Inputs** and **Output** can be inverted.

Function OR

Input 1	Input 2	Output
0	0	0
0	1	1
1	0	1
1	1	1

Function AND

Input 1	Input 2	Output
0	0	0
0	1	0
1	0	0
1	1	1

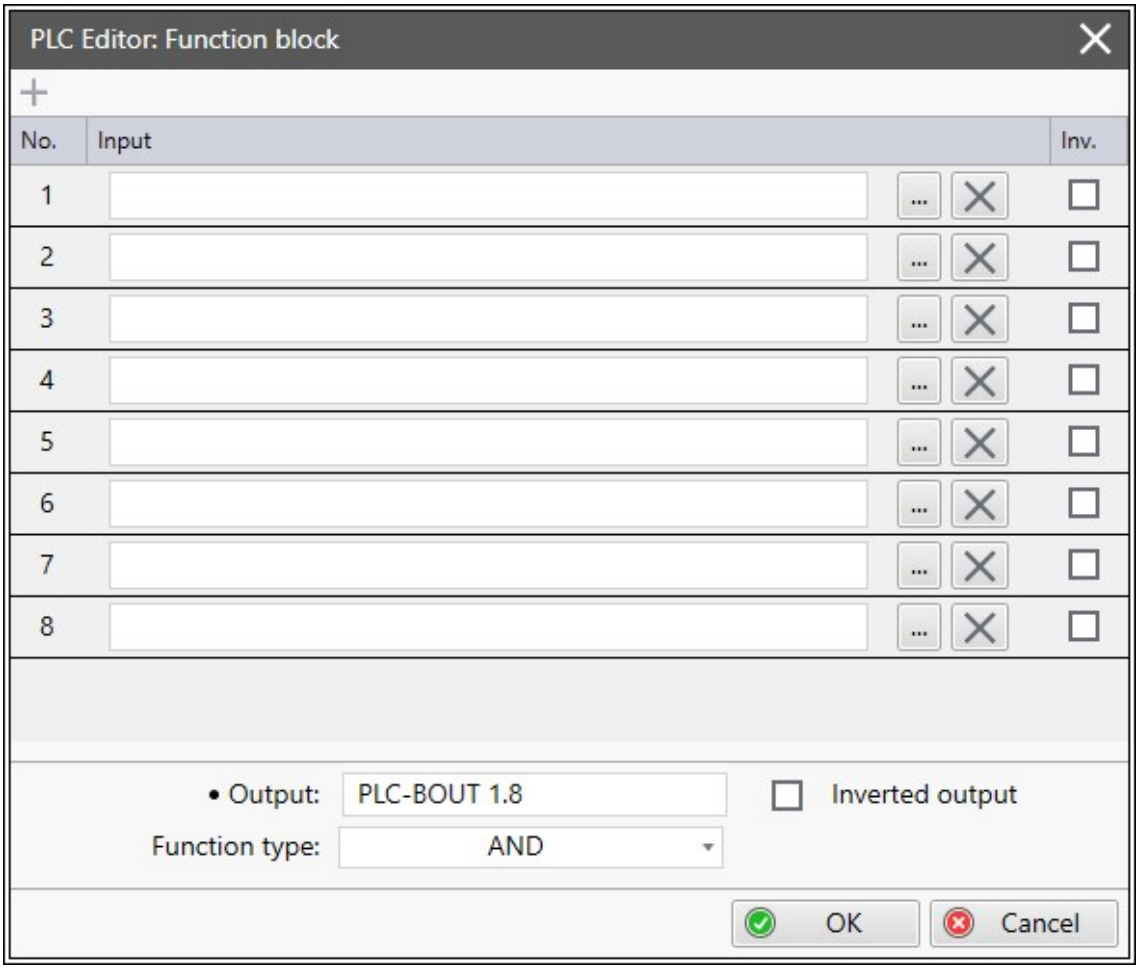
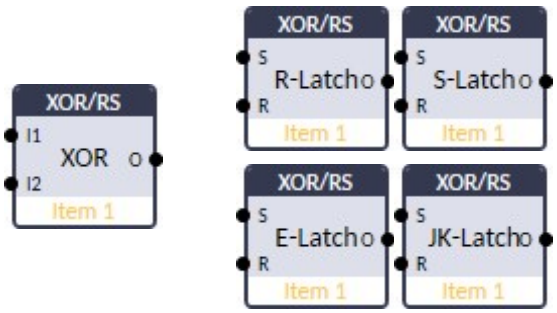


Image 15.4 Configuration of OR/AND block

back to Groups of PLC Blocks

XOR/RS

PLC Group	Logical functions	
PLC Set	Standard	
PLC Block ID	39	

Inputs

Input	Abbr.	Type	Range	Function
Input 1 Set	I1 S	Binary	0/1	**XOR mode**: Input 1 **RS mode**: Set input
Input 2 Reset	I2 R	Yes	0/1	**XOR mode**: Input 2 **RS mode**: Reset input

Note: *Both the inputs should be configured, else the Consistency Check will report "Not connected connector/s for function block "*

Outputs

Output	Abbr.	Type	Range	Function
Output	Binary	Yes	0/1	Result of the logical operation

Description

The block performs logical (boolean) XOR operation of two binary operands or several variants of the RS flip-flop function. Both **Inputs** and **Output** can be inverted.

XOR mode

The result of XOR operation between two binary inputs (**Input 1** and **Input 2**) is defined by table below.

Function type XOR

Input 1	Input 2	Output
0	0	0
0	1	1
1	0	1
1	1	0

RS mode

The block **Output** value is given by the selected RS flip-flop variant evaluation:

- R-latch: When both inputs (R, S) are set the Reset input is dominant.
- S-latch: When both inputs (R, S) are set the Set input is dominant.
- E-latch: When both inputs (R, S) are set the previous output is preserved.
- JK-latch: When both inputs (R, S) are set the block output is negated.

The block has the setting for the variant functions of the RS flip-flop circuit. This setting is available in the block configuration dialog (i.e. it is done in the configuration and cannot be changed dynamically while the PLC is running).

Function type RS

Input 1 (R)	Input 2 (S)	R-latch	S-latch	E-latch	JK-latch
		O			
0	0	O_{-1}	O_{-1}	O_{-1}	O_{-1}
0	1	1	1	1	1
1	0	0	0	0	0
1	1	0	1	O_{-1}	NOT(O_{-1})

The O_{-1} denotes the state of the RS block output in the last evaluation cycle.

Note: *If the JK-latch RS flip-flop type is used and both the R and S inputs are permanently set, the block is producing rectangular signal on its Output.*

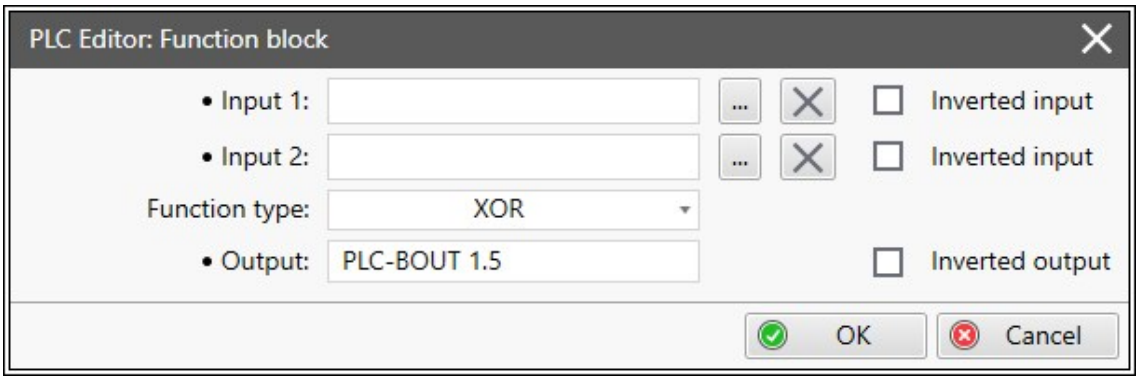


Image 15.5 Configuration of XOR/RS block

back to Groups of PLC Blocks

Logic Functions Blocks Examples

Example use of OR/AND and XOR/RS

Note: *This is just an illustrative example of the behavior of logic blocks, in practical use it does not make much sense*

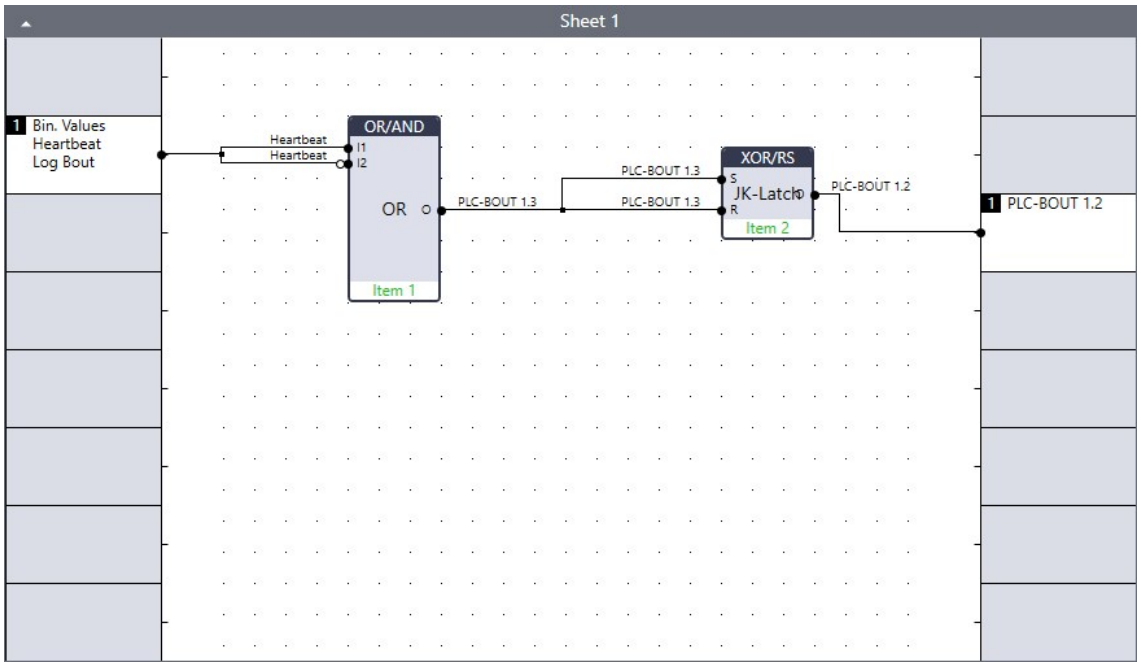


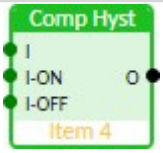
Image 15.6 Example of use logical blocks (OR / JK-latch)

The Log Bout Heartbeat binary signal has a rectangular waveform. The OR block is configured to invert the input signal on Input 2. With this configuration, the Output of the OR block is permanently set. Using the XOR/ RS block with the JK-latch mode selected then again produces a rectangular signal.

Note: *Please note that is not necessary to treat the inputs de-bouncing.*

7.2.2 Comparators

PLC Block	Comp Delay	
Block icon	T	
PLC Set	Standard	
The block performs an analog comparation of two values with selectable relation operation and adjustable delay.		

PLC Block	Comp Hyst	
Block icon	H	
PLC Set	Standard	
The block performs the input value comparation to the comparative level with hyteresis.		

PLC Block	Comp Win	
Block icon	W	
PLC Set	Standard	
The block performs comparation of input value to the adjustable interval (window) given by low / high limits.		

Comp Delay

PLC Group	Comparators	
PLC Set	Standard	
PLC Block ID	46	

Inputs

Input	Abbr.	Type	Range	Function
Input	I	Analog	$-2^{32}-1..+2^{32}-1$	Compared value
Reference	Ref	Analog	$-2^{32}-1..+2^{32}-1$	Reference value
Delay	Dly	Analog	0.0 .. 3000.0 [s]	Comparative delay

Outputs

Output	Abbr.	Type	Range	Function
Output	O	Binary	0/1	Comparator output

Description

This block compares the **Input** value with a **Reference** comparison value using a selected **Relation** operation.

The block **Output** is set when the **Relation** operation (equal / greater than / less than, etc.) between the **Input** and **Reference** value is satisfied for a time longer than the selected **Delay**.

All **Relation** operations between **Input** and **Reference** are described in the following table.

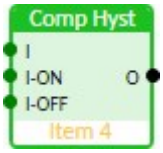
Shortcut	Name	Relation
LT	less than	Input "**<**" Reference
LE	less than equal	Input "**<=**" Reference
EQ	equal	Input "**==**" Reference
GT	greater than	Input "**>**" Reference (default)
GE	greater than equal	Input "**>=**" Reference

Note: *If the **Delay** is 0, the **Output** is immediately following the comparison operation result.*

Image 15.7 Configuration of Comp Delay block

back to Groups of PLC Blocks

Comp Hyst

PLC Group	Comparators	
PLC Set	Standard	
PLC Block ID	3	

Inputs

Input	Abbr.	Type	Range	Function
Input	I	Analog	$-2^{32}-1..+2^{32}-1$	Compared value
Input ON	I-ON	Analog	$-2^{32}-1 .. +2^{32}-1$	Comparative level on
Input OFF	I-OFF	Analog	$-2^{32}-1 .. +2^{32}-1$	Comparative level off

Outputs

Output	Abbr.	Type	Range	Function
Output	O	Binary	0/1	Comparator output

Description

The block compares the **Input** value with two comparison levels **I-ON** and **I-OFF**. The evaluation of the block depends on whether the **I-ON** level is higher than the **I-OFF** level or vice versa.

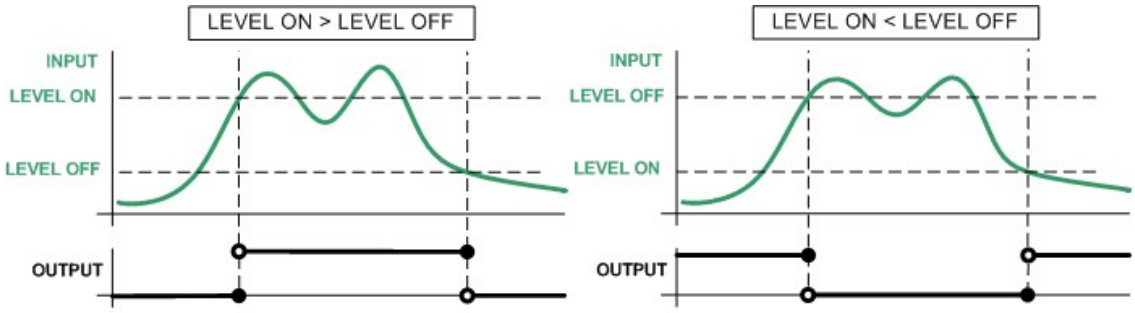


Image 15.8 Principle of Comp Hyst evaluation

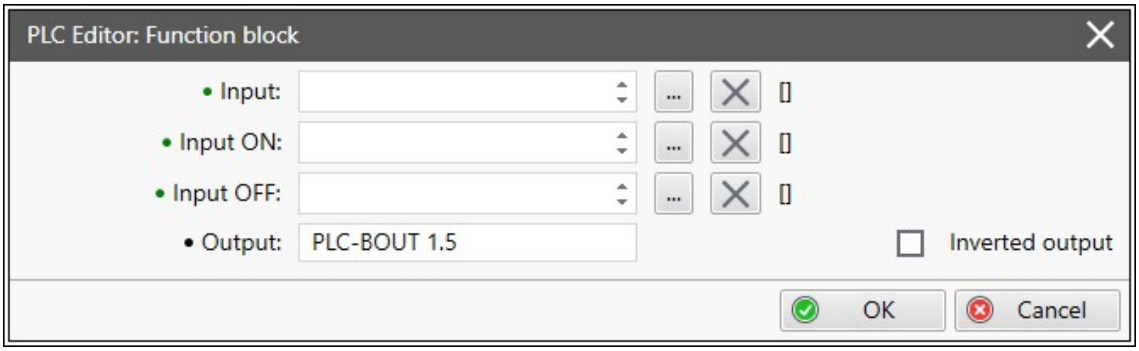


Image 15.9 Configuration of Comp Hyst block

back to Groups of PLC Blocks

Comp Win

PLC Group	Comparators	
PLC Set	Standard	
PLC Block ID	18	

Inputs

Input	Abbr.	Type	Range	Function
Input	I	Analog	$-2^{32}-1$ .. $+2^{32}-1$	Compared value
Input HIGH	HIGH	Analog	$-2^{32}-1$ .. $+2^{32}-1$	Upper window limit (high limit)
Input LOW	LOW	Analog	$-2^{32}-1$ .. $+2^{32}-1$	Lower window limit (low limit)

Outputs

Output	Abbr.	Type	Range	Function
Output	O	Binary	0/1	Comparator output

Description

The block **Output** is set whenever the **Input** value is within the range defined by the **LOW** and **HIGH** limits.

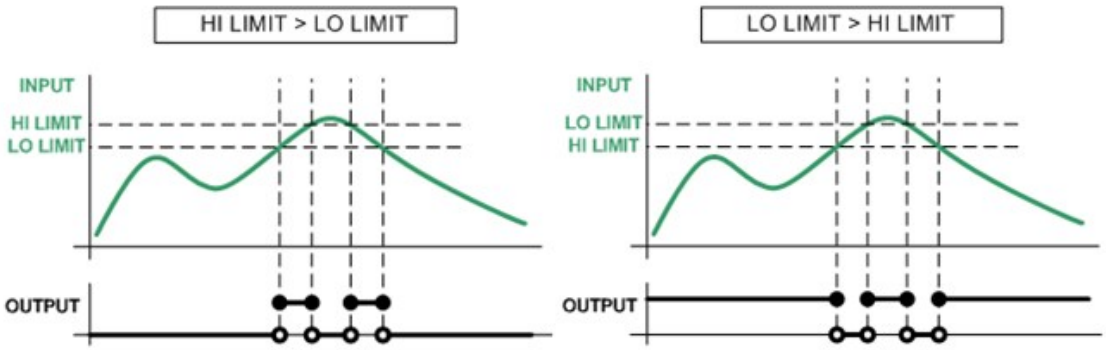


Image 15.10 Principle of Comp Win evaluation

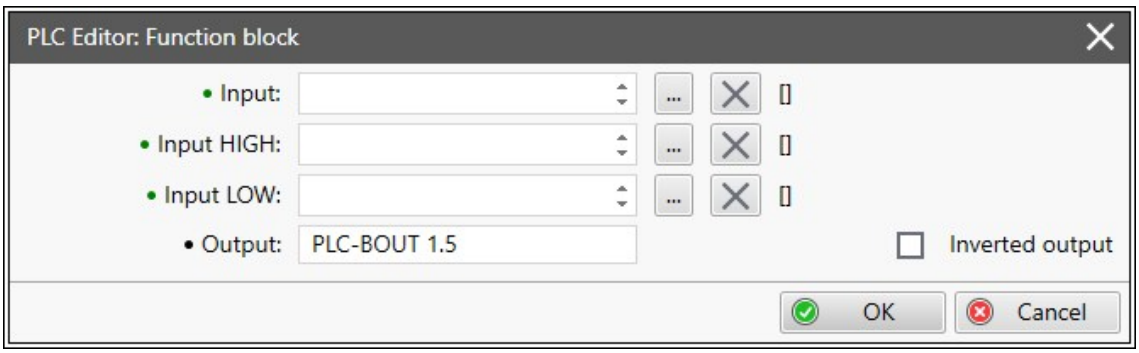


Image 15.11 Configuration of Comp Win block

back to Groups of PLC Blocks

Comparators Blocks Examples

Example use of Comp Hyst

The Comp Hyst block used here performs a hysteresis comparison of the Total Running Power input quantity between two levels. The levels are specified as block constants.

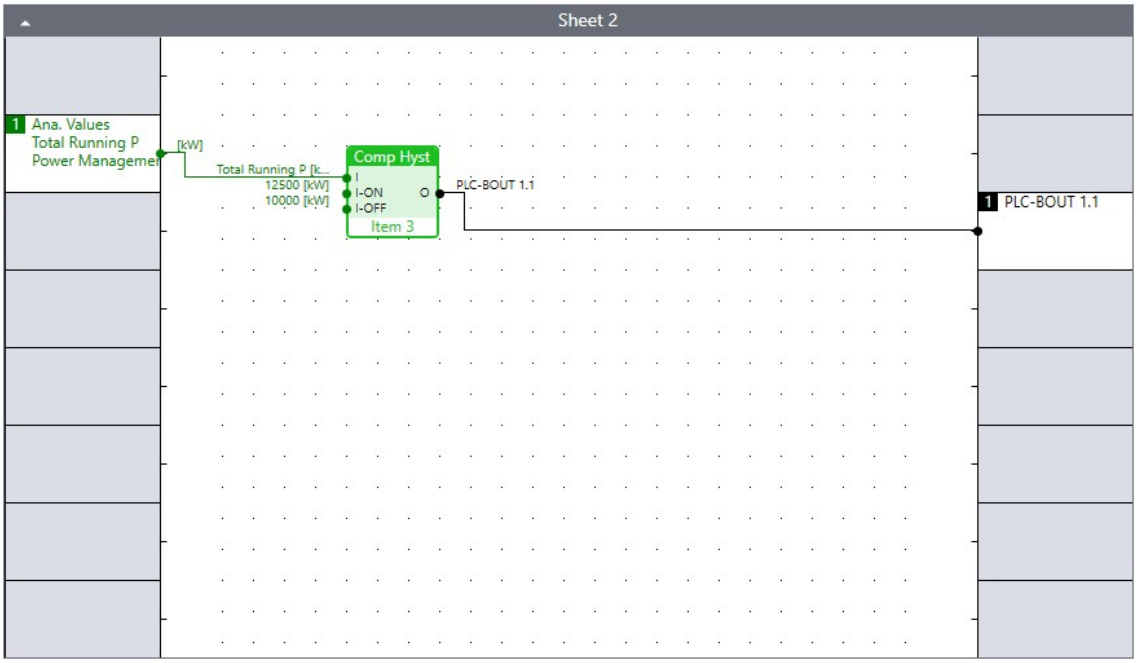
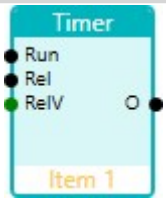


Image 15.12 Example of use Comp Hyst block

IMPORTANT: Please note the comparison levels cannot be changed during PLC execution, only by changing the configuration again.

7.2.3 Time functions

PLC Block	Delay	
Block icon	DB	
PLC Set	Standard	
The block delays input signal according to the selected Delay mode and actual inputs values.		

PLC Block	Timer	
Block icon	Ti	
PLC Set	Standard	
The block performs countdown timer according to the selected Timer mode and actual inputs values.		

Delay

PLC Group	Time functions	
PLC Set	Standard	
PLC Block ID	33	

Inputs

Input	Abbr.	Type	Range	Function
Input	I	Binary	0/1	Input signal to be delayed
Input time up	Up	Analog	0 .. 214 748 364,7 [s, m, h]	**Delay mode**: delay of the rising edge **Pulse mode**: pulse length generated by rising edge of the input
Input time down	Dn	Analog	0 .. 214 748 364,7 [s, m, h]	**Delay mode**: delay of the falling edge **Pulse mode**: pulse length generated by falling edge of the input
Input reset	Res	Binary	0/1	Resets the **Output** to logical 0.

Note: *After rising edge of **Input reset** the **Output** remains reset until new rising edge appears on the **Input** (when **Input reset** is deactivated already)*

Outputs

Output	Abbr.	Type	Range	Function
Output	Binary	Binary	0/1	Output signal

Description

This block can operate in two operating modes (**Delay mode**, **Pulse mode**) = the block mode is defined by the **Pulse on edge** checbox option - if checked, the **Pulse mode** is active.

- **Delay mode** - the rising edge at the **Output** is generated with a delay of the **Input time up** lenght when a rising edge is detected on the **Input**. A falling edge at the **Output** is generated with a delay of the **Input time down** length when a falling edge is detected on the **Input**. If the delayed falling edge at the **Output** arrived before the delayed rising edge, then no pulse would be generated at the **Output**.
- **Pulse mode** - a pulse of **Input time up** length is generated at the **Output** when a rising edge is detected, a pulse of **Input time down** length is generated at the **Output** when a falling edge is detected.

Note: *If **Input time up** or **Input time down** value is <0, the value is internally set to zero.*

Note: ***Input time up*** *and **Input time down** values can be constants or values from controller.*

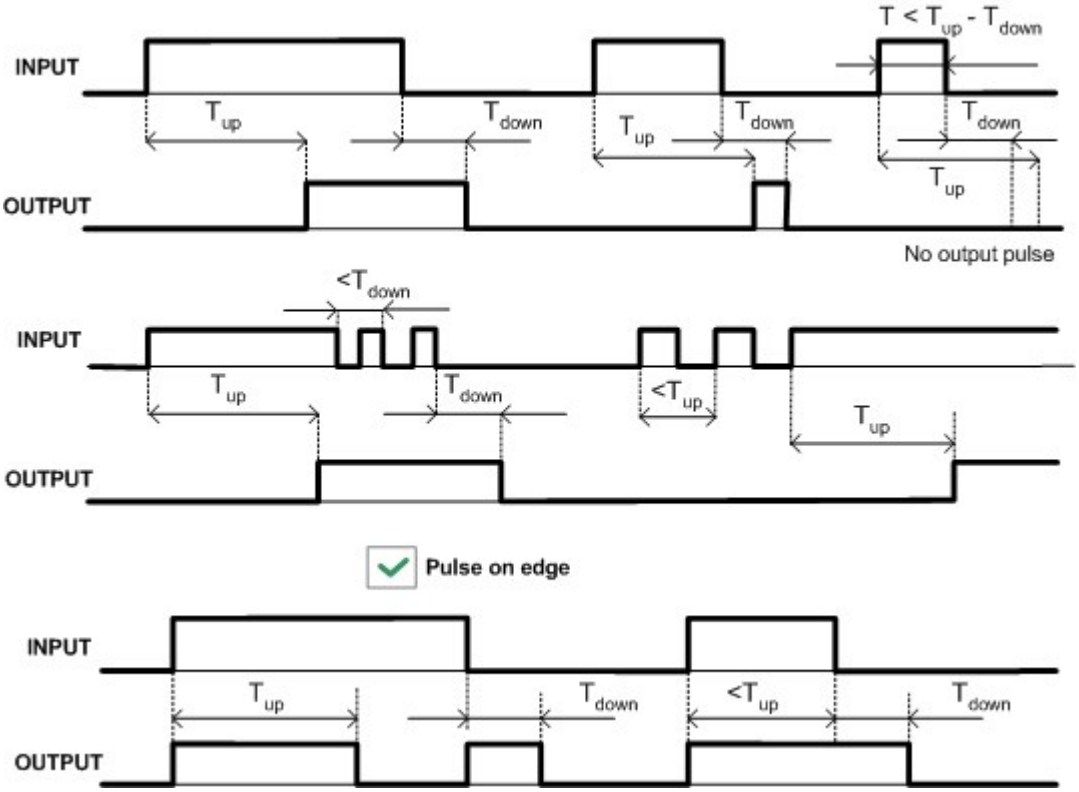


Image 15.13 Delay block modes principles (Delay mode / Pulse mode)

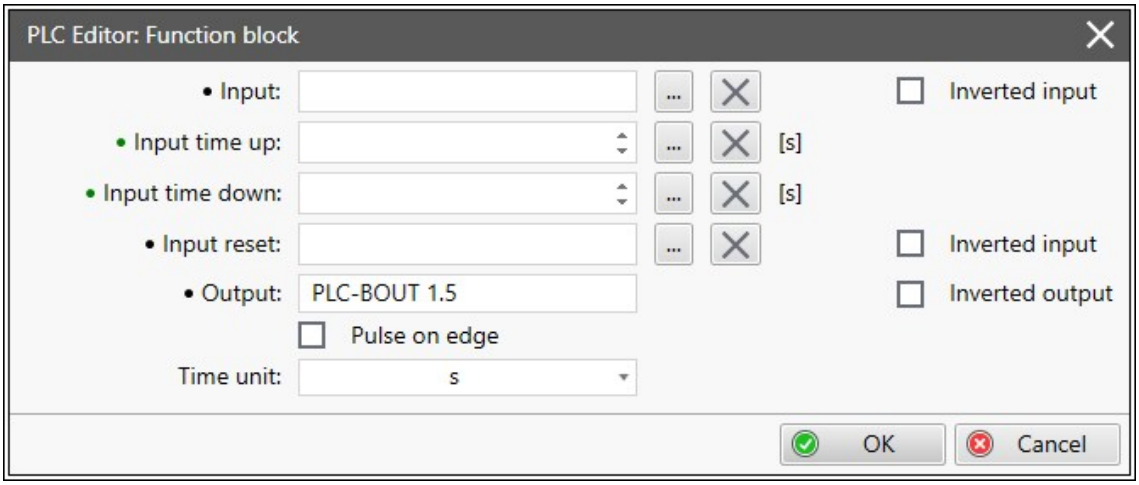
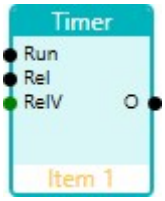


Image 15.14 Configuration of Delay block

back to Groups of PLC Blocks

Timer

PLC Group	Time functions	
PLC Set	Standard	
PLC Block ID	38	

Inputs

Input	Abbr.	Type	Range	Function
Run	Run	Binary	0/1	The timer runs only if this input is active or not connected
Reload	Rel	Binary	0/1	This input reloads the timer to the initial value (**Reload value**)
Reload value*	RelV	Analog	0,0 .. 214 748 364,7 [s]	Initial value of the timer

* means mandatory input(s).

Outputs

Output	Abbr.	Type	Range	Function
Output	O	Binary	0/1	Timer **Output**

Resources

Value	Type	Range	Function
Actual Timer Value	Analog	0,0 .. Reload value	Analog value that shows Actual Timer Value is available in **PLC Resources** value group. The index of the **PLC Resource$_x$** variable depends on current block order of execution (see also **PLC Execution**)

Note: *The PLC Resource index could be derived as described here **PLC Variables**.*

Description

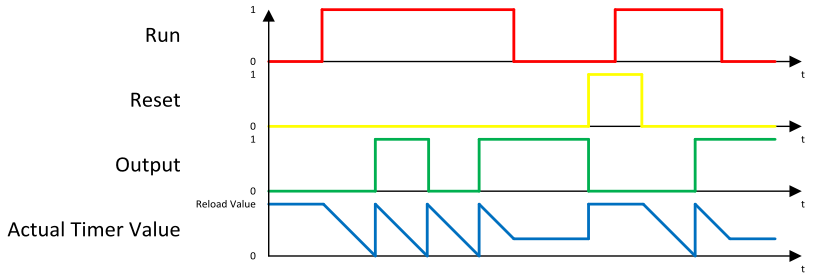
The block performs countdown Timer according to the selected **Timer mode** and actual inputs values.

The Timer mode could be selected as:

- **ComAp** timer mode = if the Timer block is to generate a periodic signal at its **Output**
- Timer mode **TP** = if the Timer block is to generate a pulse signal of defined width at its **Output**
- Timer mode **TON** = if the Timer block is to delay the rising edge of the **Input** by a defined time.
- Timer mode **TOFF** = if the Timer block is to delay the falling edge of the **Iutput** by a defined time.

Timer mode ComAp

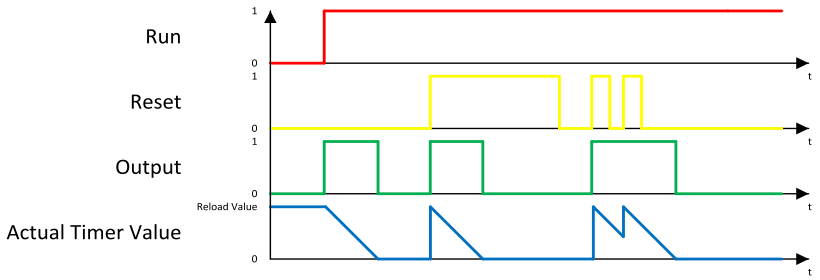
Comap



The Timer is counting down only when the **Run** is on and **Reset** is off. It is also reset to the **Reload value** if it reaches 0 or **Reset** is enabled. The state of the binary **Output** is negated whenever the Timer value is zero.

Timer mode TP

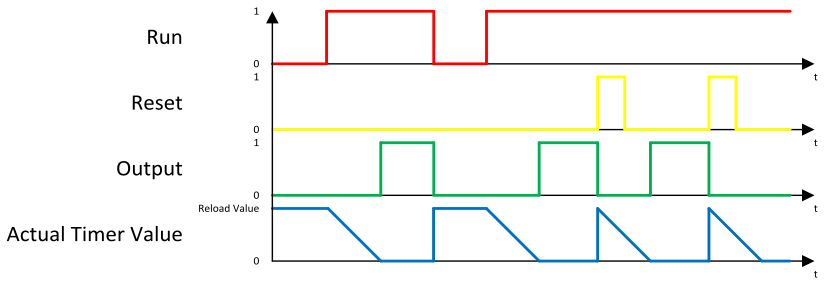
TP



The Timer counts down when **Run** is on.The **Reset** accepts only the rising edge and is required to load the **Reload value** to the actual Timer value. The **Output** is set as long as the **Actual Timer Value** is not equal to 0 (the countdown is in progress).

Timer mode TON

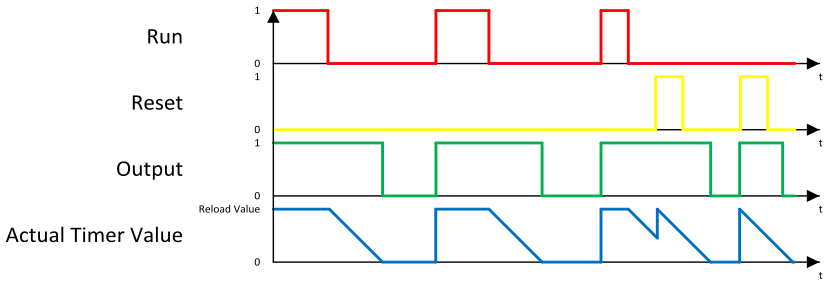
TON



The Timer starts counting down with the rising edge of **Run**. The falling edge of **Run**, like the rising edge of **Reset**, reloads the **Reload value** to actual Timer value. The **Output** is set when the **Actual Timer Value** is 0 (the countdown is finished).

Timer modeTOF

TOFF



The Timer starts counting down with the falling edge of the **Run**. The rising edge of **Run**, like the rising edge of **Reset**, reloads the **Reload value** to actual Timer value. The **Output** is set if the **Actual Timer Value** is not equal to 0 (the countdown is in progress).

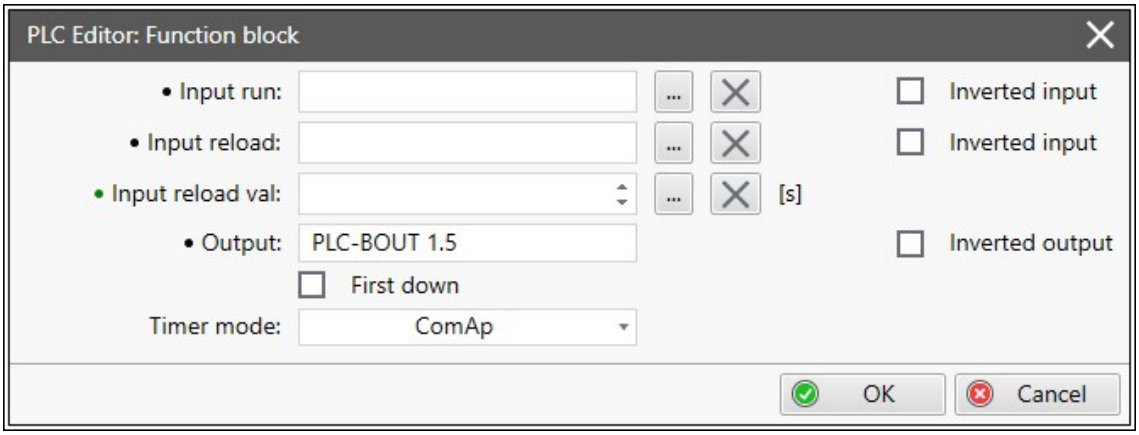


Image 15.15 Configuration of Timer block

Note: *For* ***ComAp*** *Timer mode: if you want the* ***Output*** *to start at logic 0, check the* ***First down*** *option. Otherwise, the* ***Output*** *will start at logical 1.*

IMPORTANT: For ComAp Timer mode: if no inputs are connected and the First down option is not checked, the Output is active.

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Time Functions Blocks Examples

Example use of Timer

To generate a rectangular signal for some testing purposes (e.g. for commisionning of control loop), a Timer block can be used in ComAp mode of operation.

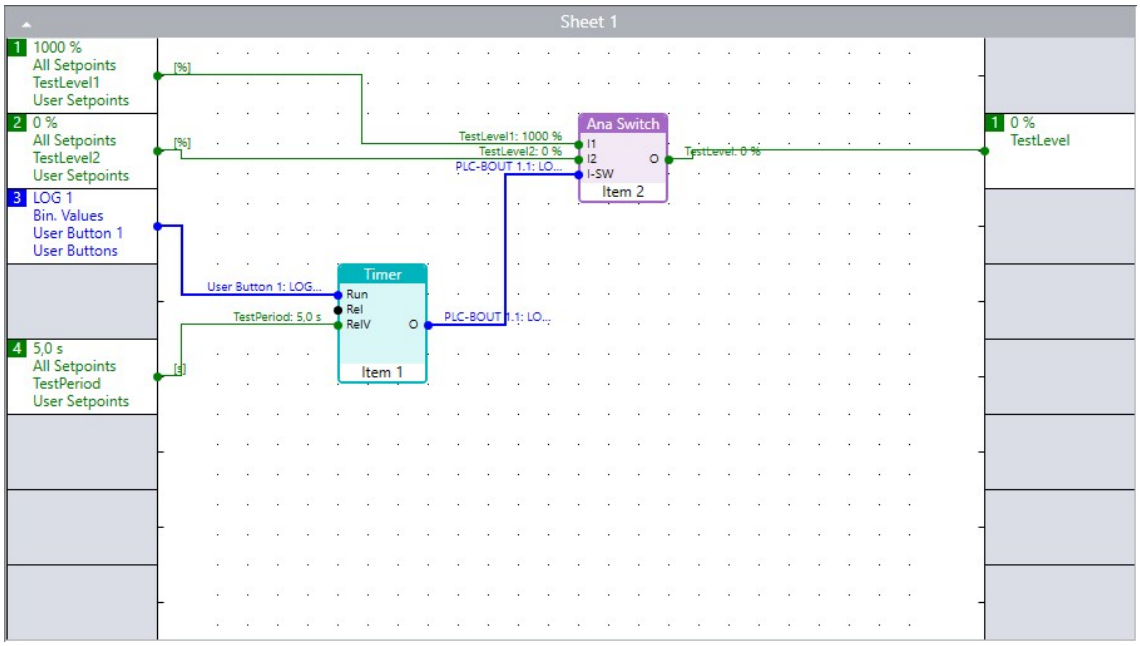
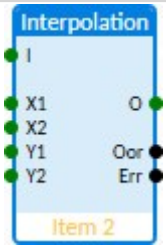
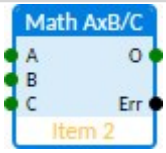


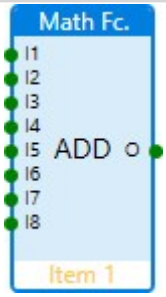
Image 15.16 Example of use Timer block in ComAp mode

In the above diagram, the Timer block is used as generator of rectagular signal with a period defined by TestPeriod user setpoint value. The Ana switch blockis then used as the source of the final TestLevel value, periodically changing between the values TestLevel1 and TestLevel2.

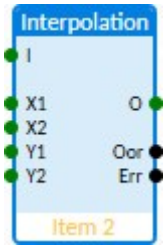
7.2.4 Math operations

PLC Block	Interpolation	
Block icon	I	
PLC Set	Standard	
The block performs a linear transformation of the Input value with the limitation.		

PLC Block	Math AxB/C	
Block icon	R3	
PLC Set	Standard	
The block performs the mathematic operation of three operands (multiplication and dividing) - aka RuleOfThree.		

PLC Block	Math Fc	
Block icon	Mf	
PLC Set	Standard	
The block performs mathematic operation of 2 - 8 analog operands based on the selecter operation type.		

Interpolation

PLC Group		
PLC Set	Standard	
PLC Block ID	34	

Inputs

Input	Abbr.	Type	Range	Function
Input	I	Analog	$-2^{32}-1$ .. $+2^{32}-1$	Input value
X1	X1	Analog	$-2^{32}-1$ .. $+2^{32}-1$	Low X limit (Input low limit)
X2	X2	Analog	$-2^{32}-1$ .. $+2^{32}-1$	High X limit (Input high limit)
Y1	Y1	Analog	$-2^{32}-1$ .. $+2^{32}-1$	Low Y limit (Output low limit)
Y2	Y2	Analog	$-2^{32}-1$ .. $+2^{32}-1$	High Y limit (Ouput high limit)

Outputs

Output	Abbr.	Type	Range	Function
Output	O	Analog	Y1 .. Y2	Transformed value
Out of Range	Oor	Binary	0/1	Set when **Input** value is outside range <**X1**, **X2**>
Data Invalid	Err	Binary	0/1	Set when the **Output** value is invalid

Description

This block performs a linear transformation of the **Input** value with limitation. The transformation function is defined by two pairs of points **[X1, Y1]** and **[X2, Y2]**.

If the **Input** is within the interval **<X1, X2>** the **Output** is given by the linear conversion. If the **Input** lies outside this interval, the **Output** is limited to either the high or low limit given by **Y1** or **Y2** and **Out of Range** is set. If any of the inputs is invalid, **Data Invalid** is set and **Output** is set to an invalid value.The resolution and dimensions of the **X1** and **X2** should be the same as the **Input**.

The **Output**, **Y1**, **Y2** has **Resolution** and **Dimension** according to the block settings.

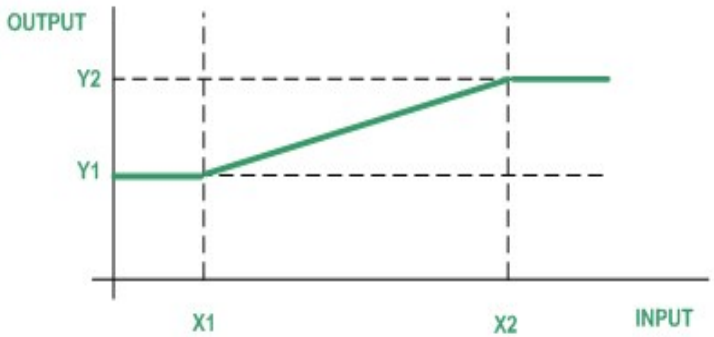


Image 15.17 Principle of Interpolation

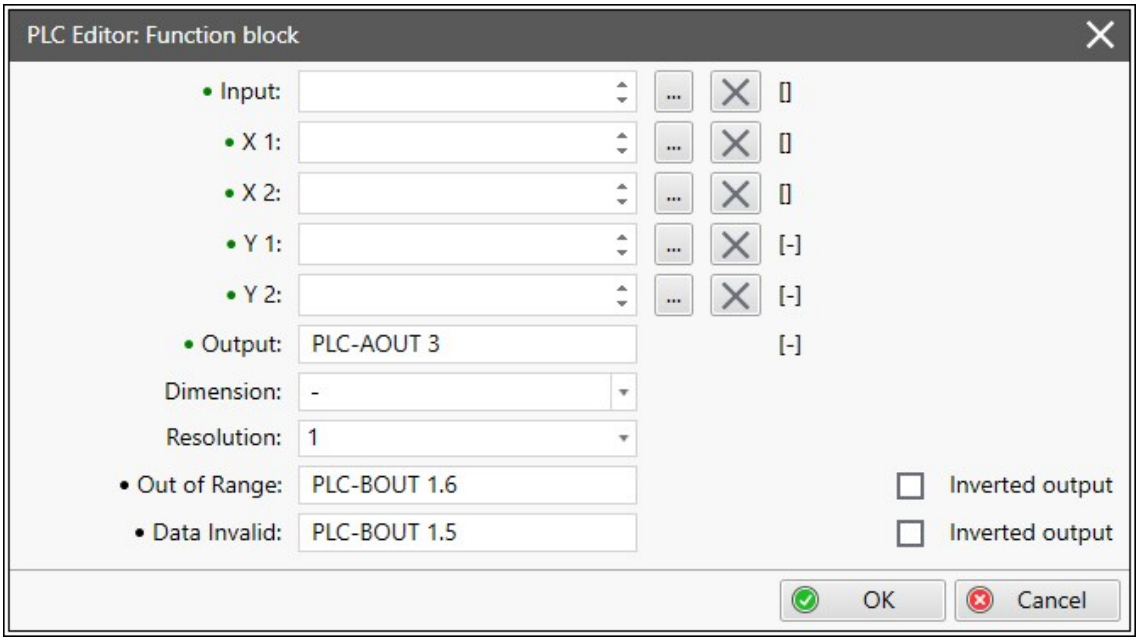
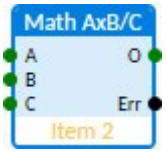


Image 15.18 Configuration of Interpolation block

back to Groups of PLC Blocks

Math AxB/C

PLC Group		
PLC Set	Standard	
PLC Block ID	35	

Inputs

Input	Abbr.	Type	Range	Function
Input A	A	Analog	$-2^{32}-1$ .. $+2^{32}-1$	First multiplicant
Input B	B	Analog	$-2^{32}-1$ .. $+2^{32}-1$	Second multiplicant
Input C	C	Analog	$-2^{32}-1$ .. $+2^{32}-1$	Divider

Note: *If the **Input C** (Divider) value is zero (0), the **Data invalid** output is set.*

Note: *If any **Input$_x$** have invalid value, the **Data invalid** output is set and the **Output** also has an invalid value.*

Outputs

Output	Abbr.	Type	Range	Function
Output	O	Binary	$-2^{32}-1$ .. $+2^{32}-1$	Result of the $O = \frac{A \cdot B}{C}$ operation
Data invalid	Err	Binary	0/1	Set when **Output** is out of range or when dividing by zero occurrs

Description

The block performs the mathematical operation AxB/C.

In case of invalid data on any of the inputs, the**Output** is set to an invalid value and **Data Invalid** is set.

The **Output** has **Resolution** and **Dimension** according to the block settings.

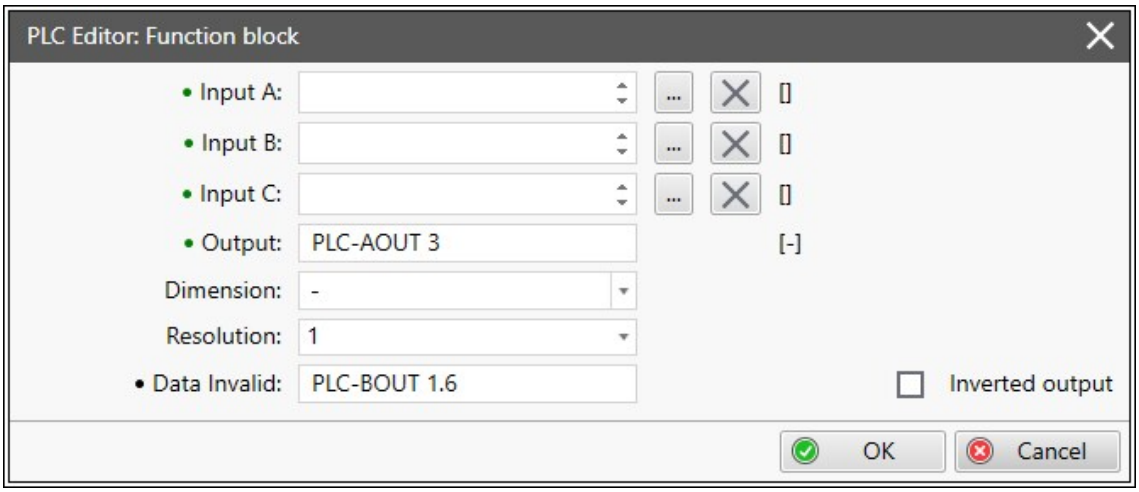
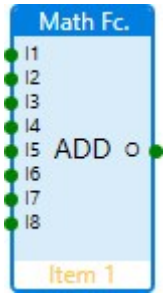


Image 15.19 Configuration of Math AxB/C block

back to Groups of PLC Blocks

Math Fc.

PLC Group		
PLC Set	Standard	
PLC Block ID	17	

Inputs

Input	Abbr.	Type	Range	Function
Input 1	I1	Analog	$-2^{32}-1$ .. $+2^{32}-1$	Input 1
Input 2	I2	Analog	$-2^{32}-1$ .. $+2^{32}-1$	Input 2
Input 3	I3	Analog	$-2^{32}-1$ .. $+2^{32}-1$	Input 3 (optional)
Input 4	I4	Analog	$-2^{32}-1$ .. $+2^{32}-1$	Input 4 (optional)
Input 5	I5	Analog	$-2^{32}-1$ .. $+2^{32}-1$	Input 5 (optional)
Input 6	I6	Analog	$-2^{32}-1$ .. $+2^{32}-1$	Input 6 (optional)
Input 7	I7	Analog	$-2^{32}-1$ .. $+2^{32}-1$	Input 7 (optional)
Input 8	I8	Analog	$-2^{32}-1$ .. $+2^{32}-1$	Input 8 (optional)

Outputs

Output	Abbr.	Type	Range	Function
Output	O	Analog	$-2^{32}-1$ .. $+2^{32}-1$	Result of the mathematical operation

Description

This block performs basic mathematical operations of 2 to 8 operands based on selected function type.

All invalid inputs are ignored. If any configured input contains an invalid value and at least one configured input is valid, the **Output** has value evaluated from only valid inputs based on the selected function. If all configured inputs are invalid, the **Output** has an invalid value.

The **Output** has a **Resolution** and **Dimension** according to the block settings.

Function	Output
ADD - Addition	Input 1 + Input 2 + … + Input N
SUB - Substraction	Input 1 - Input 2 - … - Input N
|SUB| - Absolute value of substraction	ABS(Input 1 - Input 2 - … - Input N)
AVG - Average	Input 1 + Input 2 + … + Input N) / N*
MIN - Minimal value	MIN(Input 1, Input 2, … ,Input N)
MAX - Maximal value	MAX(Input 1, Input 2, … ,Input N)

Note: *In case of AVG operation type the N* is number of inputs with valid value.*

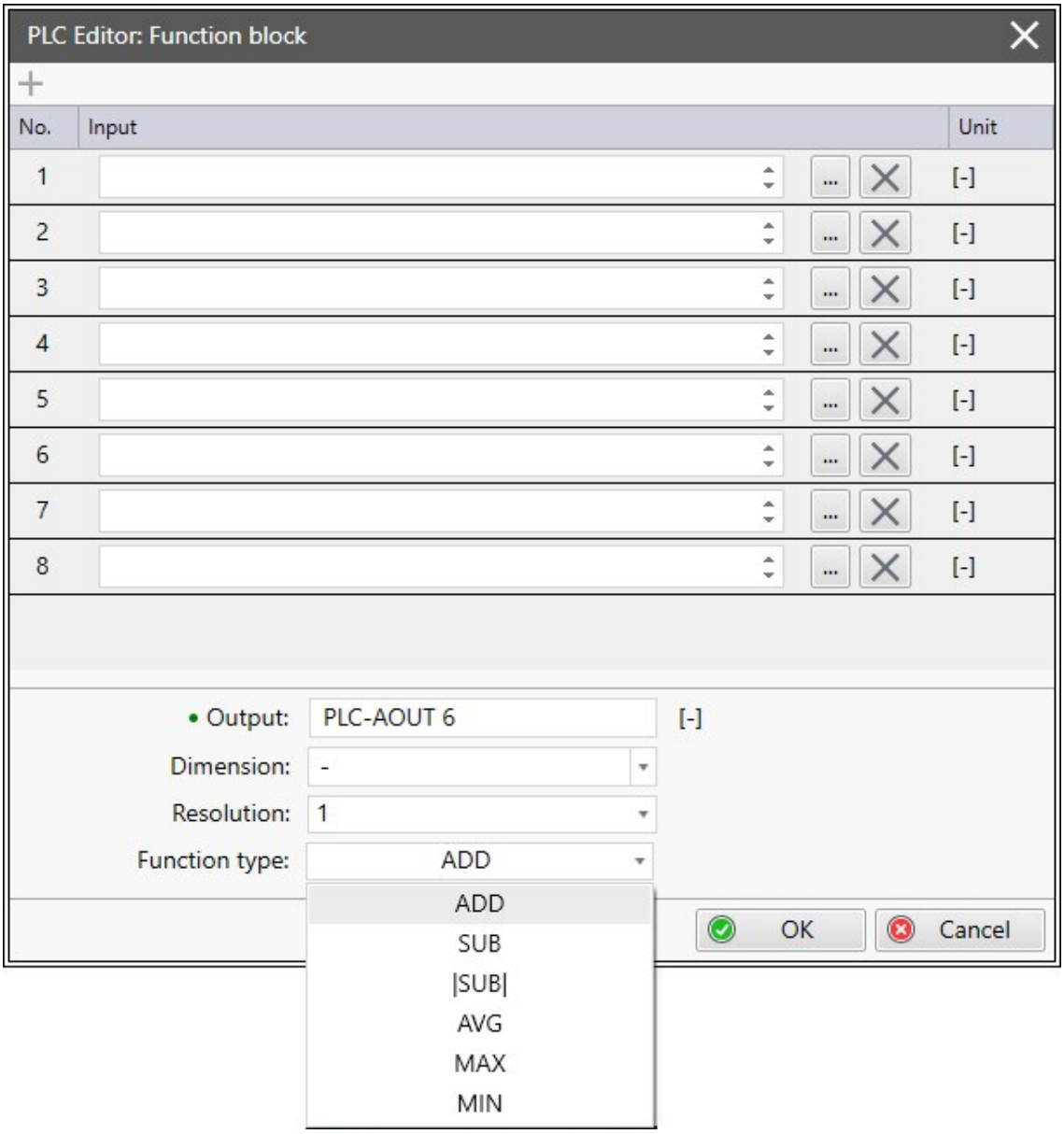


Image 15.20 Configuration of Math Fc. block

back to Groups of PLC Blocks

Math Functions Blocks Examples

Example use of Interpolation

The Interpolation block can be used, for example, to implement a piecewise linear approximation of the sensor conversion characteristic.

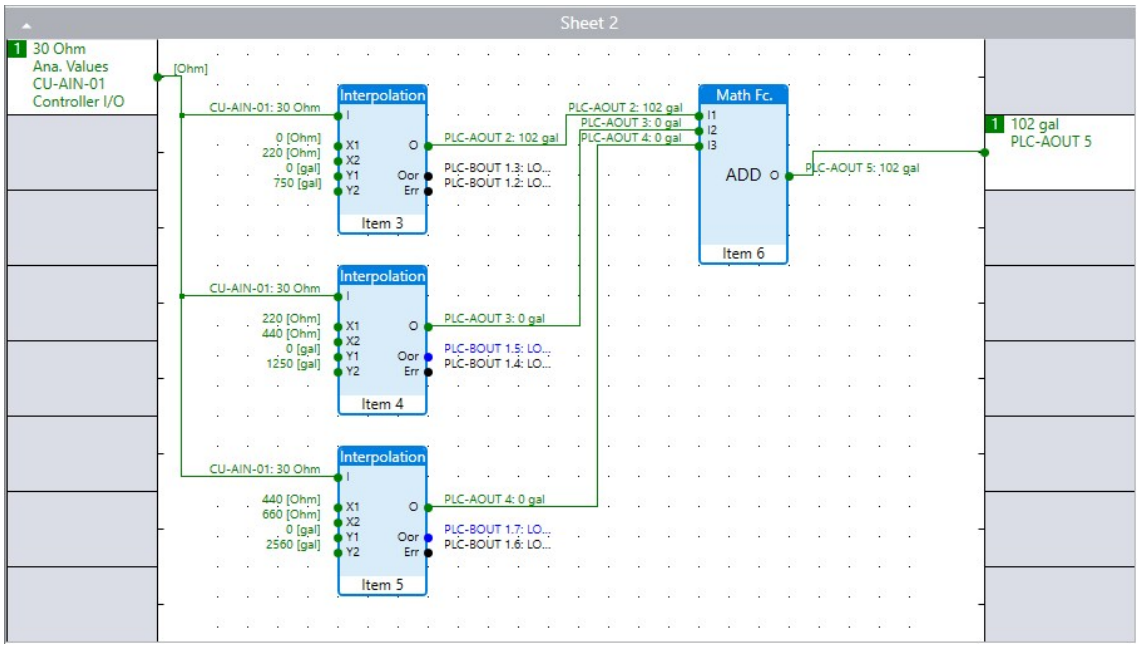
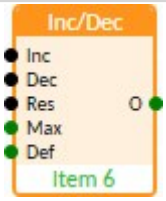


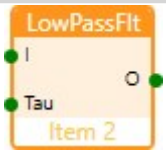
Image 15.21 Example of use Interpolation blocks

Here, three Interpolation blocks are used to implement three interleaved linear transfer intervals that together form the final conversion characteristic.

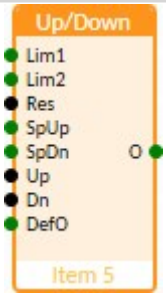
Note: *This task could be of course solved by configuration of User Sensor.*

7.2.5 Ramp functions

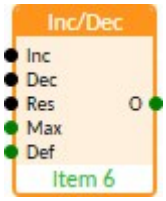
PLC Block	Inc/Dec	
Block icon	Inc	
PLC Set	Standard	
The block increments/decrements Output based on rising edge on Increment/Decrement		

PLC Block	LowPassFlt	
Block icon	Lf	
PLC Set	Standard	
The block performs first-order low pass filtering of input value.		

PLC Block	Ramp	
Block icon	R	
PLC Set	Standard	
The block limits maximal rate of change of the input value and provides this value on the output.		

PLC Block	UpDown	
Block icon	Up	
PLC Set	Standard	
The block provides an analog value controlled by binary up / down inputs with a defined rate of increase/decrease.		

Inc/Dec

PLC Group		
PLC Set	Standard	
PLC Block ID	22	

Inputs

Input	Abbr.	Type	Range	Function
Increment	Inc	Binary	0/1	Rising edge increase the **Output** value
Decrement	Dec	Binary	0/1	Rising edge decrease the **Output** value
Reset	Res	Binary	0/1	Rising edge resets **Output** to **Default**
Maximum	Max	Analog	0 .. $+2^{32}$-1	Maximum value of **Output**
Default	Def	Analog	0 .. $+2^{32}$-1	Initial value of **Output**

Note: *All inputs are optional (not mandatory), so only the necessary input needs to be configured.*

Outputs

Output	Abbr.	Type	Range	Function
Output	O	Analog	0 .. Maximum	Output value

Resources

Value	Type	Range	Function
Actual Inc/Dec Value	Analog	0 .. Maximum	Analog value that contains Actual Inc/DecValue is available in **PLC Resources** value group. The index of the **PLC Resource$_x$** variable depends on current block order of execution (see also **PLC Execution**)

Note: *The PLC Resource index could be derived as described here **PLC Variables**.*

Description

The block increments or decrements **Output** by one based on rising edge on **Increment** or **Decrement**.

If the **Increment** and **Decrement** edges arrive simultaneously, the **Output** value does not change.

The initial value of **Output** is set by **Default**, the maximum value is specified by **Maximum**.

If the **Cycle** option is selected, the counting will continue over the upper / lower limit (**0** / **Maximum**):

- If the counter value is at **Maximum** and incrementation is coming, the counter will be **0** again.
- If the counter value is at **0** and decrementing is coming, the counter will have be at **Maximum**.

The **Output** can be reset by rising edge on **Reset**.

The **Output** has a **Resolution** and **Dimension** according to the block settings.

Note: *If both the inputs **Increment** and **Decrement** are active, the **Output** value is not changed.*

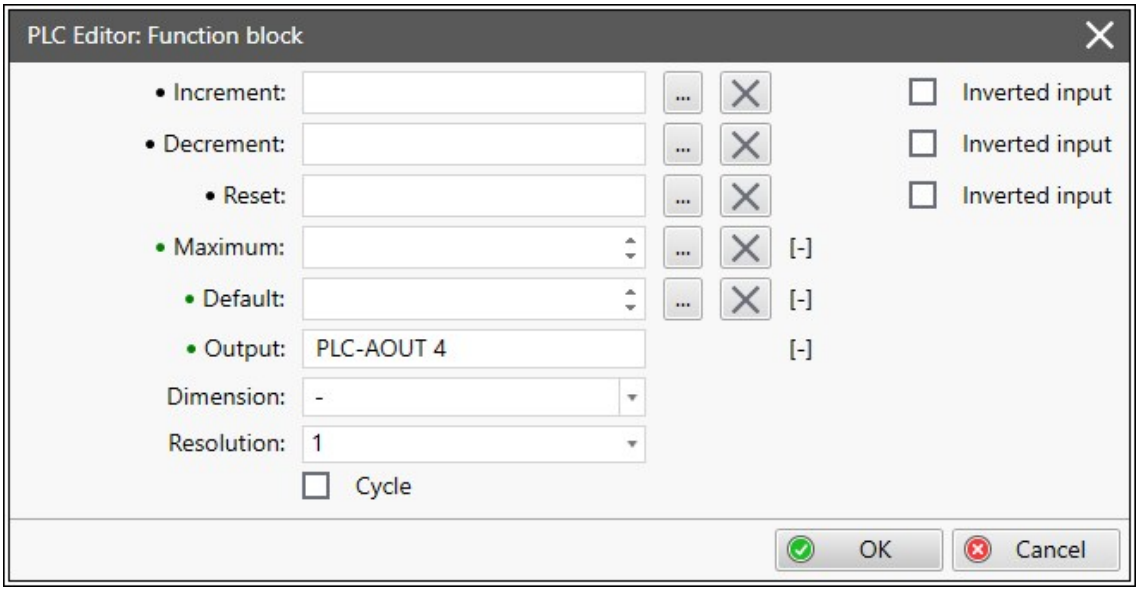


Image 15.22 Configuration of Inc/Dec block

IMPORTANT: When the controller is powered off the Output value is not preserved.

back to Groups of PLC Blocks

LowPassFlt

PLC Group		
PLC Set	Standard	
PLC Block ID	40	

Inputs

Input	Abbr.	Type	Range	Function
Input	I	Analog	$-2^{32}-1$ .. $+2^{32}-1$	Input Value
Tau	Tau	Analog	0,0 .. 60,0 [s]	Time Constant of the filter

Outputs

Output	Abbr.	Type	Range	Function
Output	O	Analog	$-2^{32}-1$ .. $+2^{32}-1$	Filtered **Input**

Description

The block performs the function of the first-order low pass filter.

Evaluation of 1st order IIR filter is according the equation: $y_k = a_1 \cdot y_{k-1} + b_0 \cdot x_k$

Internaly use the analog filter time constant (for $a_1 + b_0 = 1$):

$$\tau = \frac{a_1}{(1-a_1)} . \Delta T$$

$$a_1 = \frac{\tau}{(\tau+\Delta T)}$$

$$b_0 = (1 - a_1)$$

Typical usage of this function is filtering of a value whose instantaneous value fluctuates rapidly around its mean, which is changing slower.

The **Output** has a **Resolution** and **Dimension** according to the block settings.

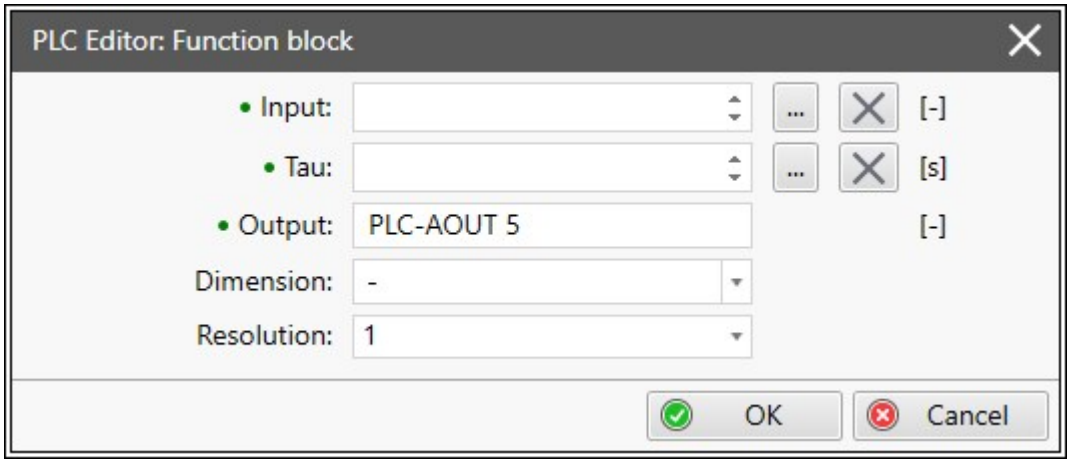
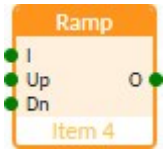


Image 15.23 Configuration of LowPassFlt block

back to Groups of PLC Blocks

Ramp

PLC Group		
PLC Set	Standard	
PLC Block ID	19	

Inputs

Input	Abbr.	Type	Range	Function
Input*	I	Analog	$-2^{32}-1$ .. $+2^{32}-1$	Value to be ramped
Up	Up	Analog	$-2^{32}-1$ .. $+2^{32}-1$	Maximal rising rate of the **Output** per second
Down	Dn	Analog	$-2^{32}-1$ .. $+2^{32}-1$	Maximal lowering rate of the **Output** per second

* mandatory input(s)

Outputs

Output	Abbr.	Type	Range	Function
Output	O	Analog	$-2^{32}-1$ .. $+2^{32}-1$	Ramped value

Description

This block limits maximal rate of change of **Output**.

The maximal rates **Up** and **Down** are adjustable separately and ramping is based on enabled ramps . The **Output** has a **Resolution** and **Dimension** according to the block settings.

Function	Description
Enabled Up	**Output** can be ramped only up.
Enabled Down	**Output** can be ramped only down.
Enabled Up/Down	**Output** can be ramped up and down.

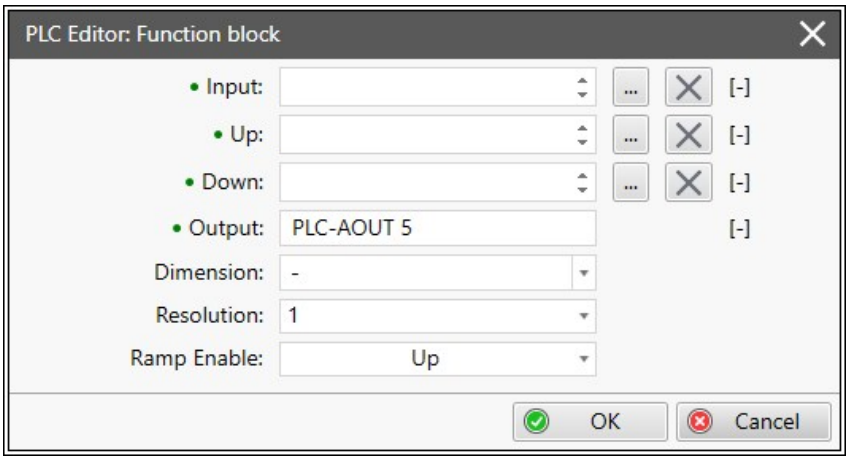
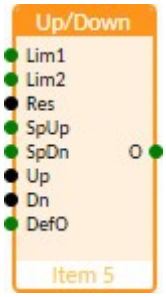


Image 15.24 Configuration of Ramp block

back to Groups of PLC Blocks

Up/Down

PLC Group		
PLC Set	Standard	
PLC Block ID	20	

Inputs

Input	Abbr.	Type	Range	Function
Limit 1	Lim1	Analog	$-2^{32}-1$ .. $+2^{32}-1$	Lower limit of the **Output**
Limit 2	Lim2	Analog	$-2^{32}-1$ .. $+2^{32}-1$	Upper limit of the **Output**
Reset	Res	Binary	0/1	When active resets the **Output** to **Default Output Value**
Speed Up	SpUp	Analog	$-2^{32}-1$ .. $+2^{32}-1$	**Output** increase rate per second
Speed Down	SpDn	Analog	$-2^{32}-1$ .. $+2^{32}-1$	**Output** decrease per second
Up	Up	Binary	0/1	Activates **Output** increase
Down	Dn	Binary	0/1	Activates **Output** decrease
Default Output Value	DefO	Analog	$-2^{32}-1$ .. $+2^{32}-1$	Initial value of **Output**

Outputs

Output	Abbr.	Type	Range	Function
Output	O	Analog	Limit 1 .. Limit 2	Output value

Description

The block provides an analog value controlled by binary **Up** / **Down** inputs with a defined rate of increase/decrease.

The ramp speed is set using the **Speed Up** and **Speed Down** functions.

The output limit is set using **Limit 1** (low limit) and **Limit 2** (high limit). The default **Output** value is set using **Default Output Value**.

Activate the **Reset** input to reset the **Output** value to the **Default Output Value**.

The **Output** has a **Resolution** and **Dimension** according to the block settings.

IMPORTANT: If both the inputs Up and Down are active, the Output is set to Default Output Value.

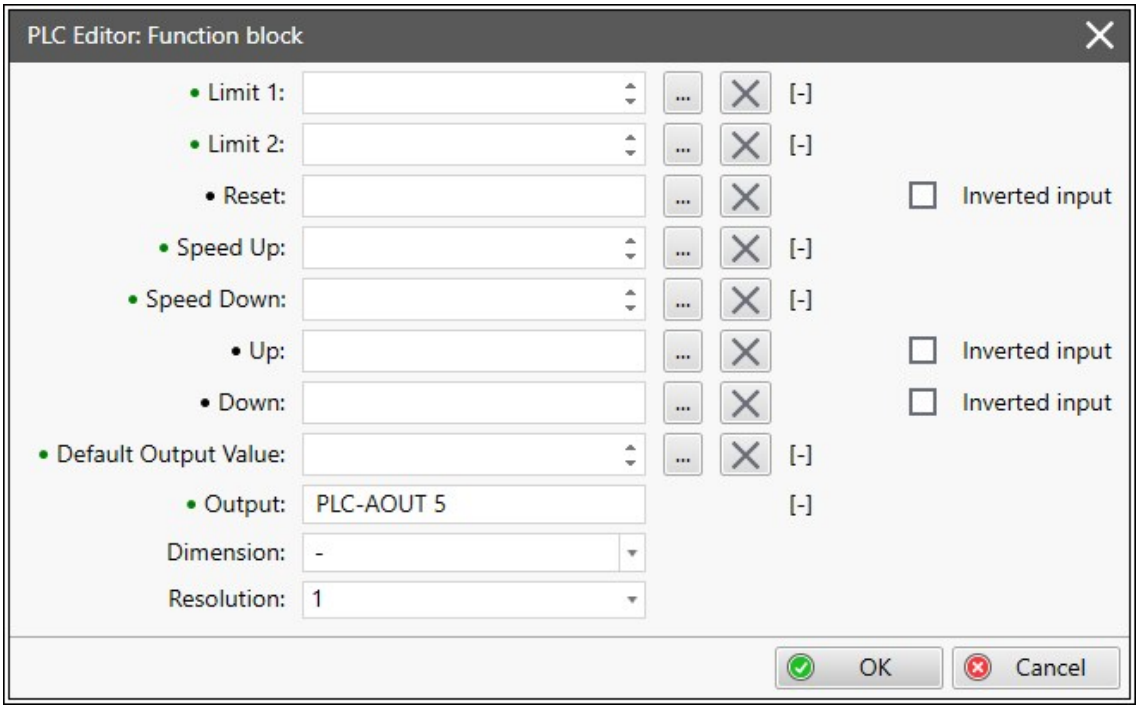


Image 15.25 Configuration of Up/Down block

back to Groups of PLC Blocks

Ramp Functions Blocks Examples

Example use of Inc/Dec

The Inc/Dec block together with the AnaSwitch8 and two Decomposers could be used as cam switch:

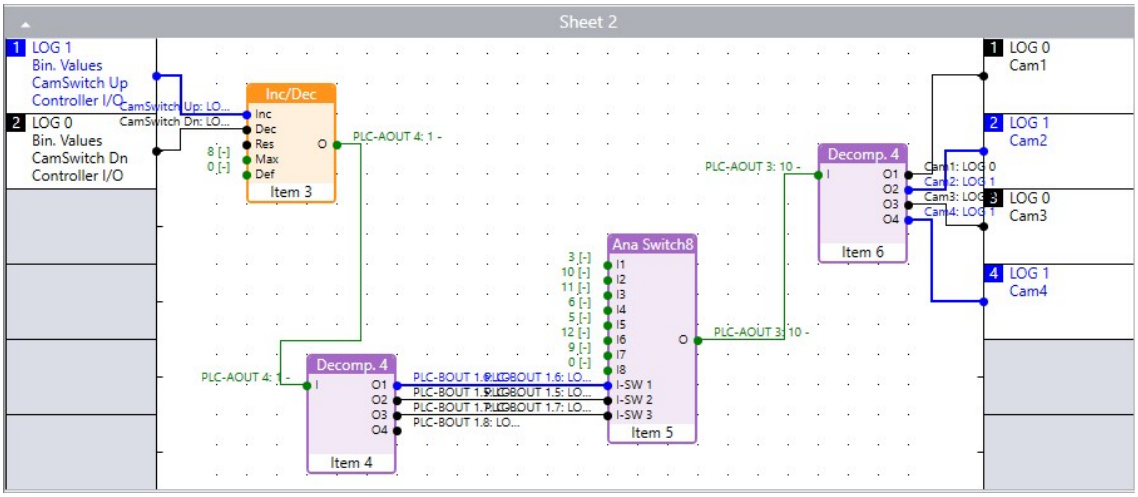
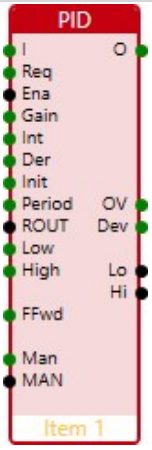
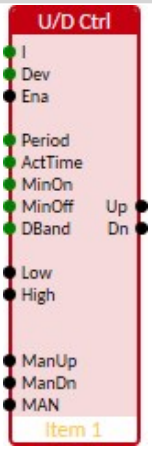


Image 15.26 Example of Inc/dec block use as cam switch

The above diagram shows the actual procesing of two binary signals Up / Down intended to move the "virtual" cam switch.The internal value of the Inc/Dec counter is then converted to the desired state of the Cam_x outputs using the AnaSwitch8 block. The switching of the Cam_x outputs is defined according to the table below.

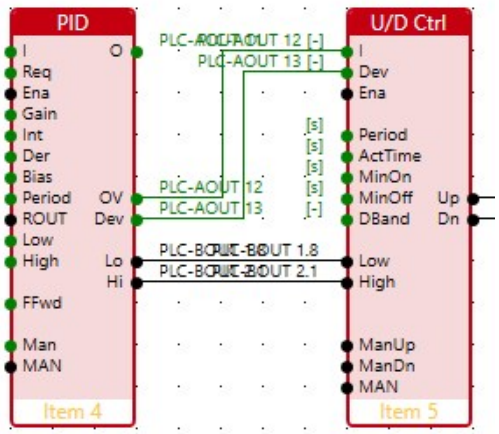
Position Inc/Dec	Cam Value AnaSwitch8	Cam 1 Decomp4.O1	Cam 2 Decomp4.O2	Cam 3 Decomp4.O3	Cam 4 Decomp4.O4
0	3	0	0	1	1
1	**10**	**1**	**0**	**1**	**0**
2	11	1	0	1	1
3	6	0	1	1	0
4	5	0	1	0	1
5	12	1	1	0	0
6	9	1	0	0	1
7	0	0	0	0	0

7.2.6 Regulators

PLC Block	PID	
Block icon	PI	
PLC Set	Extended	
The **PID** block performs computation of PID feed-back control algorithm, having ability to add feed-forward path, with output limitation and manual control.		
PLC Block	U/D Ctrl	
Block icon	UD	
PLC Set	Extended	

The **U/D Ctrl** block acts as an **Up/Down Control** unit (relay control block) with binary up/down outputs and adjustable control period.

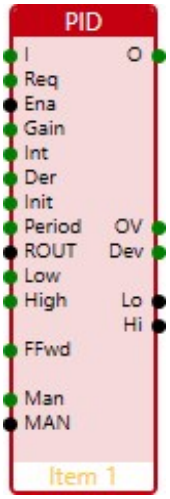
Note: *These blocks are used together to perform PID controller with relay output ("Binary PID")*

	The **U/D Ctrl** block (Up/Down relay Control block) is intended for use as an output stage of the primary controller, converting its analog control action to up/down outputs (PWM controlled). The **PID** block and **U/D Ctrl** block connected together thus forms PID controller with two relay controll **Up** / **Down** binary outputs.

Note: *The term controller, used in this chapter to mean a control block ("regulator"), may be mixed up with the term controller used for the ComAp control unit itself (and/or the firmware installed in it). Therefore, in this chapter the term* ***PID controller*** *or simply* ***controller*** *will be used for the PLC control block and* ***ComAp controller*** *for the ComAp control unit meaning.*

PID Block

PID

PLC Group		
PLC Set	Extended	
PLC Block ID	41	

Inputs

Input	Abbr.	Type	Range	Function
Input Value*	I	Analog	$-2^{32}-1$ .. $+2^{32}-1$	Actual (controlled) value aka "process value".
Requested Value*	Req	Analog	$-2^{32}-1$ .. $+2^{32}-1$	Required value aka "setpoint value".
PID Enable	Ena	Binary	0/1	Enable the PID.
Gain*	Gain	Analog	0,00 .. 100,00	Gain of the PID controller K. The value 0 turns the controller off.
Int	Int	Analog	0,00 .. 120,00 s	Integration time constant T_i. The value 0 disables the integrating part.
Der	Der	Analog	0,00 .. 4,00 s	Derivation time constant T_d. The value 0 disables the derivating part.
Init Value*	Init	Analog	-10 000 .. 10 000	The Init Value is set to the **Output** when PID Enable is not active or there is an invalid value on the Input Value of the controller.
Period*	Per	Analog	0,1 - 3250,0 s	PID evaluation period.
Reverse Output	ROUT	Binary	0/1	Reverse Output: off = higher PID output → higher process value (default) on = higher PID output → lower process value
Low Limit*	Low	Analog	-10 000 .. 10 000	The low limit (minimum) of the

				Output.
High Limit*	High	Analog	-10 000 .. 10 000	The high limit (maximum) of the **Output**.
FeedForward Value	FFwd	Analog	$-2^{32}-1$ .. $+2^{32}-1$	Feedforward control value.
FeedForward Weight		Analog	-10^{13} .. 10^{13}	Feedforward control value weight Wff (default 0)
Manual Value	Man	Analog	-10 000 .. 10 000	Controller output value in **MANual mode**.
MANual Mode	MAN	Binary	0/1	Manual Mode: off - **AUT**omatic mode (default) on - **MAN**ual mode

* mandatory input(s).

Note: *If **PID Enable** input is not connected the controller is enabled.*

Note: *When **PID Enable** is not true or there is an invalid value on the **Input Value**, the **Output** is set to **Init Value**.*

Note: *Negative values of **Gain** are not allowed, use the **Reverse Output** input for such a purpose.*

Note: *The **Init Value** is not limited by the **Low Limit** and **High Limit**. **Output** value in the Init mode is given in a whole range of regulator output (from -10 000 to 10 000).*

Note: *There is a difference between **Init Value** (inactive PID block) and **Manual Value** - **Manual Value** is available only while the **PID Enable** is true, **MAN** mode is enabled and is limited by the **High Limit** and **Low Limit**.*

Note: *The **Period** should be adjusted according to the response speed of the system, e.g. longer period for slower systems, a shorter period for faster systems.*

Outputs

Output	Abbr.	Type	Range	Function
Output	O	Analog	-10 000 .. 10 000	Process value (controller output) "control value".
Output Velocity	OV	Analog	-10 000 .. 10 000	Derivation of controller **Output** "speed of control value".
Control Deviation	Dev	Analog	-10 000 .. 10 000	Control deviation (= Requested Value - Input Value).
Out Low Limit	Lo	Binary	0/1	PID Controller output reaches the **Low Limit**
Out High Limit	Hi	Binary	0/1	PID Controller output reaches the **High Limit**

Description

The **PID** block is a PID controller, created by combining a proportional, an integration and a derivative controller

together (all forming the feed-back controller) with an optional forward control path (intended for the feed-forward control).

The main purpose of using a PID controller is to eliminate the entry control deviation by changing the output control value (also called the manipulated value). The **Control Deviation** is evaluated as the difference between the **Requested Value** (setpoint value) and the **Input Value** (process value).

If the controller is operating in automatic mode (**MANual mode** input is inactive), the action value is calculated according to the control law equation. In the case of manual control (**MAN mode** input is active), the value of the **Manual Value** is used instead. In both cases, the **Output** value is limited by the **Low Limit** and **High Limit** limit values.

The PID block features:

- Standard controller parameters (ISA Form) with anti-windup feature.
- Limitation of the control (process) value (block output).
- Adjustable evaluation period.
- Feed-forward input (with feed-forward gain parameter).
- AUT/MAN switch with manual setpoint value.
- ROUT switch (reversing of control value polarity).

The function of the PID controller can be disabled by the **PID Enable**. While the regulator is disabled, the **Output** is set to a **Init Value**.

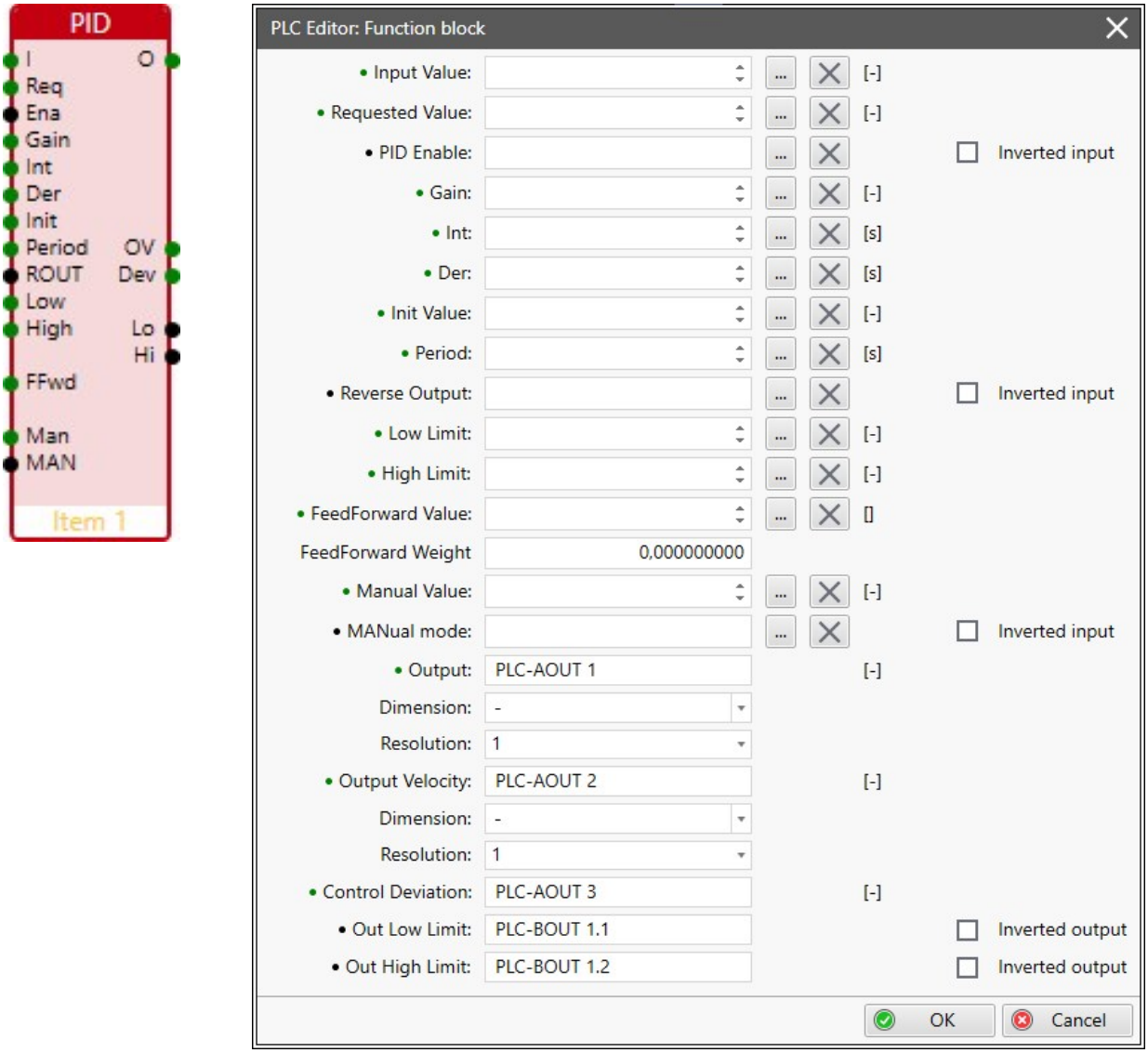


Image 15.27 Configuration of PID block

back to Groups of PLC Blocks

PID Block Details

PID Principle Block Diagram

The following figure shows the basic block diagram of a PID controller with feed-forward path and manual control (as implemented in PLC block).

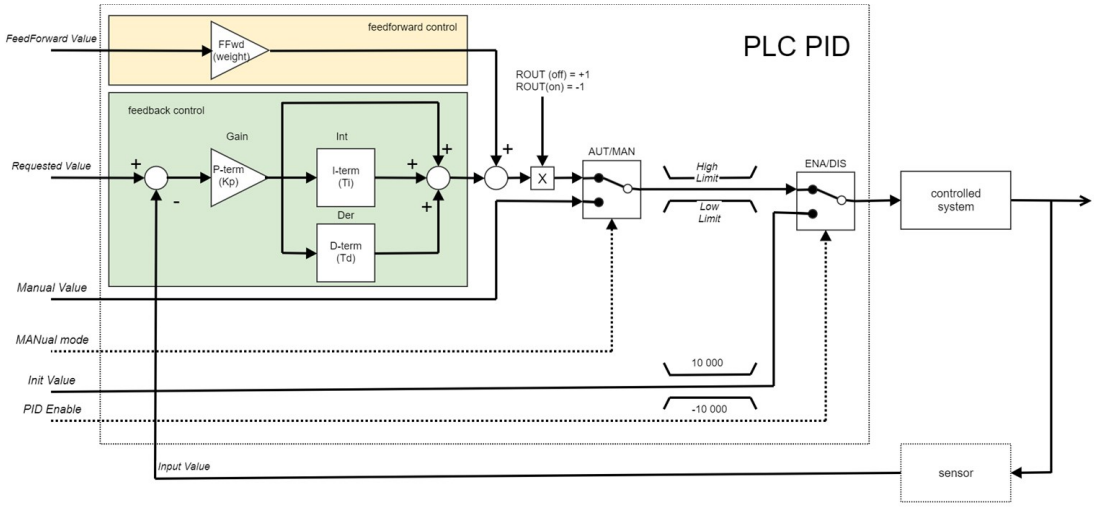


Image 16.1 PID principle block diagram

The controller performs following control-law equation:

$$u_{k+1} = u_k + K_P \cdot (\Delta_k (w - y) + \frac{\Delta T}{K_I}(w_k - y_k) + \frac{K_D}{\Delta T}(\varepsilon_k - 2\varepsilon_{k-1} + \varepsilon_{k-2})) + K_{ff} * ffwd$$

w	The request value.
y	The actual value.
u	The process value (controller output) ("control value" or "manipulated value").
ε	The control error (difference between requested and actual values $\varepsilon = w - y$)
K_p	The gain for the proportional part of PID controller
K_i	The integral term constant for the integral part of PID controller
K_d	The derivative term constant for the derivative part of PID controller
K_{ff}	The gain for the feed-forward path

Feed-forward and feedback control

The control system performance can be improved by combining the feedback (or closed-loop) control of a PID controller with feed-forward (or open-loop) control. Knowledge about the system (e.g. the transport delay parameter) can be fed forward and combined with the PID output to improve the overall system performance. The feed-forward value alone can often provide the major portion of the controller output, the PID controller has to compensate for whatever difference or error remains between the requested value and the system response to the open-loop control. Since the feed-forward output is not affected by the process feedback, it can never cause the control system to oscillate, thus improving the system response without affecting stability. Feed-forward can be based on the setpoint (feed-forward weight or feed-forward gain) or designed by control system analysis (e.g. Smith predictor for compensation of transport delay) applied to extra measured signal (of disturbances).

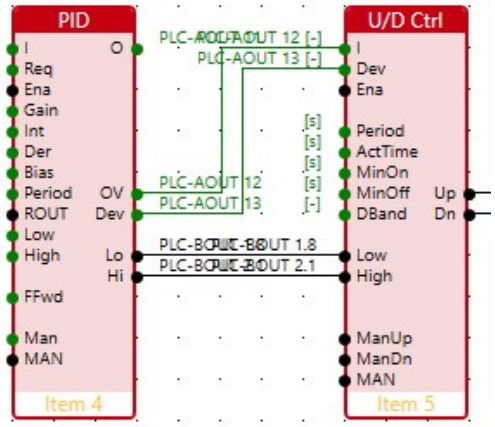
Feedforward and feedback control is often combined with cascade control, to ensure that their control actions manipulate the physical process linearly, eliminating control valve nonlinearities and mechanical problems.

For specific systems it is advantageous to use the so-called primary and secondary control loops. This makes it possible, for example, to affect the behavior of some cases of systems with a transport delay (e. g. use Smith predictor approach) or to include secondary control of the balancing of another variable (e.g. to eliminate the temperature distribution of individual parts of the system).

For some use cases of the PID and U/D Ctrl blocks see the **Regulation Blocks Examples** chapter.

***Note: FeedForward Value**, **FeedForward Weight** - The PLC **PID** block uses simple weighting of input **FeedForward Value**, the weight value could be e.g. specified by some experimental results during commissioning.*

Up/Down Control



The **U/D Ctrl** block (Up/Down relay Control block) is intended for use as an output stage of the primary controller, converting its analog control action to up/down outputs (PWM controlled).

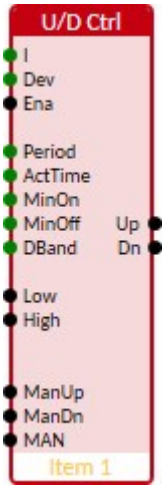
Block parameters are therefore set according to the characteristics of the actuator connected onward.

The **PID** block and **U/D Ctrl** block connected together thus forms PID controller with relay contrlled Up / Down outputs.

The **U/D Ctrl** block itself could also act as converting block from analog value to PWM modulated signals.

If the **U/D Ctrl** block is operating in **MANual** mode, the manual setting of respective outputs (**Output Up** / **Output Down**) is possible.

Up/Down Control



PLC Group

PLC Set Extended

PLC Block ID 42

Inputs

Input	Abbr.	Type	Range	Function
Input Value*	I	Analog	-10 000 .. 10 000	Control value (Input) = obviously velocity output of primary PID control block.
Control deviation	Dev	Analog	-10 000 .. 10 000	Control deviation (= "requested value" - "actual value") of primary block (usually PID controller). Works with **Deadband** parameter.
U/D Enable	Ena	Binary	0/1	U/D Ctrl block enable
Period*	Period	Analog	0,1 .. 3250,0 s	Period of output PWM - it is the time interval between the start time of one pulse to start time of the next pulse.
Actuator Time*	ActTime	Analog	0,1 .. 3250,0 s	It is time that the actuator (servo, etc.) needs for changing its position from fully closed to fully open.

Min On Time*	MinOn	Analog	0,1 .. 3250,0 s	The minimum amount of time a relay is allowed to be closed (**Output Up**/**Down** is on).
Min Off Time	MinOff	Analog	0,1 .. 3250,0 s	The minimum amount of time a relay is opened (**Output Up** / **Down** is off) during the constant switching control range. This time could be zero.
Deadband	DBand	Analog	-10 000 .. 10 000	**Deadband** range of **Control deviation** → both outputs are inactive (off).
Low Limit	Low	Binary	0/1	Primary controller output in its Low Limit.
High Limit	High	Binary	0/1	Primary controller output in its High Limit.
Manual Up	ManUp	Binary	0/1	In MANual mode force the block to activate Output Up.
Manual Down	ManDn	Binary	0/1	In MANual mode force the block to activate Output Down.
MANual Mode	MAN	Binary	0/1	Manual Mode: off - AUTomatic mode (default) on - MANual mode

* mandatory input(s).

Note: *If **U/D Enable** input is not connected the controller is enabled.*

Note: *When **U/D Enable** is not true or there is an invalid value on the **Input Value** of the block, both the outputs (**Output Up** and **Output Down**) have a value off.*

Note: *For the **Deadband** parameter there is presumed symmetrical interval around zero value.*

Note: *The **Period** is the time interval between the start time of one to start time of the next PWM pulse.*

Note: *The **Period** should be adjusted according to the **Actuator Time** and shouldn't be shorter than the primary PID controller evaluation period. Recommended ratio is at least Period : Actuator Time = 1 : 10 (better more).*

Note: *If the **Manual Up** shall be active, the **Manual Down** must be inactive*

Note: *If the **Manual Down** shall be active, the **Manual Up** must be inactive*

Outputs

Output	Abbr.	Type	Range	Function
Output Up	Up	Binary	0/1	Actuator control - "Raise"
Output Down	Dn	Binary	0/1	Actuator control - "Lower"

Description

The PLC block performs the function of Up/Down Control Unit (Relay Control block) with two binary outputs **Output Up**/**Output Down** and adjustable regulation period. The function of the block can be disabled by the binary input U/D Enable. The Input signal corresponds to the speed (velocity = the change of the action variable)

output of the primary controller (Output Velocity of the PID block). The input signal value is expected in range <-10000; +10000>. For detail description see the **Up/Down Control Details**.

If the **Deadband** parameter is non-zero, the switching of the outputs (**Output Up** or **Output Down**) is suppressed for input signal **Control Deviation** smaller than the value of **Deadband**. The remaining switching pulse length is still maintained for future evaluation.

If inputs **Low Limit** or **High Limit** (primary controller output reaches its limits - due to this the **Input Value** is zero), the remaining pulse time is maintained accordingly to perform appropriate output (**Output Up** or **Output Down**) switching.

By activating the binary input **MAN**, the inputs **Manual Up** or **Manual Down** are respected on the outputs (**Output Up** or **Output Down**) - when both the **Manual Up** or **Manual Down** is active, both the outputs **Output Up** and **Output Down** are inactive.

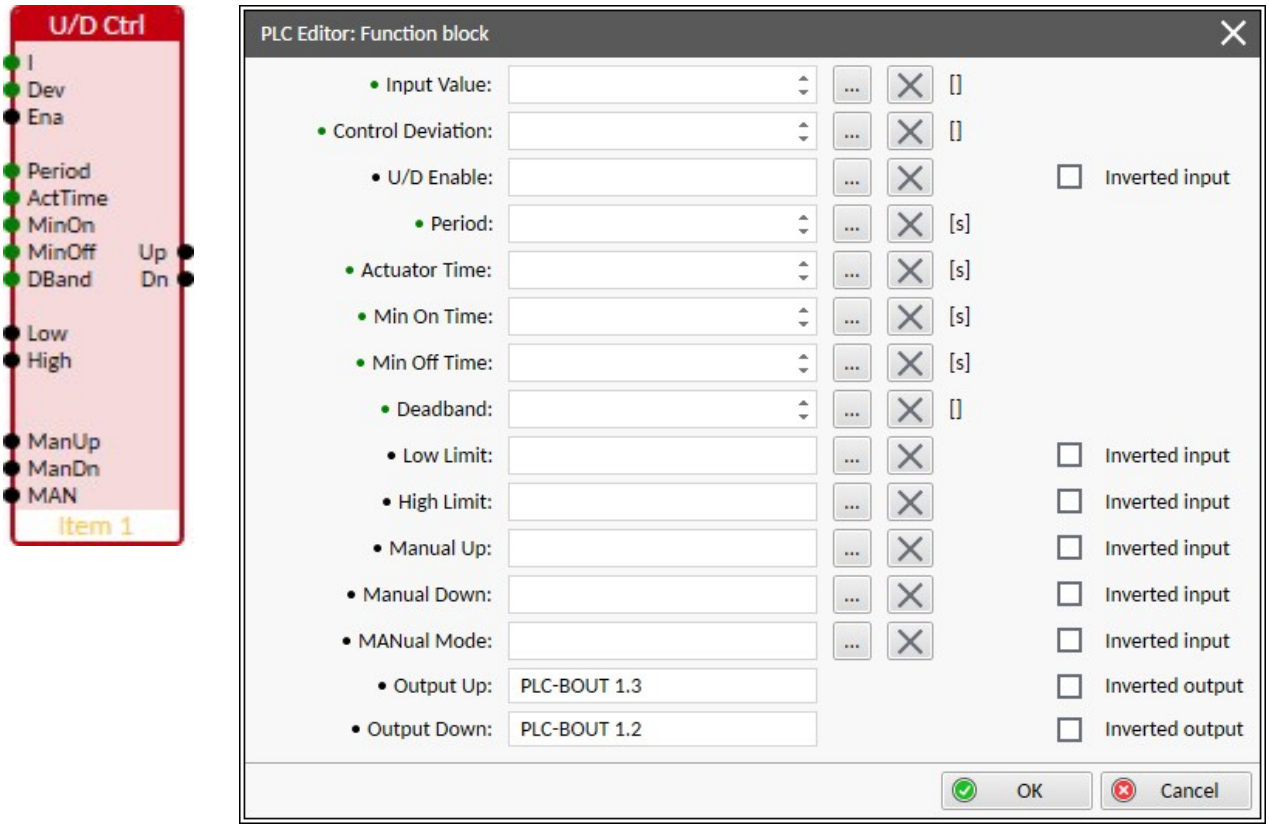


Image 16.2 Configuration of Up/Down Ctrl block

back to Groups of PLC Blocks

Up/Down Control Details

Up/Down Control Principle Block Diagram

The following figure shows the basic block diagram of relay output control with manual control (as implemented in a PLC Up / Down Control block). Together with the PID block, it forms what used to be called the PID Binary (PID Bin) block in previous generation of ComAp controllers.

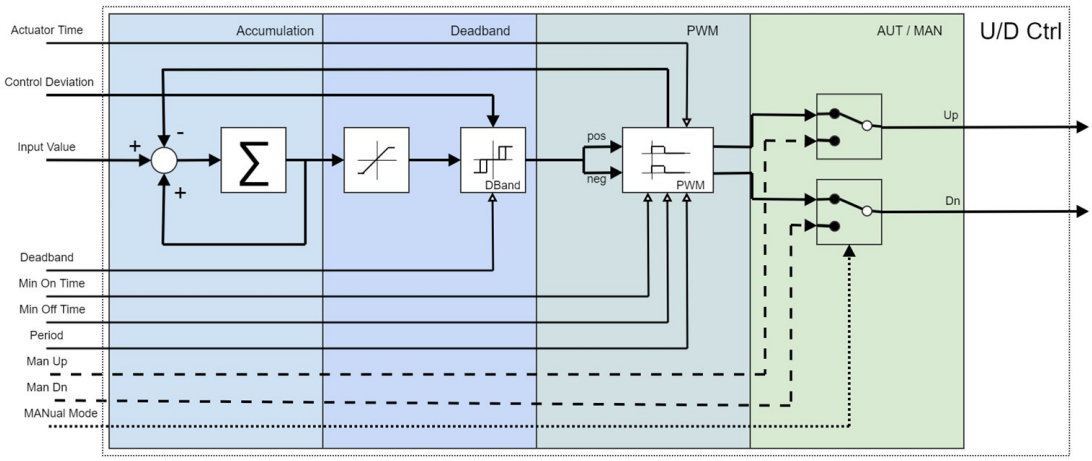


Image 16.3 U/D Ctrl principle block diagram

Internally the block could be divided to four stages:

1. **Accumulation stage** - here the input signals (**Input Value, Low Limit, High Limit**) are accumulated.
2. **Deadband stage** - if the **Deadband** value is specified, the **Control Deviation** input is evaluated here.
3. **Pulse-width modulation stage** - according to the **Actuator Time, Min On Time, Min Off Time** and **Period** values the resulting output switching is computed.
4. **AUT / MAN control stage** - here is respected the **MANual Mode** switch.

Up/Down Control Inputs Detailed Description

The **Input Value** signal corresponds to the primary control output velocity (= contains the change of the action variable of the primary PID controller), so this input (I) must be connected to the control velocity (**PID.OV**) output of the primary **PID** control block.

The **Period** block parameter determines the **U/D Ctrl** block evaluation period - it should be set in the appropriate ratio to the **Actuator Time** parameter, recommended ratio is at least **Period : Actuator Time** = 1 : 10. The **Period** parameter is different from the **PID** Period parameter.

> **IMPORTANT: The Period parameter value should be at least equal (or greater) as the primary PID controller PID.Period value.**

Based on parameters:

- **Actuator Time** - the time it takes for the actuator (servo, etc.) to change position from fully closed to fully open, this parameter determines the conversion ratio of the input signal to the duration of the active output (up or down pulse).
- **Min On Time** - minimum time the relay can be closed (**Output Up** or **Output Down** is on).
- **Min Off Time** - minimum time the relay can be open (**Output Up** or **Output Down** is off), during the constant switching control range.

the switching of the respective output (**Output Up** / **Output Down**) is evaluated.

The time conversion ratio has the value $k = \frac{\text{ActuatorTime}}{(\text{Inputmax} - \text{Inputmin})} \cdot \frac{1}{\text{periodPLC}} = \frac{\text{Actuator Time}}{(20000) * \text{periodPLC}}$

The input signal sample (summed with the remaining value from the previous PLC evaluation) is converted to the required pulse length based on the **Actuator Time** parameter.

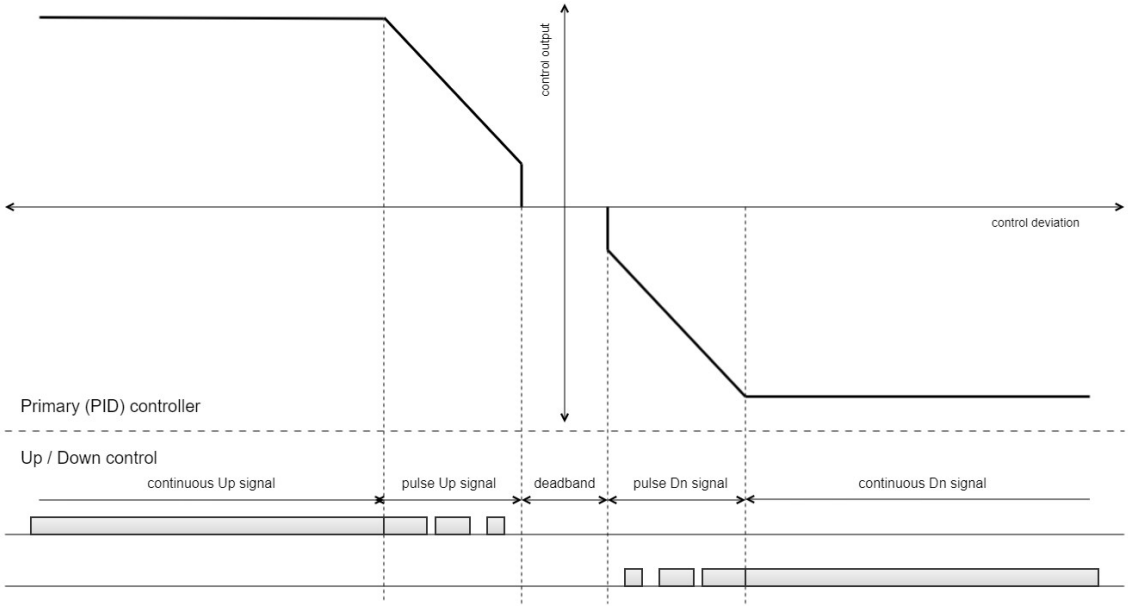


Image 16.4 U/D Ctrl outputs PWM principle (deadband)

The resulting pulse is realized on the PWM principle: the Period parameter determines the length of the switching interval, within it the appropriate pulse is performed:

- If the pulse request is longer than the **Period** time, the corresponding binary output (**Output Up** or **Output Down**) is permanently closed.
- If the pulse request length is within the **Period** time, the corresponding binary output (**Output Up** or **Output Down**) is switched on at the least for Min On Time.
- If the pulse request length is less than **Min On Time**, both the binary outputs (**Output Up** or **Output Down**) are inactive. The remaining switching pulse length is kept for future evaluation.

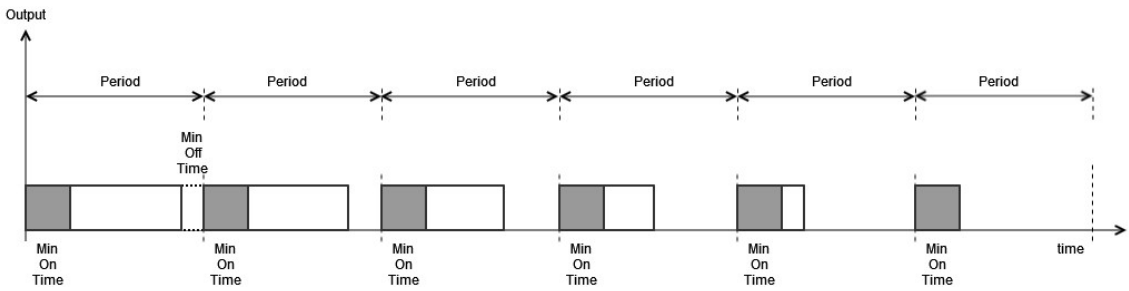
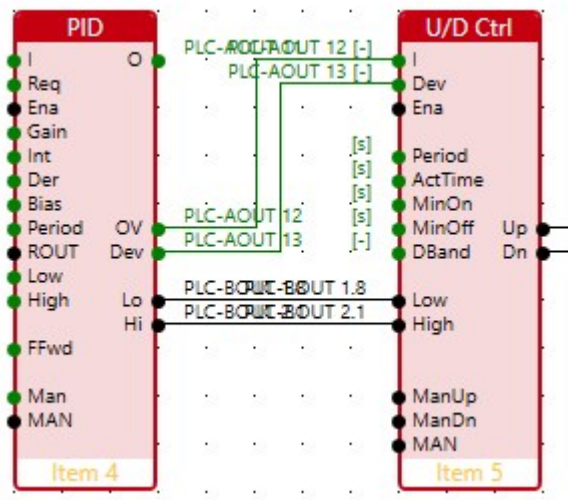


Image 16.5 U/D Ctrl outputs PWM principle (switching)

Between the subsequent pulses, the **Min Off Time** (could be zero, giving drop-less pulse) is maintained (it does not matter whether it is a switching sequence on the same or opposite output).

Example of resulting behaviour



The following figure illustrates the use of blocks **PID + U/D Ctrl** together. The graph on the right shows both the output signals of the **PID** control block (PID O = **Output**, PID OV = **Output Velocity**, PID Dev = **Control Deviation**) and the processed up/down control signals from the **U/D Ctrl** block (U/D Ctrl **Up**, U/D Ctrl **Dn**).

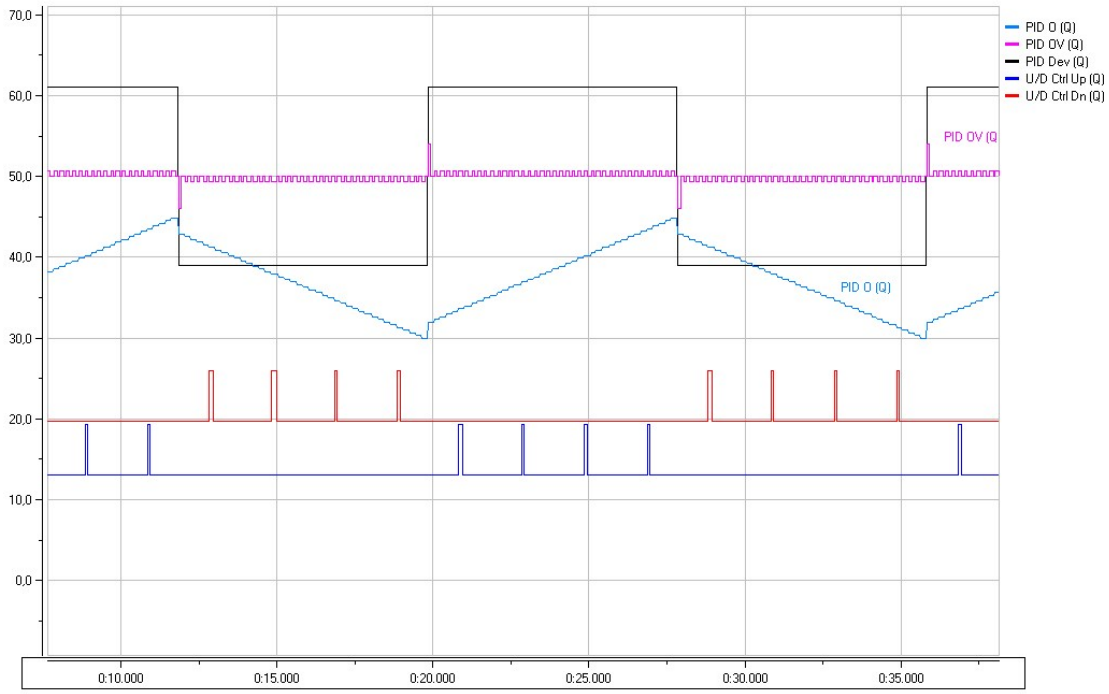


Image 1.1 PID + U/D Ctrl blocks working together

In this example a rectangular signal is fed to the requested value input of the **PID** block with the actual value keept at zero, which produces a rectangular control deviation signal (**PID.Dev**).

The controller is of the PI type (which is evident from the nature of its output signal **PID.O**).

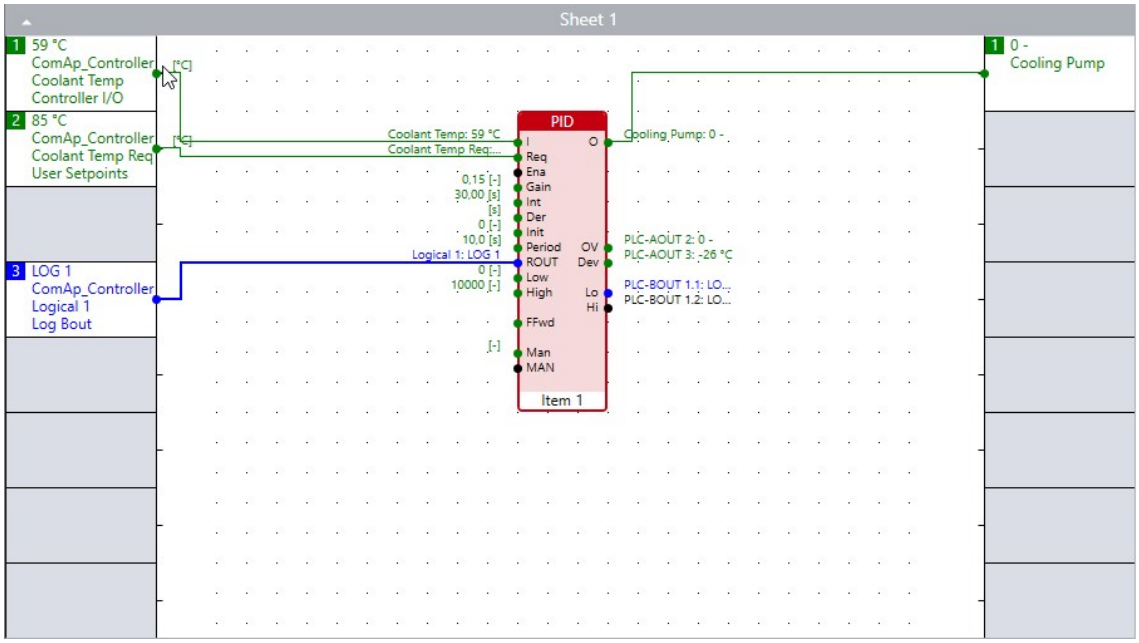
The **Output Velocity** (**PID.OV**) signal is then derived from the **PID.O** output signal - after the change of **Control Deviation** first is seen more noticeable pulse (due to the proportional component), followed by a series of smaller pulses (contributions from the integration component of the PI controller).

It can be seen quite clearly how the contributions from the **Output Velocity** (**PID.OV**) signal are accumulated in the **U/D Ctrl** block, forming the corresponding **Up** / **Down** outputs when the **Min On Time** limit is exceeded.

Regulation Blocks Examples

Basic use of PID

The PID controller is basically designed to maintain the system variable at the requested value.



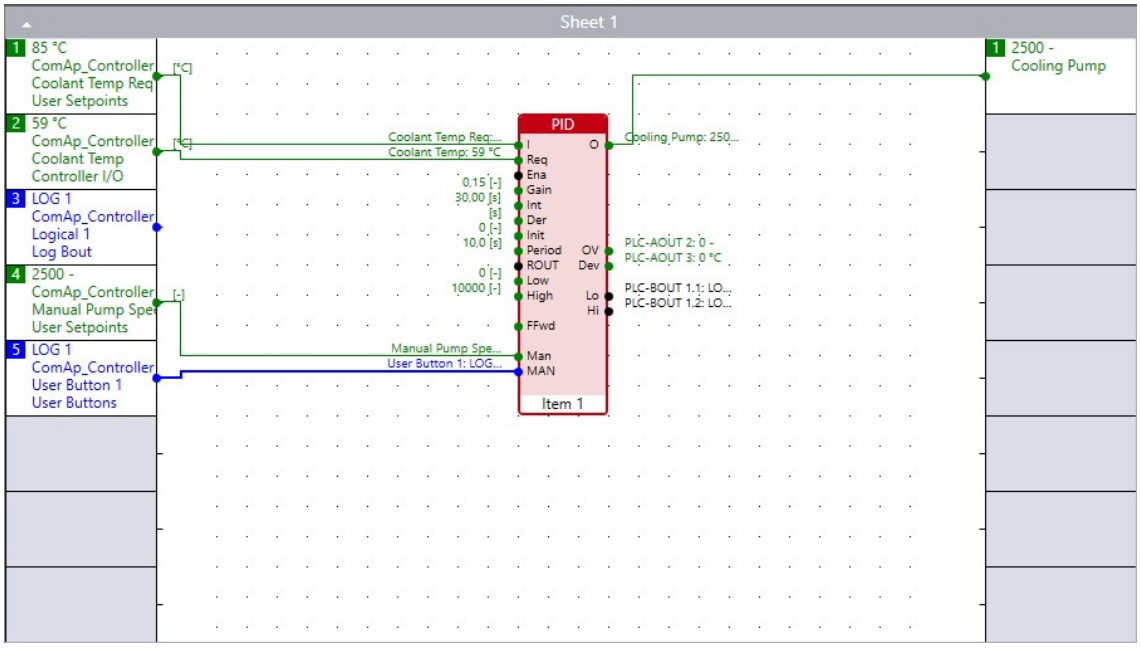
The above diagram shows the basic wiring and settings of the PID controller - as an example the cooling pump control is chosen to control the cooling circuit temperature to the desired value (here set by the user setpoint **Coolant Temp Req**). The parameters of the block used form a PI-type controller with gain 0.15 and integration time constant 30 s. Due to the dynamics of the controlled system (thermal system), the sampling frequency (Period) of 10 s is chosen.

> **IMPORTANT: Please note the ROUT input - due the nature of cooling pump speed control the controller should have reversed action: higher controller output → lower process value**

Note: *Both the Input Value and Request Value shall have the same range and number of decimal points.*

Manual control of PID

Especially when commissioning of the controlled system, it is advantageous to use manual control of the PID controller output. Since the control value is limited by lower and upper limits, the block behavior is under supervision.

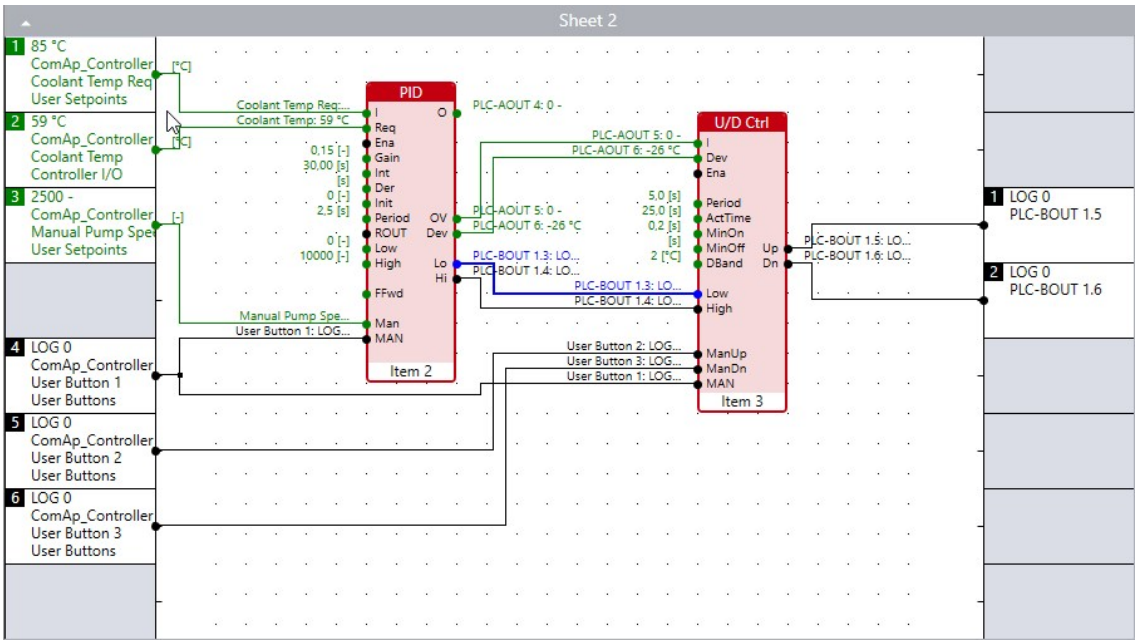


When the automatic mode is switched on again (**MANual mode** control input is inactive), the system smoothly follows the actual value of the manual control and continue to resulting stable state according the actual **Requested Value** and **Input Value**.

Note: *Both the Manual Value and Output Value shall have the same range and number of decimal points.*

PID with relay control output (U/D Ctrl)

In some cases (e.g. marine applications), relay outputs are used to process the control value - usually called up/down control or relay control. For this purpose, the PLC **U/D Ctrl** block is used as a successor to the PLC **PID** block (as can be seen in the following figure).



When using PID control with the relay output both the **PID** and **U/D Ctrl** block should be used. The velocity output of the primary controller (PID **Output Velocity**) is an input for the **U/D Ctrl** block.

To treat the saturation of the primary controller (i.e. it's action variable is at lower or upper limit), it is necessary to connect the PID **Out Low Limit** and **Out High Limit** output signals to the **U/D Ctrl Low Limit** and **High Limit inputs** respectively.

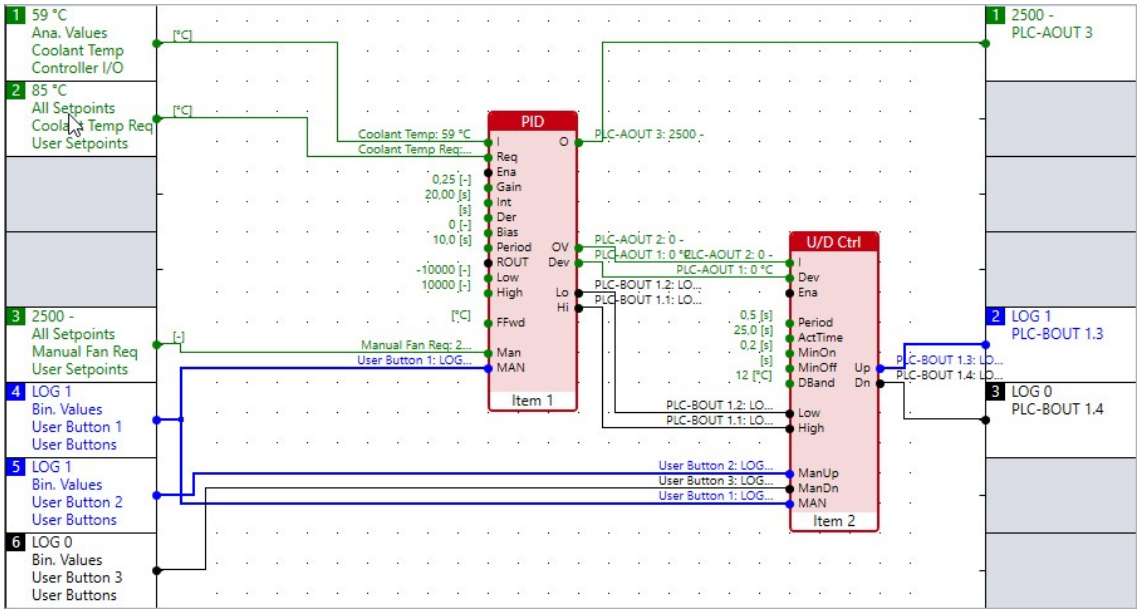
If it is useful to limit the switching rate of the relay outputs near steady state (e.g. to extend the lifetime of actuators and/or to reduce maintenance costs), it is possible to connect the Control Deviation output of the primary controller to the corresponding input and set the **Deadband** parameter of the **U/D Ctrl** block appropriately.

The key setting of the time parameters is based on the **Actuator Time** (that is, the time it takes for the actuator to go from one limit to another). It is advisable to choose the switching period parameter (**Period**) in a ratio of at least 1 : 10 (better more); however, it is also useful to have the **Period** parameter in the order of seconds (to ensure sufficient PWM switching sensitivity).

Note: *For PLC consistency is necessary to have the same range and number of decimals for following signals: PID* ***Input Value****, PID* ***Request Value****, PID* ***Control Deviation*** *(automatically), U/D Ctrl Control Deviation, U/D Ctrl* ***Deadband****.*

Note: *If the Min Off Time is ommitted, it is taken as zero.*

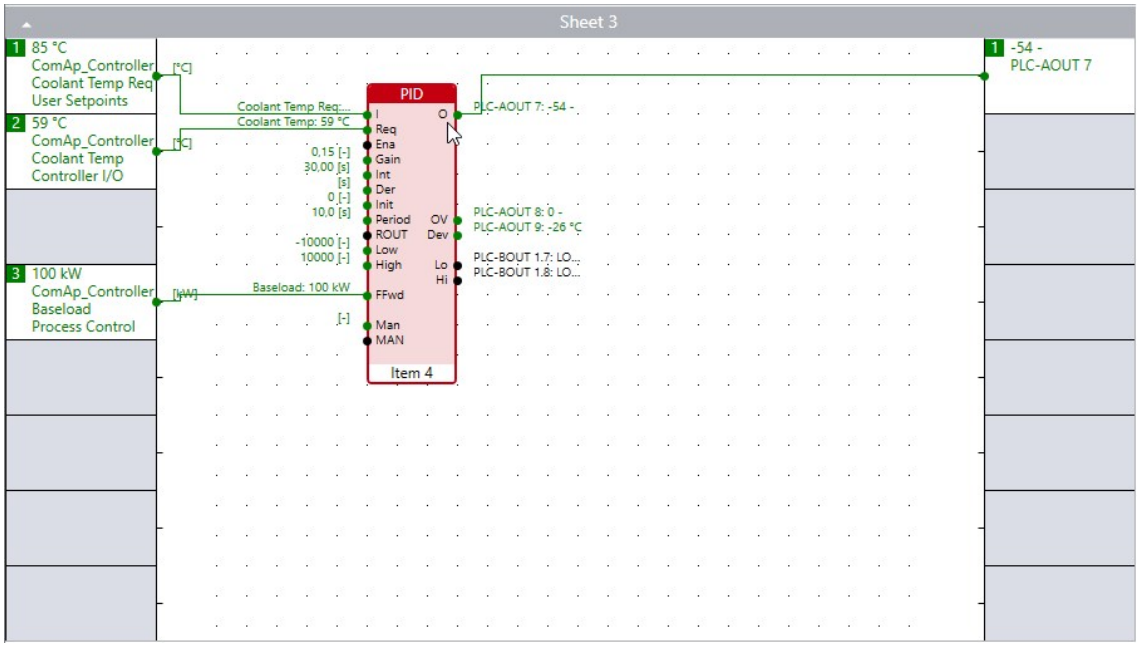
Manual Control of U/D Ctrl



The manual control of **U/D Ctrl** block is available by similar way as used in the **PID** block. Since the manual inputs (**ManUp / ManDn**) have only binary values, the corresponding output is without PWM shaping (the manual control only sets the desired level at the corresponding output).

Feed-forward and feedback control

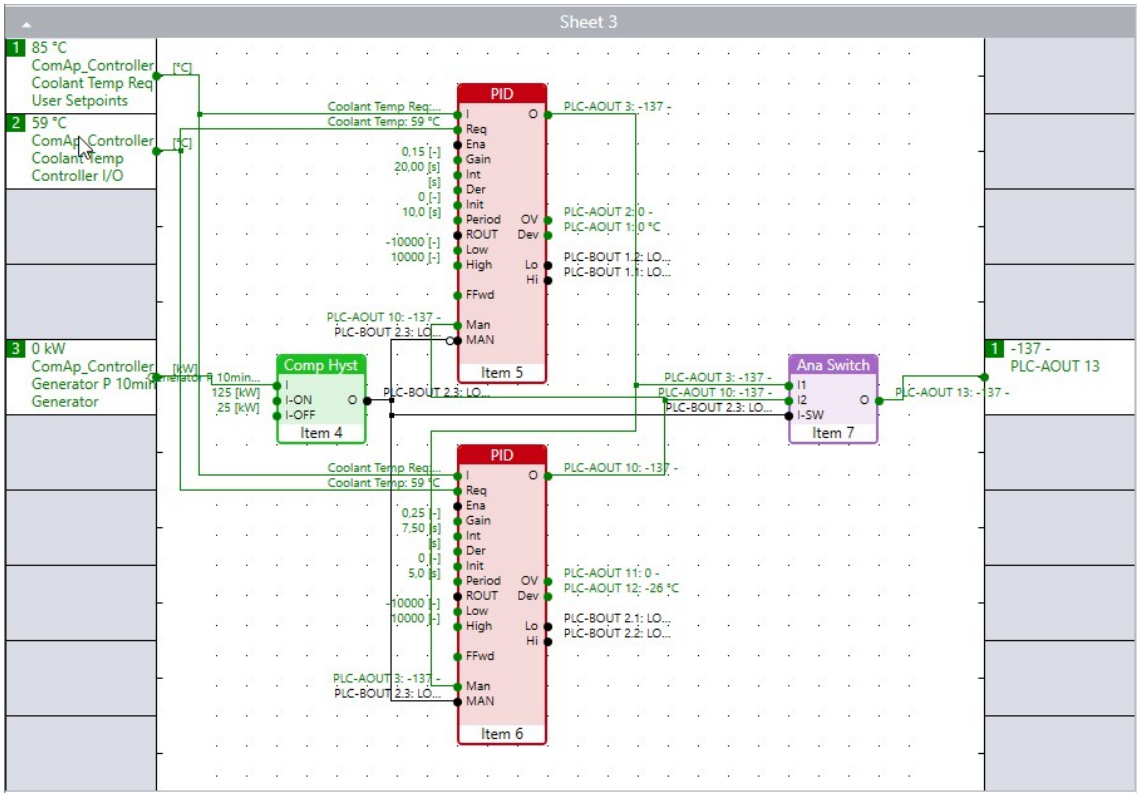
Feed-forward control can be used very successfully to improve a control loop's response to disturbances. Feed-forward control reacts the moment a disturbance occurs, without having to wait for a deviation in process variable. If any process control loop is subject to large, measurable disturbances, it can benefit greatly from feed-forward control.



The above diagram shows simple use of feed-forward control in coolant pump control scheme. Feedback control loop (coolant temperature + coolant temperature request) is appended by feed-forward action. based on generator active power request. This will help improve the performance of the cooling system as the power demand value pushes directly on the coolant pump.

Bumpless PIDs switching

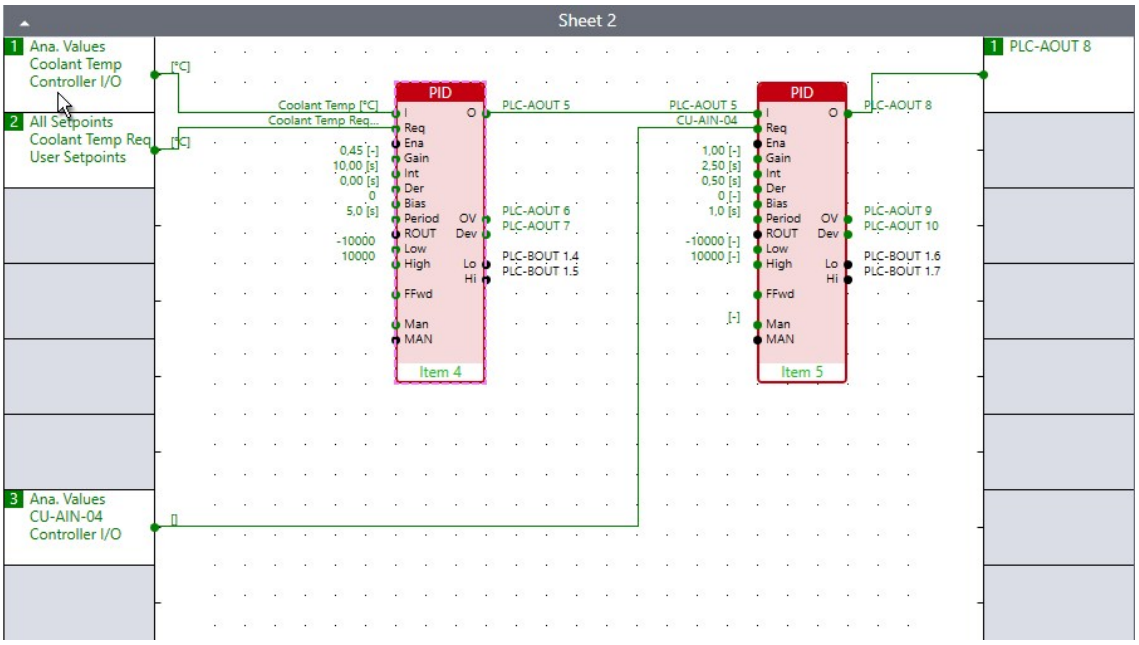
In complex control schemes, where several control loops are designed in parallel (e.g. in case of so-called gain scheduling technique), it seems necessary to ensure bumpless switching. This can easily be done by using a manual control input and cross feeding control values from the opposite control loop(s) - see following scheme.



As can be clearly seen in the schematic, the cross feed of control values pushes the opposite controller (the one that is "not in use") to track the output of the active controller. When the controllers switch, there is a smooth transfer from one loop to the other.

Cascade control

In the case of relatively slow system dynamics, the use of a single control loop could lead to a long response time to a change in setpoint. The overall dynamics could be improved by concatenating the control loops into a cascade form. The inner loop would maintain the direct process value (e.g., the direct boiler temperature) and the outer loop would perform the demand setting for the inner loop (in our case, the required water temperature).



PID Control Tuning

PID Controller Standard Parameters

The underlying (continuous) equation for PID controller is:

$$U = K_p \left(E + \frac{1}{T_i} \int E dt + T_d \frac{dE}{dt} \right)$$

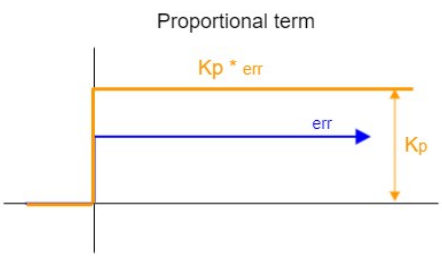
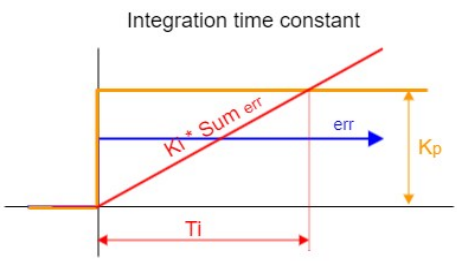
U	The process value (controller output) ("control value" or "manipulated value").
E	The error (difference) between requested and actual values
K_p	The gain for the proportional part (please note the zero value of this parameter leads to de-activation of PID control action)
T_i	The integral action time for the integral part of controller
T_d	the derivative action time for the derivative part

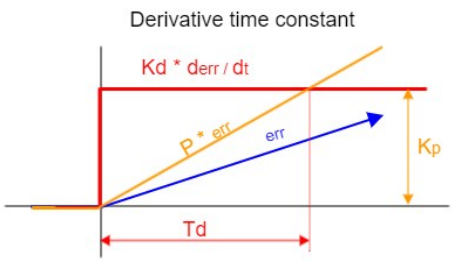
With the use of mathematical methods the discrete form of above equation is shown below:

$$U_k = K_p \left(e_k + \frac{\Delta T}{T_i} \cdot \sum_{j=0}^{k} e_j + \frac{T_d}{\Delta T} \cdot [e_k - e_{k-1}] \right)$$

where subscript $_k$ denotes appropriate values at given time *k*.

Standard controller parameters

PID Controller Parameter	Description
	**The proportional term** considers “how far” the measured process variable has moved away from the desired setpoint. K_p (controller gain) is defined as the ratio between the output value of the controller and the error value (if the error signal is constant, the output value is also constant). The proportional term action gives a change in the input directly proportional to the control error. Increased value of K_p gives more proportional action and faster control; however, excessive magnitude can lead to oscillations of the control variable.
	**The integral term** addresses “how long” the measured process variable has been away from the desired setpoint. T_i (controller integration time constant) is defined as the time when the integration of the constant error value reaches the level of the proportional term. The integration term constant K_i (used in the controller calculation) is thus derived from the T_i parameter. The integral term action gives a change in the input proportional to the integrated error, and its main purpose is to eliminate steady state offset. Decreased value of T_i gives more integral action and faster control; however, excessive magnitude can lead to oscillations of the control variable.



The derivative term considers “how fast” the error value changes at agiven point in time. T_d (derivative time constant of the controller) is defined as the time when the derivative signal of the error value with constant slope (speed) has the same value as the level of the proportional term. The derivation term constant K_d (used in the controller calculation) is thus derived from the T_d parameter.

The derivative term action is used in some cases to speed up the response or to stabilize the system, and it gives a change in the input proportional to the derivative of the controlled variable. Increased value gives of T_d more derivative action and faster control. The derivative control is a rough prediction of future error based on the current slope of the error, the prediction horizon is T_d (derivative time constant).

E. g. if the error changes at a constant rate of 2% per second, and the derivative time constant T_d = 3 second, the predicted error is 6%.

PID Settings Effect

To illustrate the effect of changing the PID controller parameters, tests of the behavior of the **PID** control block in a loop with a first order system model with transport delay (FOPDT system) were performed.

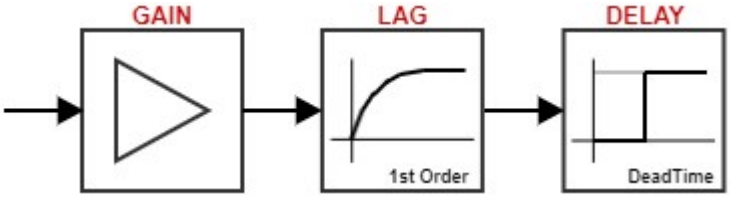


Image 17.1 FOPDT - First Order Plus DeadTime system

The FOPDT system parameters are as below.

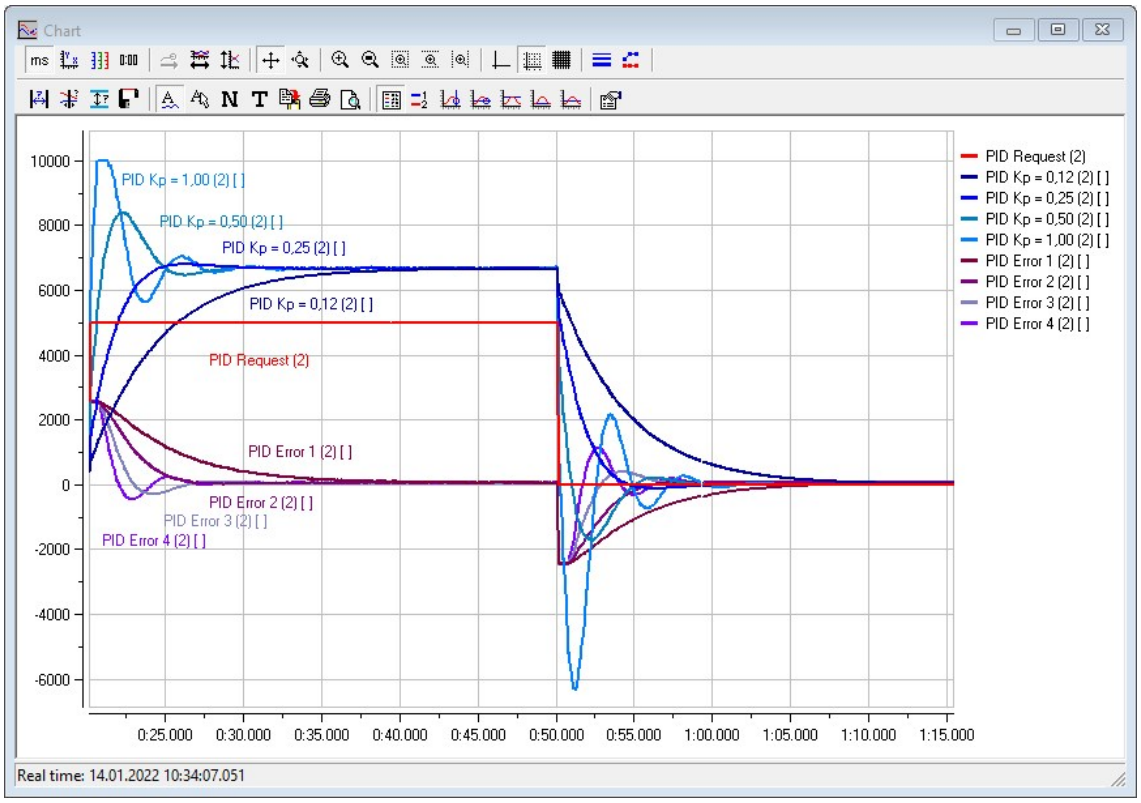
Process	
process gain	1.0
process time constant	1.0 s
process deadtime	0.5 s

Change in Proportional Gain

Following figures show the response of the control loops for different proportional gain settings (K_p = 0,12; 0,25; 0,5 and 1,0) and identical integration time constant 5,0 s.

Response to the Change in Request Value

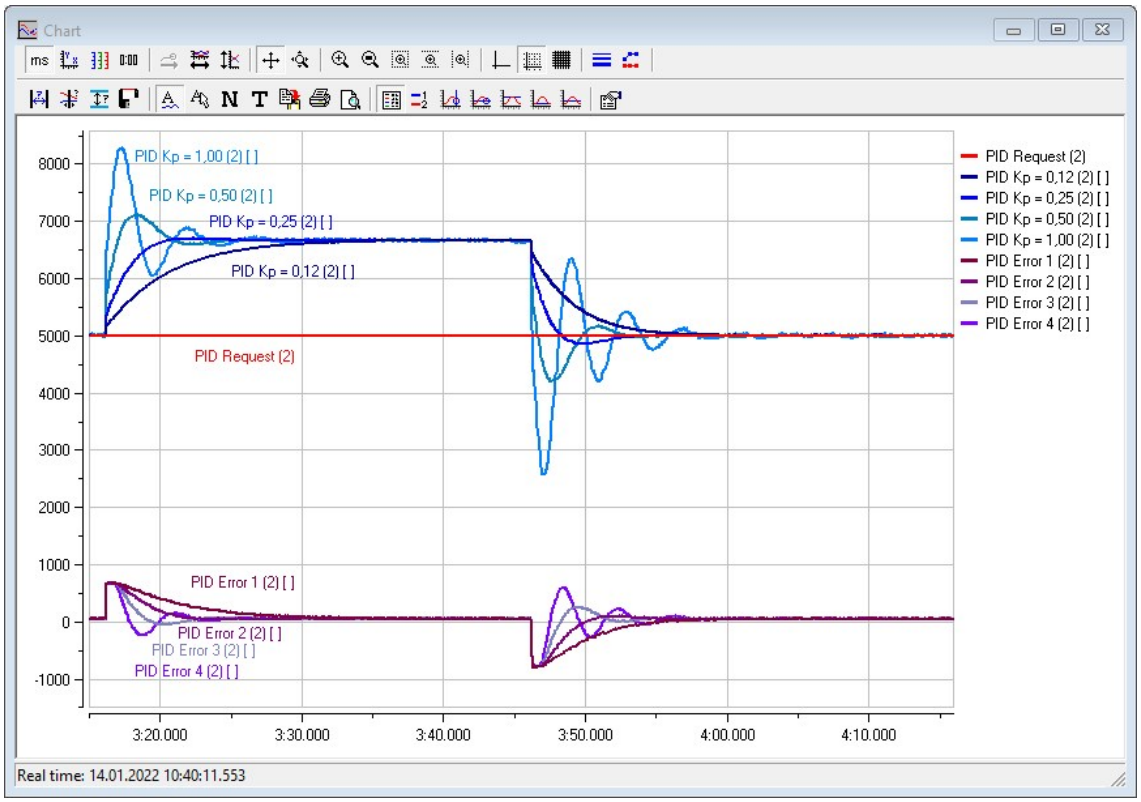
This figure shows the response of the control loops to the step change in the requested value, also plots the control error for each setting.



It is clearly seen as the controller response becomes faster as the gain value increases, but the process value becomes oscillatory.

Response to the Change in Process Value due System Disturbances

This figure shows the response of the control loops to the change in the process value due the system disturbances (i.e. change of process gain 1.0 → 0.75 → 1.0).

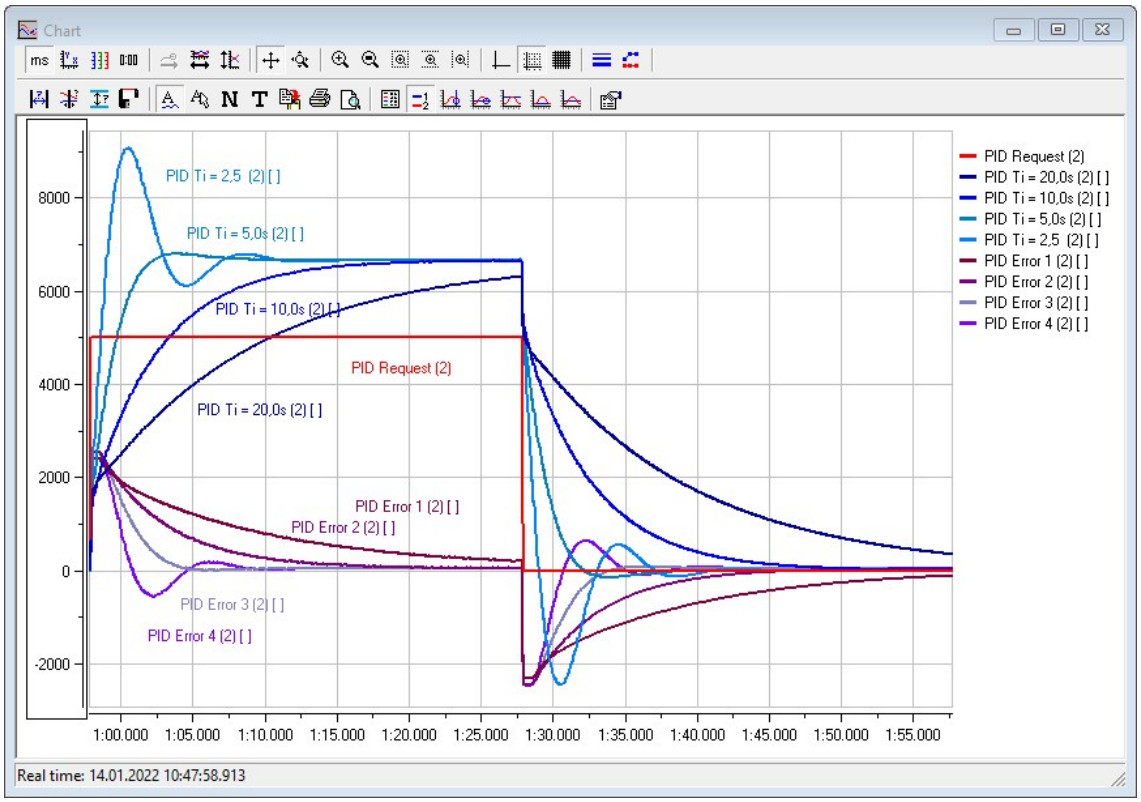


Change in Integration Time Constant

Following figure shows the response of the control loops for different integration time settings (Ti = 2,5s; 5,0s; 10,0s and 20,0) and identical proportional gain 0,25. At the top are the process values for different setting, below are plotted the control errors.

Response to the Change in Request Value

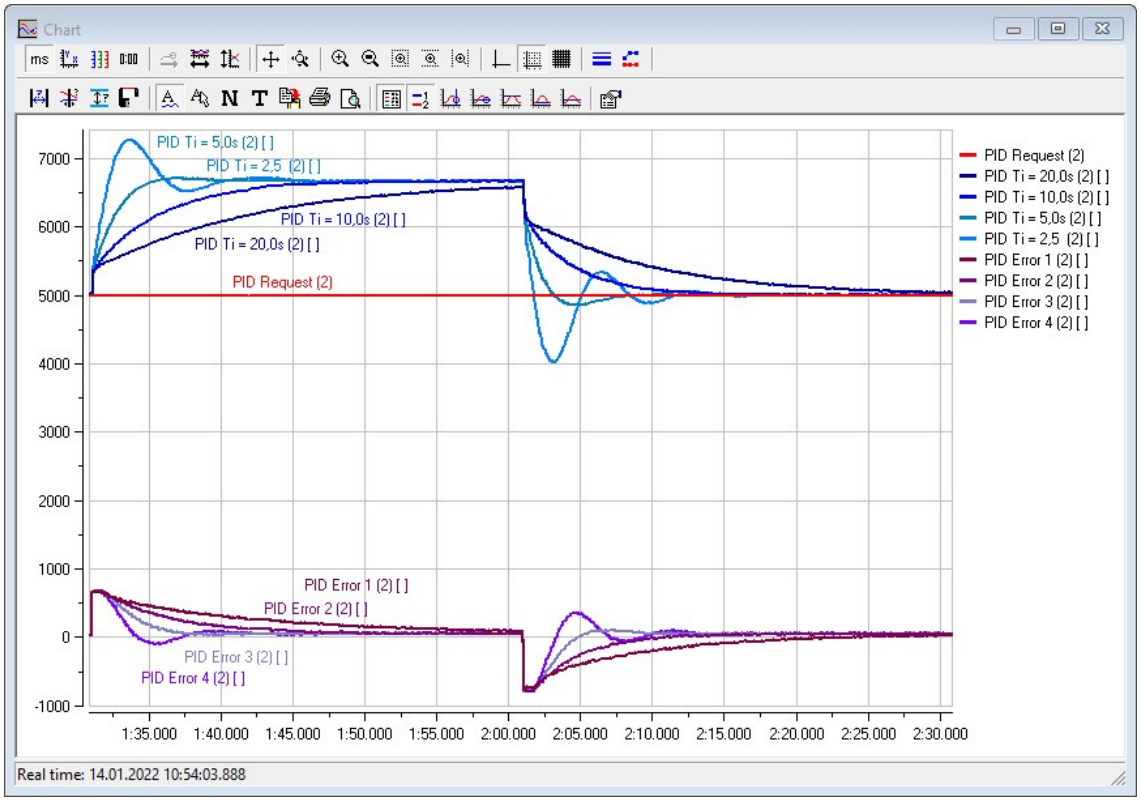
This figure shows the response of the control loops to the step change in the requested value, also plots the control error for each setting.



Similarly, it is clearly seen as the controller response becomes faster as the integration time value decreases, but the process value becomes oscillatory.

Response to the Change in Process Value due System Disturbances

This figure shows the response of the control loops to the change in the process value due the system disturbances (i.e. change of process gain 1.0 → 0.75 → 1.0).



The above experiments show that the "optimal" setting of the PID controller for regulation with minimum overshoot is as follows:

Process		**Controller**	
process gain	1.0	proportional gain	0.25
process time constant	1.0 s	integration time constant	5.00 s
process deadtime	0.5 s	derivative time constant	0.00 s

Note: *Please note the relationship between process gain and controller proportional gain*

PID Parameters Tuning

There are two basic strategy goals for controller loop tuning:

- Optimize the control loop response to the change in requested value
- Optimize the control loop response to the change in process value

The target of parameter tuning can also be divided according to the target focus - optimization of some property. These include:

- Optimization for response speed
- Obtaining sufficient stability of the control loop
- Achieving robustness to possible changes in system parameters

There is a fundamental tradeoff in control lop tuning between the loop stability and control loop's speed. Many tuners tend to tune for speed because they don't fully understand its tradeoff with control loop stability.

During operation, the elements of the control loop may change their properties (e.g. due to ageing springs, poor maintenance, mechanical wear, etc.). The changes causing loop instability:

- Increase process gain (e.g. due the change in fuel composition)
- Increase of deadtime (e.g. due the mechanical wear)
- Decrease in time constant (e.g. due to ageing of counter springs)

These changes may affect the behavior of the system and may lead to less loop stability. To avoid this, it is definitely better to optimize the tuning of the control loop for stability rather than speed.

Trial-and-Error Tuning

This approach works on the principle of changing one of the controller settings (e.g. controller gain) and observing how this affects the loop performance. If the change caused the loop to behave better, continue the change in the same direction. If the change made the loop performance worse, change it back and try the opposite direction of change. Changes should be made in multiples of two (double or half of the previous step).

	Loop seems sluggish	Loop oscillates or overshoots
Integral time	decrease	increase
Gain	increase	decrease
Derivative time	try small decrease if worsens, increase	try small increase if worsens, decrease

If a satisfactory state has been achieved, the next parameter (e.g. the integration time constant) can be tuned. After finding the optimal state of this parameter, it is necessary to return to the previous parameter and verify again that it is the optimal setting.

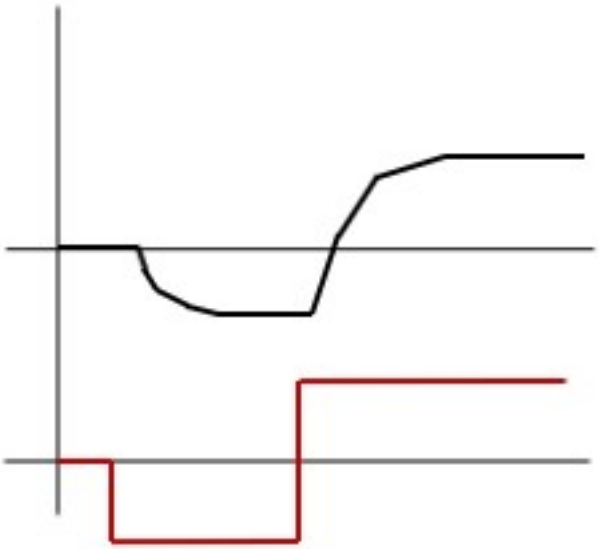
This method is simple, and its success rate increases with tuning experience. The disadvantage is that there is no information about the degree of stability of the achieved setting and instabilities may occur in case of future changes of the control system elements.

Open-Loop (Step Test) Tuning Procedure

The step response is measured by a bump test. The process is first brought to steady state, then the input is changed by an appropriate value and finally the output is measured and scaled to match the unit step input.

In general, the step should be at least five times larger than the peak-to-peak noise and/or interference in steady state. A dilemma arises: the system operator wants the steps to be as small as possible to minimize the impact on the process, but for good process identification it is advantageous to make pretty large step changes. A simple

method for obtaining a good measurement of the step response is to first make a step down by an agreed step magnitude, wait until the system settles into a new steady state, and make another change in the opposite direction.



In this way, you actually get a double magnitude step response, from which is more convenient to do the evaluation.

Ziegler-Nichols step response method

Here we publish a basic procedure (also known as the Ziegler-Nichols step response method) based on the step response of an open loop experiment. The Ziegler-Nichols rules work well only on processes where the dead time is less than half the length of the time constant. The open-loop (step test) tuning procedure assumes that you can model any process as a first-order lag and a pure deadtime.

A common assumption often made for PID control design, is to take the integral time constant to be four times the derivative time constant.

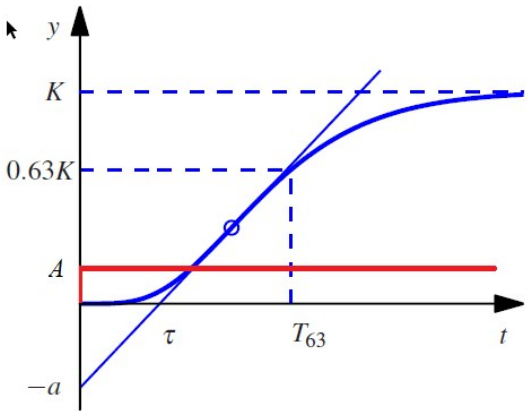


Image 19.1 Step response of 1st order system

The step response is performed and the time response should be recorded. Notice that it is not necessary to wait until steady state is reached to be able to determine the parameters; it suffices to wait until the response has had an inflection point (however, finding this point can be a problem in practice due to the existence of noise in the measured response signal).

The step response is characterized by only two parameters a and τ, which are the intercepts of the steepest tangent of the step response with the coordinate axes. The parameter τ is an approximation of the time delay of the system and a/τ is the steepest slope of the step response.

The suggested controller parameters are given in table below.

Controller	Fast performance			Normal performance			Slow performance		
Type	**K_p**	**T_i**	**T_d**	**K_p**	**T_i**	**T_d**	**K_p**	**T_i**	**T_d**
P	1 /a			0,44 /a			0,26 /a		
PI	0,9 /a	3,33 τ		0,40 /a	5,33 τ		0,24 /a	5,33 τ	
PID	1.2 /a	2.00 τ	0.50 τ	0,53 /a	4,00 τ	0,80 τ	0,32 /a	4,00 τ	0,80 τ

Cohen-Coon Method

Note: *The Cohen-Coon tuning rules work well on processes where the dead time is less than two times the length of the time constant (and you can stretch this even further if required).*

Controller	Kc	Ti	Td
P	$\frac{T}{K_c * T_d}\left[1+\frac{T_d}{3T}\right]$	—	—
PI	$\frac{T}{K_c * T_d}\left[0.9+\frac{T_d}{12T}\right]$	$\frac{T_d\left[30+3\left(\frac{T_d}{T}\right)\right]}{9+20\left(\frac{T_d}{T}\right)}$	—
PID	$\frac{T}{K_c * T_d}\left[\frac{4}{3}+\frac{T_d}{4T}\right]$	$\frac{T_d\left[32+6\left(\frac{T_d}{T}\right)\right]}{13+8\left(\frac{T_d}{T}\right)}$	$\frac{4T_d}{11+2\left(\frac{T_d}{T}\right)}$

- $\boldsymbol{T}$ is the time constant $T = t_{63} - \tau = t_{63} - (t_{50} - ln(2) * t_{63}) / (1 - ln(2))$
- $\boldsymbol{K_c}$ is the proportional gain $K_c = K / A$
- $\boldsymbol{T_d}$ is the deadtime $Td = \tau - t_0$

Closed-Loop (Ultimate Gain) Tuning Procedure

Although the closed-loop (ultimate gain) tuning procedure is very accurate, you must put your process in steady-state oscillation and observe the process value - it could be in some practical use quite difficult or impossible due the system safety.

Complete the following steps to perform the closed-loop tuning procedure:

1. Set both the integral and derivative term on your PID controller to 0.
2. With the controller in automatic mode, carefully increase the proportional gain (K_p) in small increments. Make a small change in requested value to disturb the loop after each increment. As you increase K_p, the process value should begin to oscillate. Keep making changes until the oscillation is sustained (neither growing nor decaying over time).
3. Record the controller proportional gain K_{pu}
4. Record the period of oscillation (T_u).
5. Compute the new tuning PID parameters

Controller	Fast performance			Normal performance			Slow performance		
Type	**K_p**	**T_i**	**T_d**	**K_p**	**T_i**	**T_d**	**K_p**	**T_i**	**T_d**
P	0,50 K_{pu}			0,20 K_{pu}			0,13 K_{pu}		
PI	0,45 K_{pu}	T_u/ 1,2		0,18 K_{pu}	T_u/ 1,2		0,13 K_{pu}	T_u/ 1,2	
PID	0,60 K_{pu}	T_u/ 2,0	T_u/ 8,0	0,25 K_{pu}	T_u/ 2,0	T_u/ 8,0	0,15 K_{pu}	T_u/ 2,0	T_u/ 8,0

Take these parameters as a first attempt to be further tuned in following PID testing.

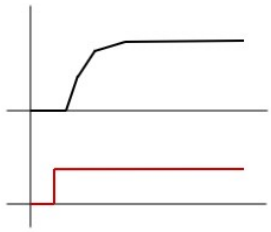
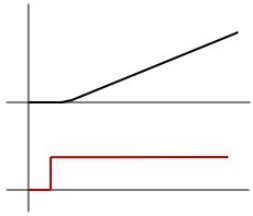
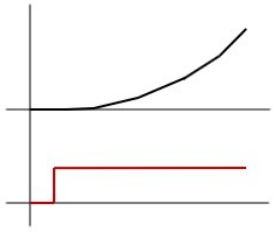
Rules of Thumb

1. Don't tune a controller on Friday afternoon if you can help it.
2. The core of good regulation is measurement. The quality of regulation can never be better than the quality of measurement. Filtering of feedback signal could help, but if possible, don't filter the signals at all.
3. Know that the control loop stability is generally more important than fast speed.
4. If the control circuit can reduce the dead time, the setting of the PI controller is easier = try to minimize the dead time as much as possible.
5. The output of the controller acts in reverse to the output of the process during control. (The exception is if the controller controls a reversing process or a control valve that is closed at 100% of the actuator - then the controller output must also be reversed.)
6. If the oscillations disappear by switching to manual mode, the control circuit is the cause of the oscillations. The cause can usually be found in the control valve, the controller setting or some interaction.
7. If the oscillations disappear only by closing the control valve completely, they are caused by pressure fluctuations in the valve. The cause may be oscillating pressure or on-off behavior.
8. If the period of oscillations in automatic mode increases very noticeably for a less aggressive PI controller (less proportional gain), the control valve insensitivity band is excessively large.
9. Conclusions from computer simulations are critically dependent on the quality of the model of the process being controlled. Simulation results obtained using an inadequate model do not correspond to reality. If the PI controller settings are taken from computer simulations, it is necessary to look at such settings as a first attempt to be further tuned.
10. In cascade control, if the control responses in the primary loop (transport delay and time constant) are not at least five times slower than in the secondary loop, the primary loop must be slowed down, e.g. by reducing the PI controller gain of the primary loop.
11. Introducing a proportional feed-forward from the change in setpoint to the output of the PI controller means improving the response of the controlled process to changes in setpoint. The setting of the proportional forward feedback term is chosen to be about half of the proportional gain of the controller.

PID Practice Hints

Process Control Basic

Depending on the nature of the system being controlled, the PID controller parameters must be adjusted to achieve the desired control response. Roughly speaking, there are three basic types of controlled processes, which are characterized by the type of response to a step change in the control variable (step response characteristic).

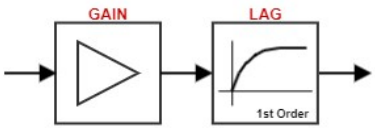
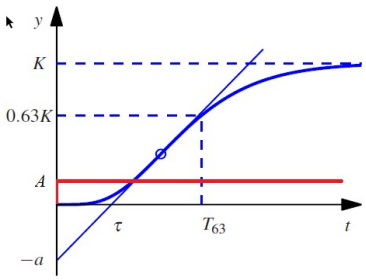
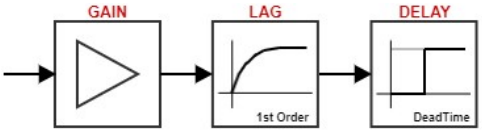
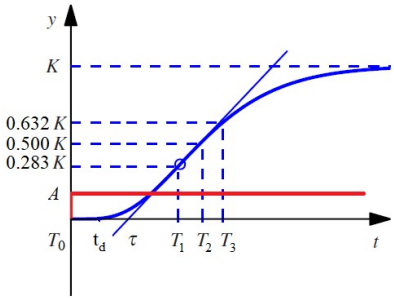
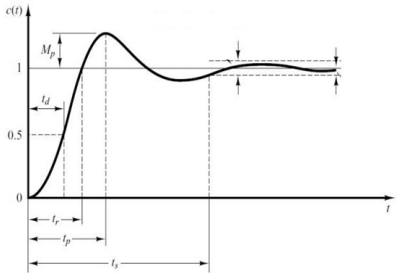
Self-regulating process	Integrating process	Runaway process
		
A pushed ball moving on a shaggy carpet	Open door at the bottom of the chewing gum ball tray	A nudged ball running downhill
P, PI, PID	**P, PD**	**P, PD**

In the vast majority of cases, we encounter the first type of processes - self-regulating processes (and few cases with integrative processes, and very rarely with runaway processes), so we will deal with the first ones.

The tasks of tuning controller parameters for particular process can be divided into two topics:

1. Recognition (identification) of the controlled system parameters (characteristics)
2. Determining the correct (appropriate) controller parameters

To obtain the characteristics of the controlled system, a number of approaches can be chosen (including theoretical analysis), the most common of which include performing and evaluating experiments with step changes in the action or disturbance variable. However, the vast majority of systems can be simplified to systems of these types:

FOL (First Order Lag)		
FOPDT (First Order Lag + DeadTime)		
SOPDT (Second Order Lag + DeadTime)		

The identified FOL / FOPDT process parameters are:

- process gain K
- deadtime t_d
- time constant τ

The process gain evaluation:

$$K_c = \frac{\text{\% change obtained in process variable}}{\text{\% change made in controller output}} = \frac{\frac{\text{FinalPV-Initial } PV}{\text{Hi limit } PV - \text{ Lo limit } PV}}{\text{Final controller output} - \text{Initial controller output}}$$

Deadtime and time constant:

- From the step response graph using graphical evaluation.

or

- Evaluate by equations:

$$K_c = \frac{K}{A} \qquad \tau = \frac{3}{2} \cdot (T_3 - T_1) \qquad t_d = (T_3 - T_0) - \tau$$

Note: *Process gain higher than 5 or lower than 0.2 may indicate a problem. Check the size and design of control elements and/or process value sensor.*

PID Type Selection

According to the nature of the system (its natural dynamics) and the controlled variable, it is necessary to determine the appropriate type of PID controller. The following table can be a guide for this selection.

Controlled quantity	**Controller type**					**Sample rate**
	P	**I(*)**	**PI**	**PD**	**PID**	**[s]**
Pressure	✓	✓✓	✓✓✓	✗	✗	< 2
Temperature	✓✓	✗	✓✓✓	✓✓✓	✓✓✓	5-15 / 15-30
Flow	✗	✓	✗	✗	✗	< 2
Level height	✓✓	✗	✓✓✓	✗	✗	1 - 5
Rotation	✓✓	✓✓	✓✓✓	✓✓✓	✓✓✓	< 0,5

✗ : Unsuitable

✓ : Usable

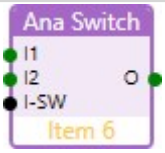
✓✓ : Suitable

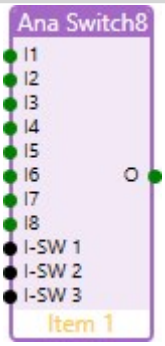
✓✓✓ : Suitable for higher demands

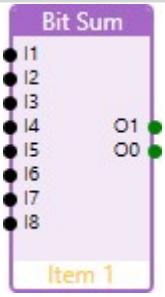
Note: *(*) Please note that a pure I-type of PID controller is not available using the PLC PID block because setting the Kp parameter to zero disables the block. In this case, the Kp value must be set to a (small) non-zero value.*

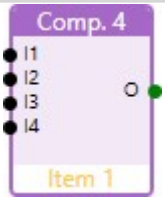
IMPORTANT: Data should be collected at a minimum of ten (10) times faster than the rate of the Process Time Constant.

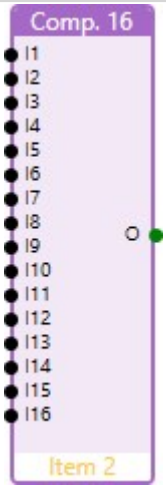
7.2.7 Other functions

PLC Block	Analog Switch	
Block icon	As	
PLC Set	Standard	
The block switches between two analog inputs based on a binary input value and provides this value on the output.		

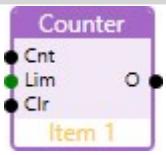
PLC Block	Analog Switch 8	
Block icon	As	
PLC Set	Standard	
The block performs switching between 2 to 8 analog inputs based on the value of the binary inputs and provides this value on the output.		

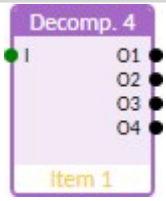
PLC Block	BitSum	
Block icon	BS	
PLC Set	Standard	
The block performs the summation of active/inactive 2 to 8 inputs and provides analog output values of these sums.		

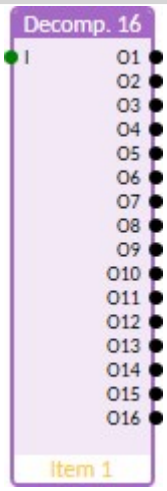
PLC Block	Composer	
Block icon	Dc	
PLC Set	Standard	
The block converts the selected four input bits to analog form and provides an analog output value.		

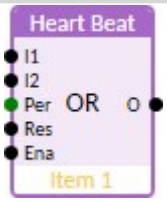
PLC Block	Composer16	
Block icon	Dc	
PLC Set	Standard	
The block converts the selected 16 input bits to analog form and provides an analog output value.		

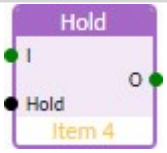
PLC Block	Convert	
Block icon	Cr	
PLC Set	Standard	
The block converts the input based on the selected resolution and dimension and passes it to the output.		

PLC Block	Counter	
Block icon	Cn	
PLC Set	Standard	
The block performs counting of input edges according the block configuration.		

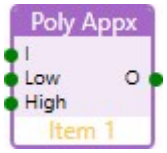
PLC Block	Decomposer	
Block icon	Dc	
PLC Set	Standard	
The block converts the input analog value to binary and provides selected 4 bits from the input as binary outputs.		

PLC Block	Decomposer16	
Block icon	Dc	
PLC Set	Standard	
The block converts the input analog value to binary and provides selected 16 bits as binary outputs.		

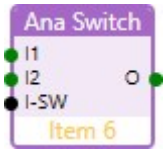
PLC Block	HeartBeat	
Block icon	HB	
PLC Set	Standard	
The block performs heartbeat checking of square input signal.		

PLC Block	Hold	
Block icon	H	
PLC Set	Standard	
The block captures the input value based on the state of the hold input and the selected mode.		

PLC Block	Jump	
Block icon	Jp	
PLC Set	Standard	
The block performs jump		

PLC Block	Polynomial approximation	
Block icon	Pa	
PLC Set	Standard	
The block performs the polynomial approximation of the input variable and provides this value on the output.		

Analog Switch

PLC Group	Others	
PLC Set	Standard	
PLC Block ID	5	

Inputs

Input	Abbr.	Type	Range	Function
Input 1	I1	Analog	$-2^{32}-1$ .. $+2^{32}-1$	Input value 1
Input 2	I2	Analog	$-2^{32}-1$ .. $+2^{32}-1$	Input value 2
Input SW	I-SW	Binary	0/1	Switching between Input value 1 and 2

Outputs

Output	Abbr.	Type	Range	Function
Output	O	Analog	$-2^{32}-1$ .. $+2^{32}-1$	Output is set to input selected by Input SW

Description

The block is switching **Input 1** and **Input 2** based on value of **Input SW**.

The **Output** has **Resolution** and **Dimension** according to the block settings.

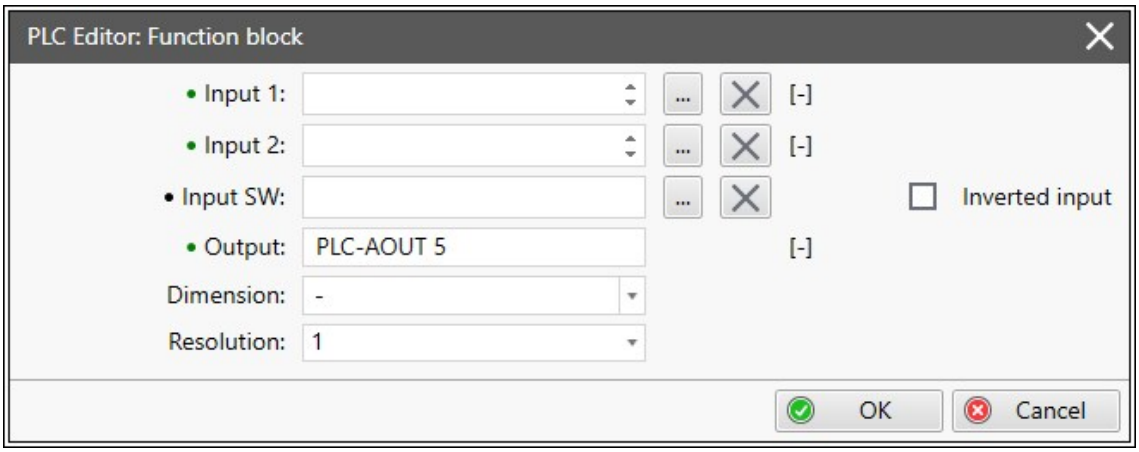
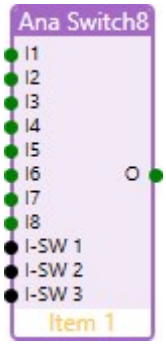


Image 19.2 Configuration of Analog Switch block

back to Groups of PLC Blocks

Analog Switch 8

PLC Group	Others	
PLC Set	Extended	
PLC Block ID	45	

Inputs

Input	Abbr.	Type	Range	Function
Input 1	I1	Analog	$-2^{32}-1$ .. $+2^{32}-1$	Input value 1
Input 2	I2	Analog	$-2^{32}-1$ .. $+2^{32}-1$	Input value 2
Input 3	I3	Analog	$-2^{32}-1$ .. $+2^{32}-1$	Input value 3 (optional)
Input 4	I4	Analog	$-2^{32}-1$ .. $+2^{32}-1$	Input value 4 (optional)
Input 5	I5	Analog	$-2^{32}-1$ .. $+2^{32}-1$	Input value 5 (optional)
Input 6	I6	Analog	$-2^{32}-1$ .. $+2^{32}-1$	Input value 6 (optional)
Input 7	I7	Analog	$-2^{32}-1$ .. $+2^{32}-1$	Input value 7 (optional)
Input 8	I8	Analog	$-2^{32}-1$ .. $+2^{32}-1$	Input value 8 (optional)
Input SW 1*	I-SW1	Binary	0/1	Switch input 1
Input SW 2	I-SW2	Binary	0/1	Switch input 2
Input SW 3	I-SW3	Binary	0/1	Switch input 3

* mandatory input(s).

Outputs

Output	Abbr.	Type	Range	Function
Output	O	Analog	$-2^{32}-1$ .. $+2^{32}-1$	Output is set to $Input_x$ value selected by switch inputs I-SW 1, I-SW 2 and I-SW 3

Description

The block works as an analog multiplexer. The **Output** value could be selected from up to 8 inputs according to the **Input SW 3**, **Input SW 2** and **Input SW 1** state

The appropriate **$Input_x$** value is then copied to the **Output**, see the table below.

The **Output** has **Resolution** and **Dimension** according to the block settings.

> **IMPORTANT: Please note that the binary combination of Input SW 3, Input SW 2 and Input SW 1 forms an index one less than that of $Input_x$.**

Input SW 3	Input SW 2	Input SW 1	Output
0	0	0	Input 1
0	0	1	Input 2
0	1	0	Input 3
0	1	1	Input 4
1	0	0	Input 5
1	0	1	Input 6
1	1	0	Input 7
1	1	1	Input 8

Note: *When a switching input (**Input SW$_x$**) is not connected, its value is considered as zero.*

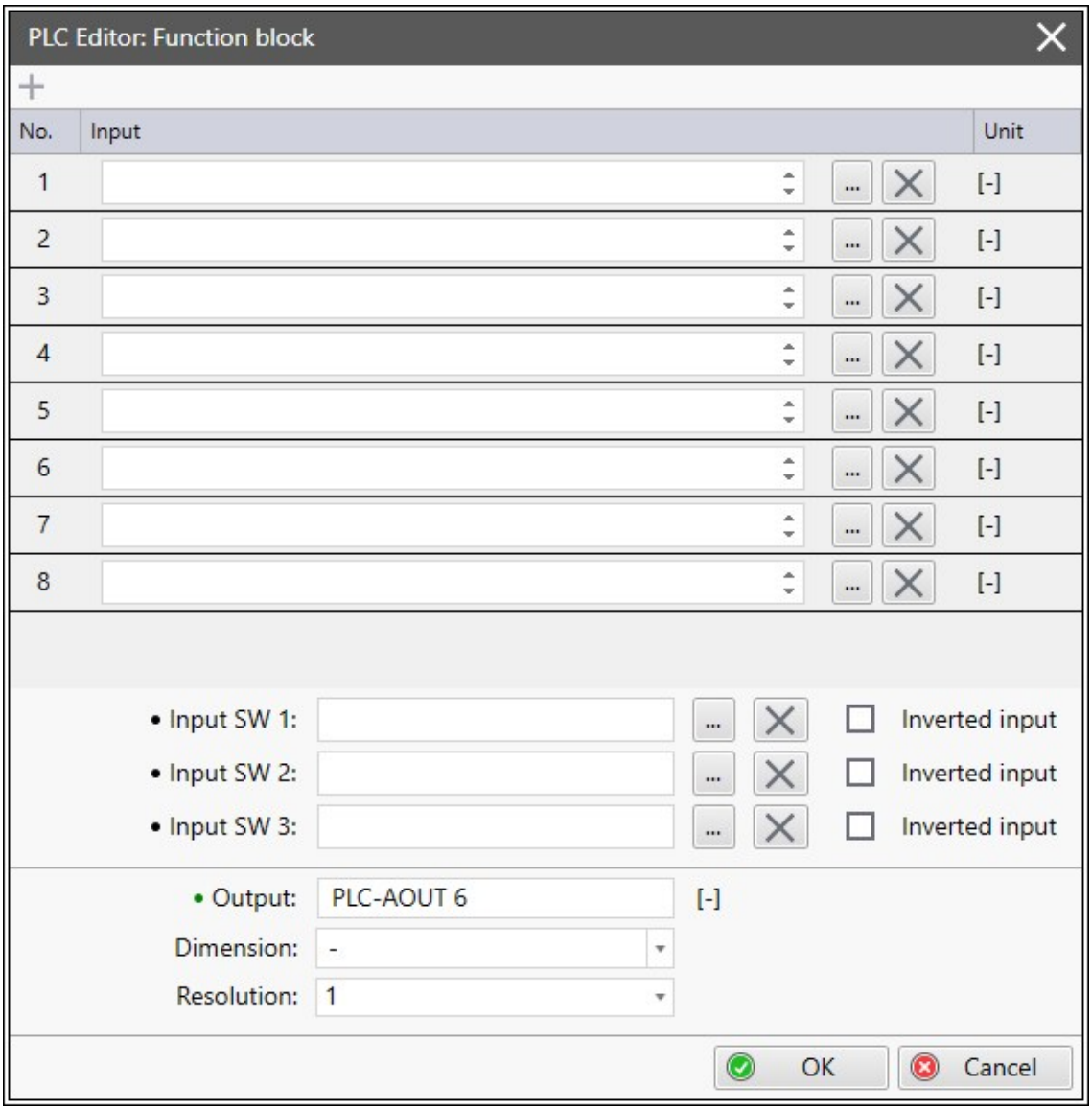
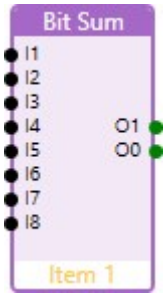


Image 19.3 Configuration of Analog Switch 8 block

back to Groups of PLC Blocks

Bit Sum

PLC Group	Others	
PLC Set	Extended	
PLC Block ID	44	

Inputs

Input	Abbr.	Type	Range	Function
Input 1	I1	Binary	0/1	Input 1
Input 2	I2	Binary	0/1	Input 2
Input 3	I3	Binary	0/1	Input 3 (optional)
Input 4	I4	Binary	0/1	Input 4 (optional)
Input 5	I5	Binary	0/1	Input 5 (optional)
Input 6	I6	Binary	0/1	Input 6 (optional)
Input 7	I7	Binary	0/1	Input 7 (optional)
Input 8	I8	Binary	0/1	Input 8 (optional)

Outputs

Output	Abbr.	Type	Range	Function
Output 1	O1	Analog	0 .. Max [-]	Output One value = sum of active inputs (**Input$_X$** has value true)
Output 0	O0	Analog	0 .. Max [-]	Output Zero value = sum of inactive inputs (**Input$_X$** has value false)

Note: *Max is the number of properly configured inputs.*

Description

The block performs the sum of active and inactive inputs (2 to 8 inputs) and provides two analog value: **Output 1** is the sum of active binary inputs and **Output 0** is the sum of inactive binary inputs.

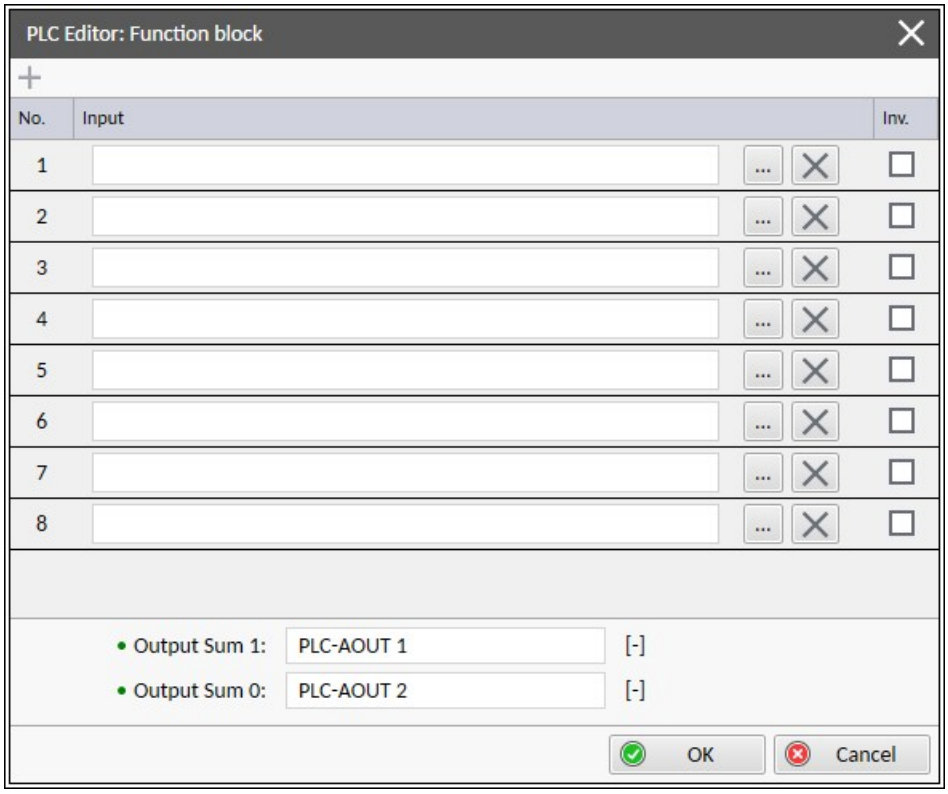
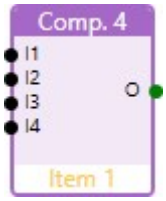


Image 19.4 Configuration of Bit Sum block

back to Groups of PLC Blocks

Composer

PLC Group	Others	
PLC Set	Standard	
PLC Block ID	24	

Inputs

Input	Abbr.	Type	Range	Function
Input 1	I1	Binary	0/1	Bit 0,4,8,12,16,20,24,28 - according to selected group of **Bits** (quad).
Input 2	I2	Binary	0/1	Bit 1,5,9,13,17,21,25,29 - according to selected group of **Bits** (quad).
Input 3	I3	Binary	0/1	Bit 2,6,10,14,18,22,26,30 - according to selected group of **Bits** (quad).
Input 4	I4	Binary	0/1	Bit 3,7,11,15,19,23,27,31 - according to selected group of **Bits** (quad).

Outputs

Output	Abbr.	Type	Range	Function
Output	O	Analog	$-2^{32}-1$ .. $+2^{32}-1$	Value to be "composed" from inputs

Description

The block converts selected input bits to analog form and provides the **Output** analog value.The resulting quad of bits is placed in the **Output** value within the selected bit range (**Bits**)

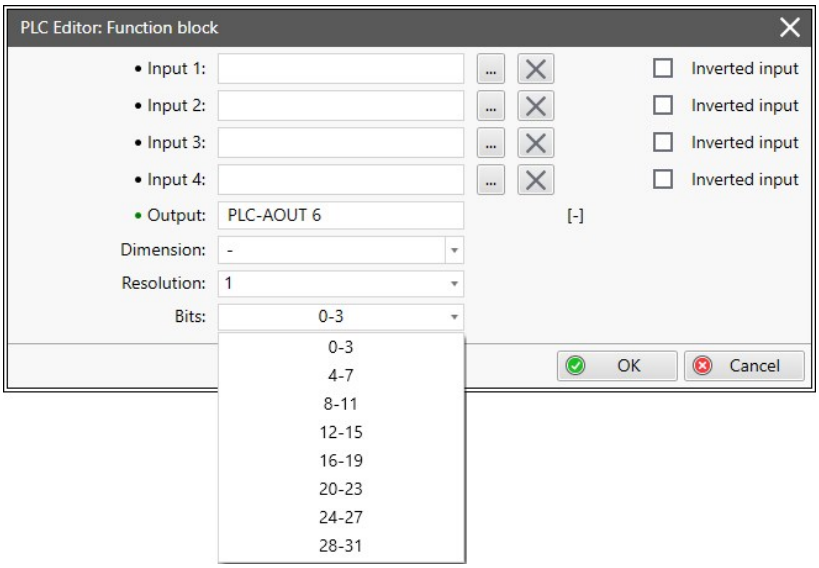
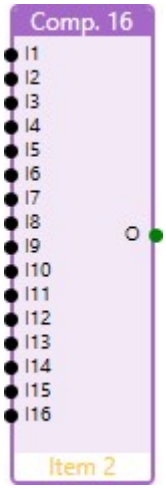


Image 19.5 Configuration of Composer block

back to Groups of PLC Blocks

Composer 16

PLC Group	Others	
PLC Set	Extended	
PLC Block ID	48	

Inputs

Input	Abbr.	Type	Range	Function
Input 1	I1	Binary	0/1	According to selected group of bits.
Input 2	I2	Binary	0/1	According to selected group of bits.
...	...	...	...	...
Input 15	I15	Binary	0/1	According to selected group of bits.
Input 16	I16	Binary	0/1	According to selected group of bits.

Outputs

Output	Abbr.	Type	Range	Function
Output	O	Analog	$-2^{32}-1$ .. $+2^{32}-1$	Value to be "decomposed" from inputs

Description

The block converts selected input bits to analog form and provides the **Output** analog value.It is possible to select lower bits 0-15 or upper bits 16-31 so it is possible to compose 32 bit value by using of two composers.

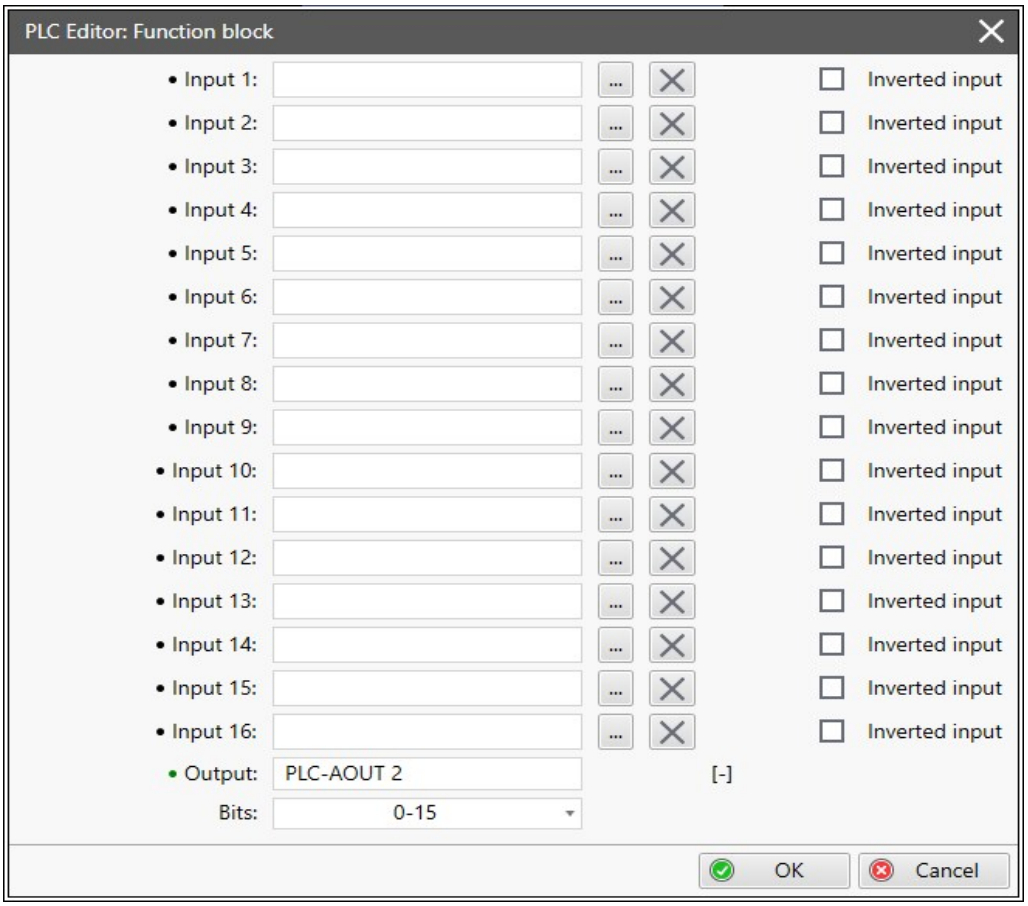
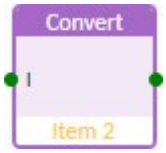


Image 19.6 Configuration of Composer 16 block

back to Groups of PLC Blocks

Convert

PLC Group	Others	
PLC Set	Standard	
PLC Block ID	25	

Inputs

Input	Abbr.	Type	Range	Function
Input	I	Analog	$-2^{32}-1$ .. $+2^{32}-1$	Input value

Outputs

Output	Abbr.	Type	Range	Function
Output	O	Analog	$-2^{32}-1$ .. $+2^{32}-1$	Converted Input value

Description

The block converts the **Input** based on the selected **Resolution** and **Dimension** and passes it to the **Output**.

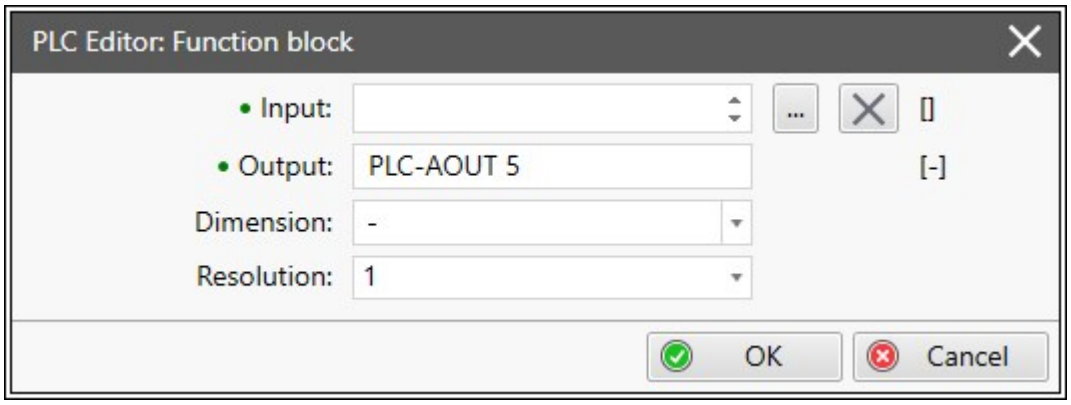
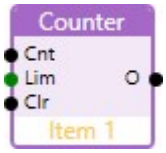


Image 19.7 Configuration of Convert block

Note: *Conversion is done to Integer32, if the input value is out of Integer32 range, output value is set to invalid status.*

back to Groups of PLC Blocks

Counter

PLC Group	Others	
PLC Set	Standard	
PLC Block ID	13	

Inputs

Input	Abbr.	Type	Range	Function
Input Count Up	Cnt	Binary	0/1	Input whose edges are counted
Input Preset Limit	Lim	Analog	0 .. 2 147 483 647	Counter limit value for **Output** activation
Input Clear	Clr	Binary	0/1	Reset input

Outputs

Output	Abbr.	Type	Range	Function
Output	Binary	No	0/1	Output is activated when the counter value exceeds the **InputPreset Limit**

Resources

Output	Type	Range	Function
Actual Counter Value	No	0 .. 2 147 483 647	Analog value that contains Actual Counter Value is available in **PLC Resources** value group. The index of the **PLC Resource$_x$** variable depends on current block order of execution (see also **PLC Execution**)

Note: *The PLC Resource index could be derived as described here **PLC Variables**.*

IMPORTANT: The counter value is lost when the controller is switched off.

Description

The block works as a counter of edges (selectable rising, falling or both) with reset input and adjustable counting limit. The maximal counter value is 2147483647. The **Output** is activated when the counter value is equal to or higher than **Input Preset Limit** and stays active until the block reset is done using **Input Clear**. Activating of the **Input Clear** resets the counter value to 0 and deactivates the **Output**. Holding the **Input Clear** active blocks the counting.

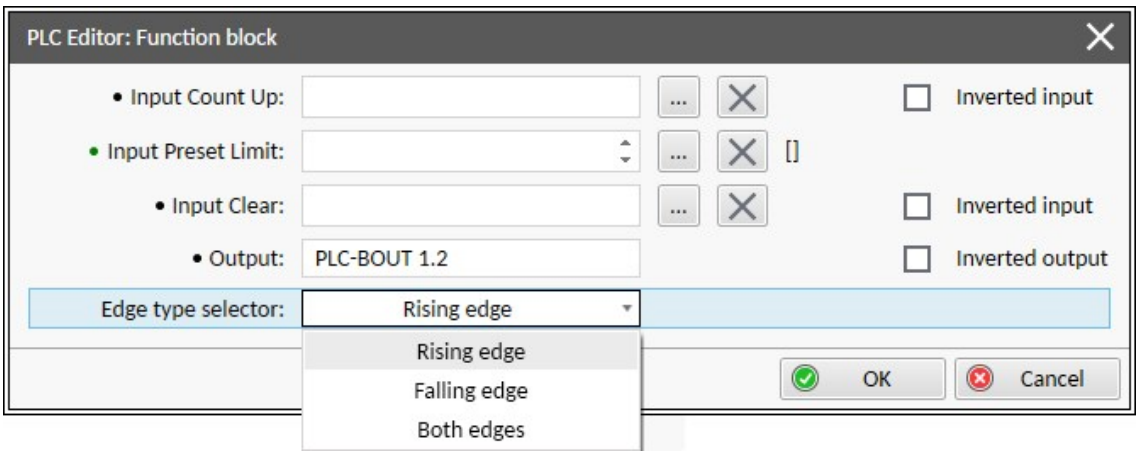
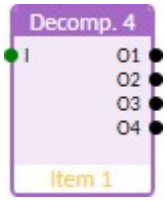


Image 19.8 Configuration of the Counter block

back to Groups of PLC Blocks

Decomposer 4

PLC Group	Others	
PLC Set	Standard	
PLC Block ID	24	

Inputs

Input	Abbr.	Type	Range	Function
Input	I	Analog	$-2^{32}-1$ .. $+2^{32}-1$	Value to be "decomposed" to **Bits**

Outputs

Output	Abbr.	Type	Range	Function
Output 1	O1	Binary	0/1	Bit 0,4,8,12,16,20,24,28 - according to selected group of bits (quad).
Output 2	O2	Binary	0/1	Bit 1,5,9,13,17,21,25,29 - according to selected group of bits (quad).
Output 3	O3	Binary	0/1	Bit 2,6,10,14,18,22,26,30 - according to selected group of bits (quad).
Output 4	O4	Binary	0/1	Bit 3,7,11,15,19,23,27,31 - according to selected group of bits (quad).

Description

The block converts the **Input** analog value to binary and provides selected bits from the input as binary **Outputs$_x$**.The input four bits are selected by bit range selection (**Bits**).

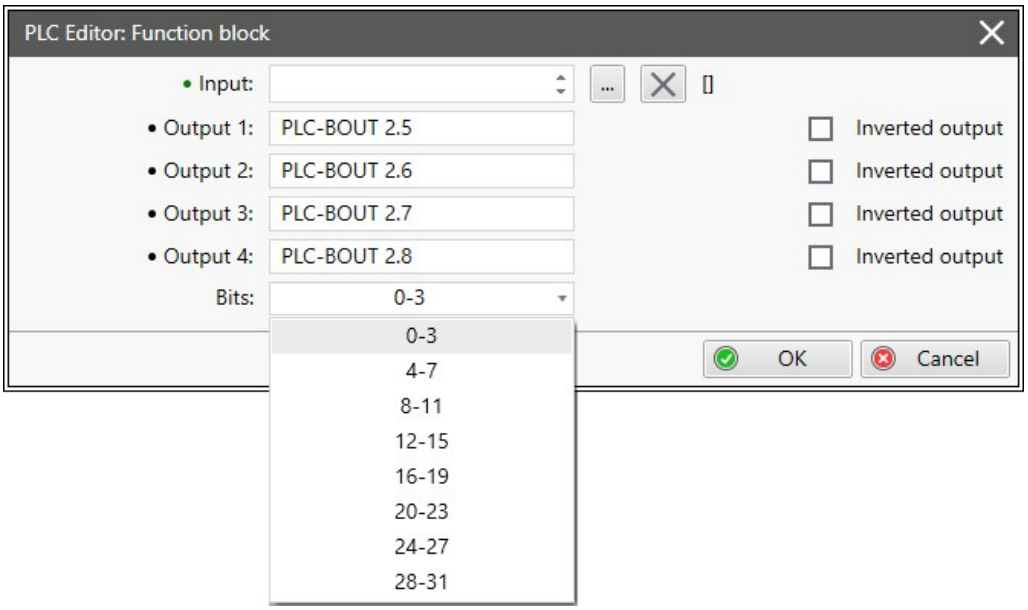
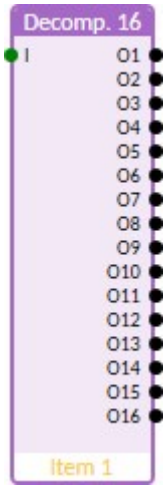


Image 19.9 Configuration of Decomposer block

back to Groups of PLC Blocks

Decomposer 16

PLC Group	Others	
PLC Set	Extended	
PLC Block ID	48	

Inputs

Input	Abbr.	Type	Range	Function
Input	I	Analog	$-2^{32}-1$ .. $+2^{32}-1$	Value to be "decomposed" to bits

Outputs

Output	Abbr.	Type	Range	Function
Output 1	O1	Binary	0/1	According to selected group of bits.
Output 2	O2	Binary	0/1	According to selected group of bits.
...	...	...	...	...
Output 15	O15	Binary	0/1	According to selected group of bits.
Output 16	O16	Binary	0/1	According to selected group of bits.

Description

The block converts the input analog value to binary and provides selected bits from the input as binary outputs.It is possible to select lower bits 0-15 or upper bits 16-31 so it is possible to decompose 32 bit value by using of two decomposers.

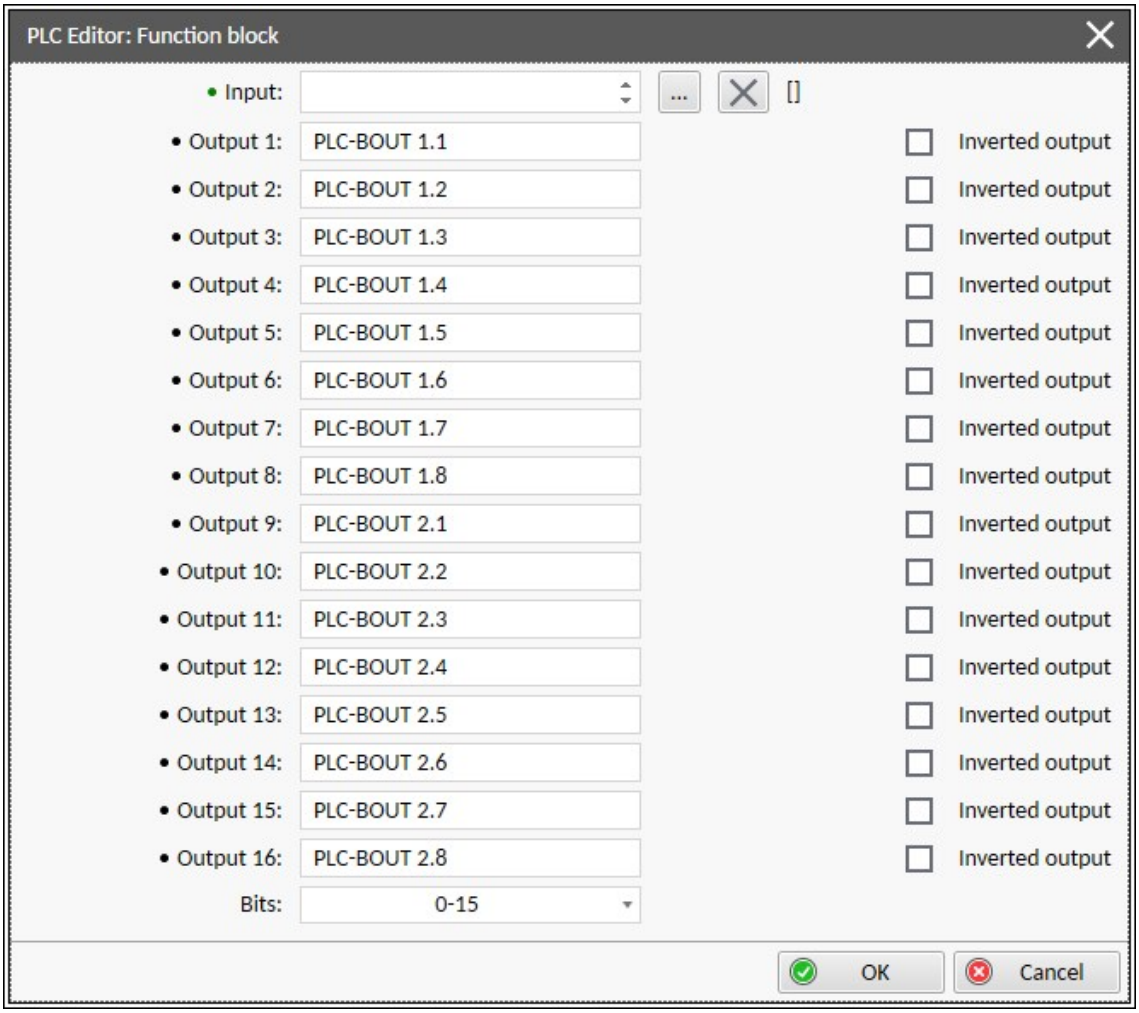


Image 19.10 Configuration of Decomp. 16 block

back to Groups of PLC Blocks

Heartbeat

PLC Group	Others	
PLC Set	Extended	
PLC Block ID	43	

Inputs

Input	Abbr.	Type	Range	Function
Input 1*	I1	Binary	0/1	The incoming (rising) edge leads to resetting the Heartbeat counter.
Input 2	I2	Binary	0/1	The optional second input signal, evaluation depends on mode of operation (OR/ XOR)
Checking Period*	Per	Analog	0,2 .. 6500,0 s	Heartbeat checking / counting period (maximum is approx. 100 min).
Reset Output	Res	Binary	0/1	The active value of this input clears the output to the default (off) value.
Enable	Ena	Binary	0/1	Heartbeat block enable.

* mandatory input(s).

Note: *If **Enable** input is not connected, the block is enabled.*

Note: *When **Enable** is not active or there is an invalid value on **Input 1** (or **Input 2**) of the block, the **Output** is 0, the internal Heartbeat counter is reset to the **Checking Period** value.*

Note: ***Checking Period*** *should be at least twice the incoming checked signal period (at least 2 PLC execution periods).*

Note: *If **Input 2** is configured, the **Reset Action** depends on the selected operation between inputs 1 and 2 (OR/ XOR) - see below.*

Outputs

Output	Abbr.	Type	Range	Function
Output	O	Binary	0/1	Output value

Description

The PLC block performs Heartbeat signal checking.The **Checking Period** parameter specifies both the Heartbeat checking period and the reload value of the internal counter. The resolution of the counter is 0,1 seconds.

The internal counter is re-set to the **Checking Period** value in the cases (**Reset Action**):

- The **Enable** input is false.

- The internal counter reaches the zero value.

Note: *Please note the Reset Output doesn't reset the internal counter!*

The Heartbeat check operation is valid:

- A rising edge is detected on **Input 1** (only input 1 is configured) or a rising edge is detected on **Input 2** (only input 2 is configured).
- Both **Input 1** and **Input 2** are configured:
  - **OR mode**:
    - If the rising edge is detected either on **Input 1** or **Input 2**.
  - **XOR mode**:
    - If a rising edge is detected on **Input 1** and followed by detection of a falling edge on **Input 2**
    - If a falling edge is detected on **Input 2** and followed by detection of a rising edge on **Input 1**.

The above conditions must be met before the counter counts down to zero to ensure that the incoming heartbeat signal is live. The **Output** binary signal is set (on) if the internal counter counts down to zero.

If the **Reset Output** input is configured and the input is active (**Reset Output** is set), the **Output** is cleared to the default (off) value. If the **Reset Output** input is not configured, the **Output** can be cleared by any successful check operation described above.

If the **Enable** input is configured and the input is inactive (**Enable** is reset), the internal counter is reloaded to the **Checking Period** value, counting stops and the **Output** is cleared to default (off) value. If the **Enable** input is not configured or the input is active (**Enable** is set), the internal counter is counting down and the Heart Beat checking functionality is excuted.

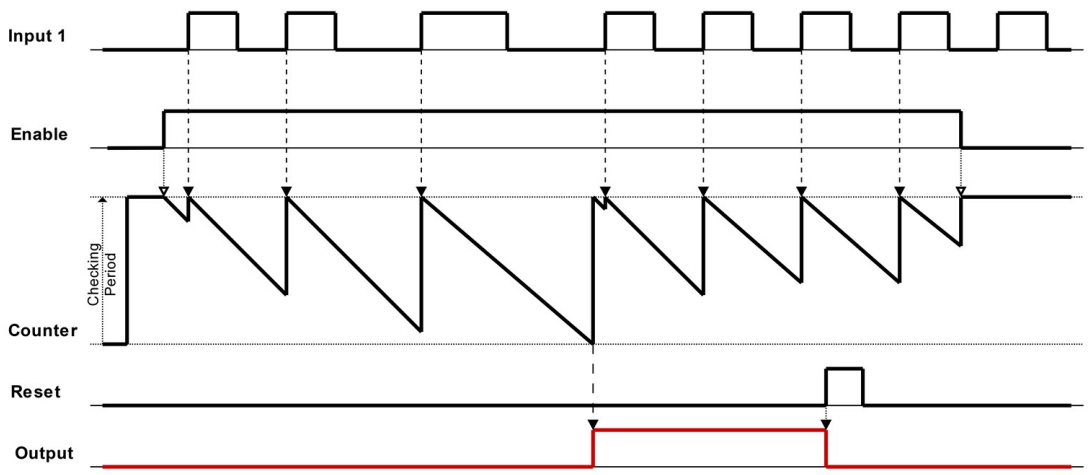


Image 19.11 Principle of operation of Heartbeat block (one input configured)

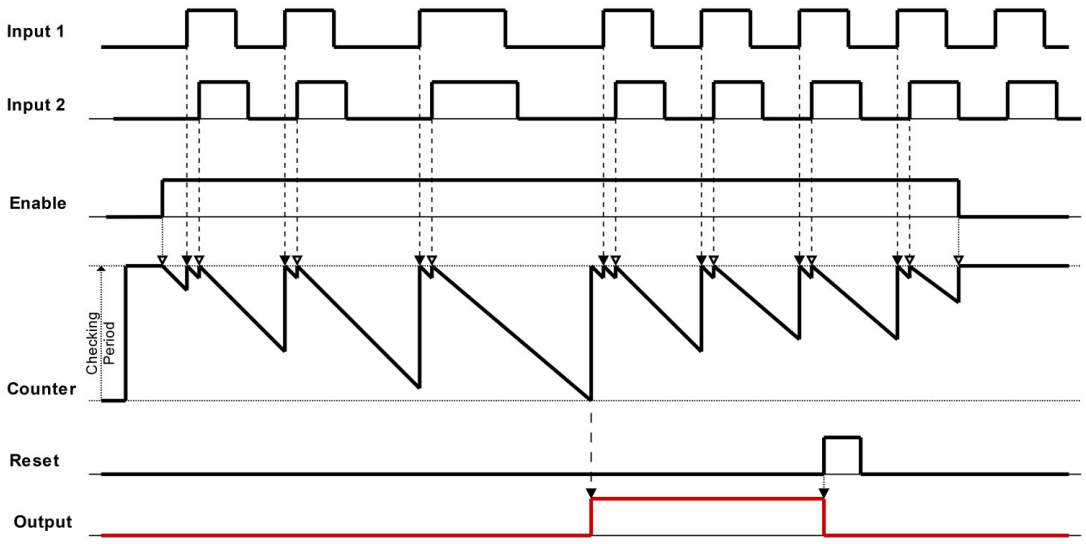


Image 19.12 Principle of OR operation of Heartbeat block (two inputs configured)

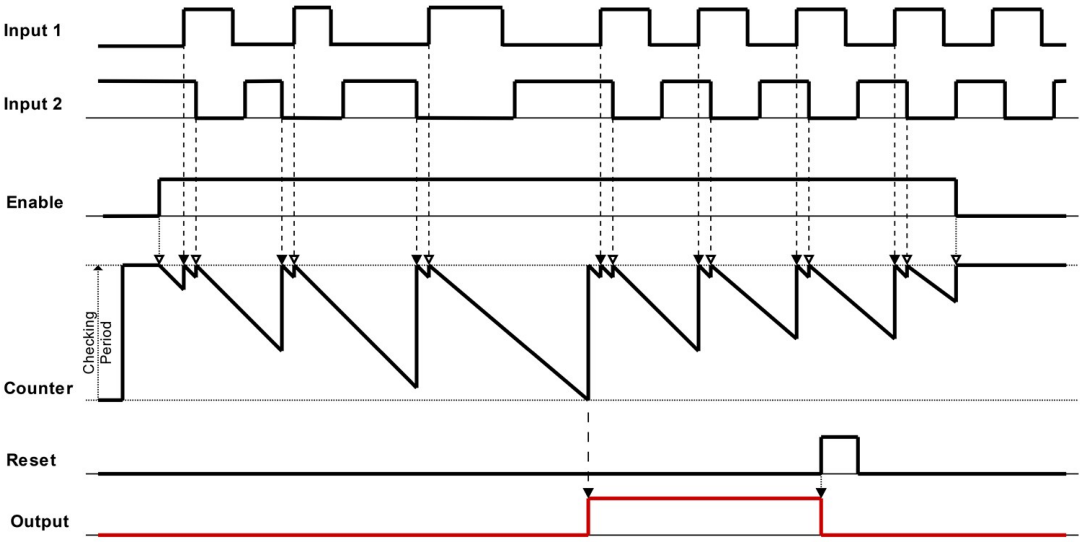


Image 19.13 Principle of XOR operation of Heartbeat block (two inputs configured)

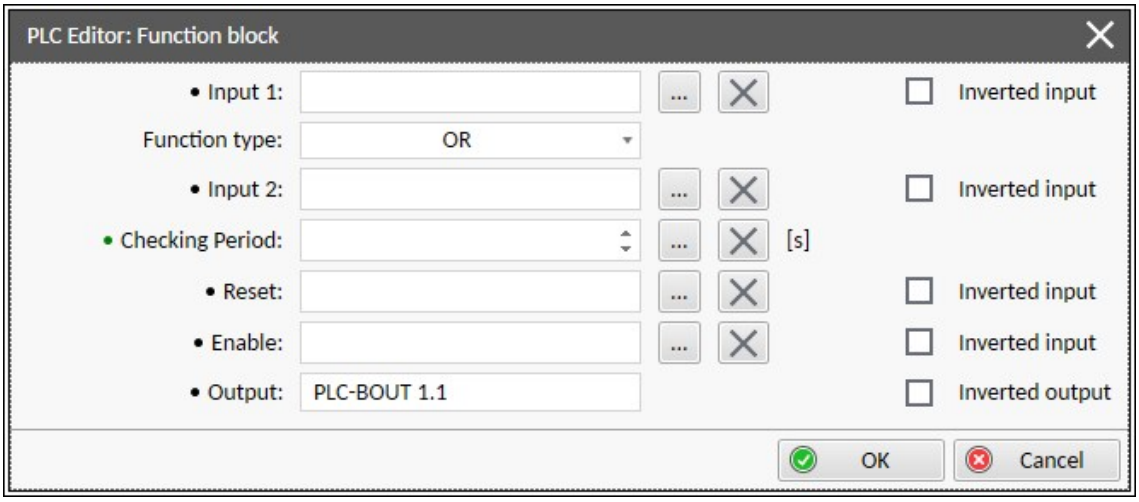
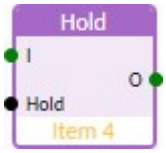


Image 19.14 Configuration of Heartbeat block

back to Groups of PLC Blocks

Hold

PLC Group	Others	
PLC Set	Standard	
PLC Block ID	37	

Inputs

Input	Abbr.	Type	Range	Function
Input	I	Analog	$-2^{32}-1$ .. $+2^{32}-1$	Input value
HoldHold	Analog	Binary	0/1	Input triggering the function

Outputs

Output	Abbr.	Type	Range	Function
Output	O	Analog	$-2^{32}-1$ .. $+2^{32}-1$	Hold output

Description

The block captures the **Input** value based on the state of the **Hold** input and the selected mode.

The **Output** has a **Resolution** and **Dimension** according to the block settings.

Mode	Description
Edge	The block acts as an analog memory. The input **Hold** acts as as trigger and responds to the rising edge. The initial **Output**value after a controller restart is 0.
Level	The block as a **Input** value tracker when the input **Hold** is inactive. The**Output** value is latched at the last value while **Hold** is active.

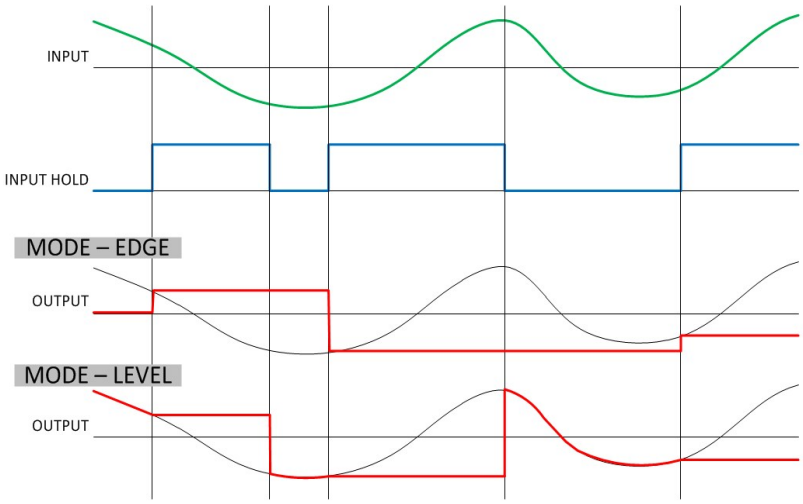


Image 19.15 Principle of the Hold modes

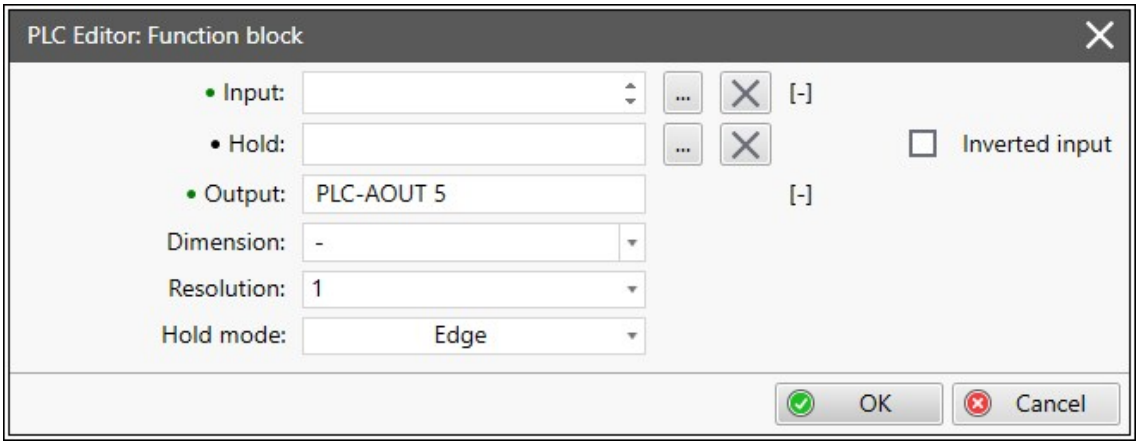
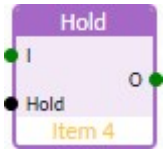


Image 19.16 Configuration of the Hold block

back to Groups of PLC Blocks

Jump

PLC Group	Others	
PLC Set	Extended	
PLC Block ID	21	

IMPORTANT: T.B.D.

Inputs

Input	Abbr.	Type	Range	Function
Input	Binary	Yes	0/1	Input which activates the jump.

Outputs

N/A

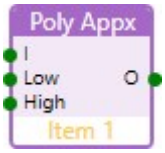
Description

If the input is active, then a group of following PLC blocks is skipped and the PLC program continues execution at the block that is specified in the block jump.

Image 19.17 Configuration of Jump block

back to Groups of PLC Blocks

Polynomial Approximation

PLC Group	Others	
PLC Set	Extended	
PLC Block ID	47	

Inputs

Input	Abbr.	Type	Range	Function
Input*	I	Analog	$-2^{32}-1$ .. $+2^{32}-1$	Input value
Low Limit	Low	Analog	$-2^{32}-1$ .. $+2^{32}-1$	Low limit of output value
High Limit	High	Analog	$-2^{32}-1$ .. $+2^{32}-1$	High limit of output value

* means mandatory input(s).

Outputs

Output	Abbr.	Type	Range	Function
Output	O	Analog	$-2^{32}-1$ .. $+2^{32}-1$	Result of the polynomial approximation of input value.

Description

The block performs the polynomial approximation function of the **Input** value by calculating a polynomial (up to 6th order).

$$O = c_0 + c_1 * I_1 + c_2 * I_2^2 + c_3 * I_3^3 + c_4 * I_4^4 + c_5 * I_5^5 + c_6 * I_6^6$$

The result is limited by the **Low Limit** and **High Limit** parameters (lower and upper limits) and passed to the **Output**.

The **Output** has a **Resolution** and **Dimension** according to the block settings.

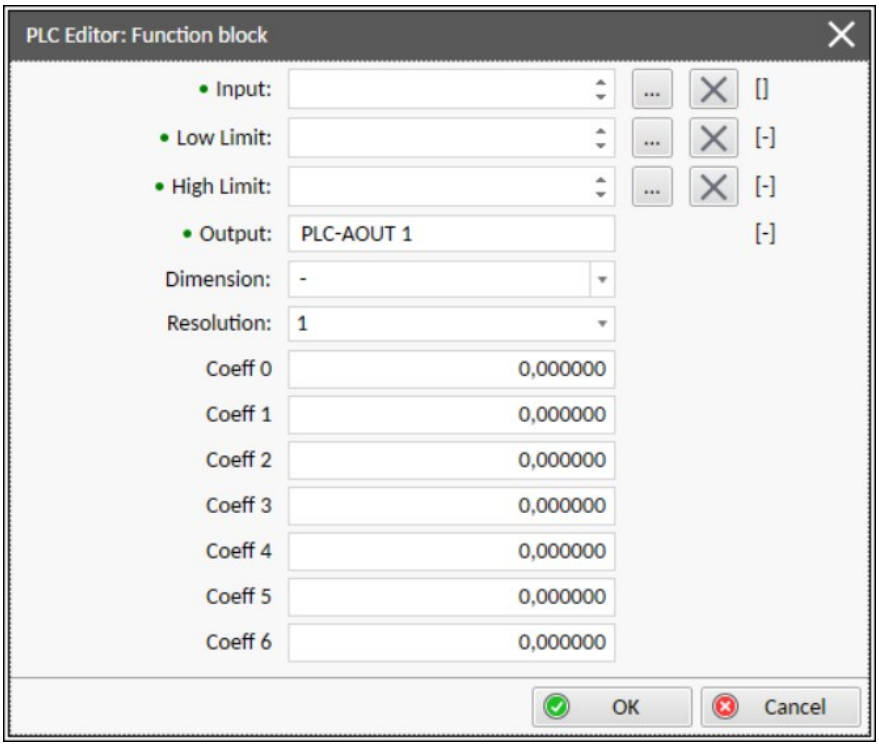


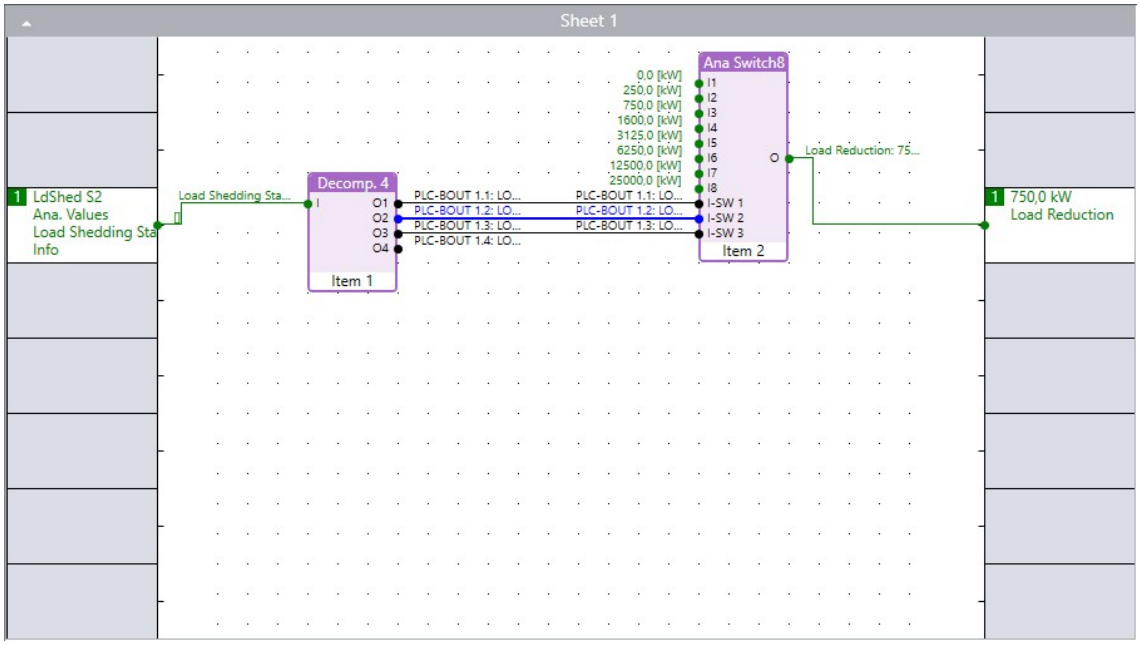
Image 19.18 Configuration of Polynomial Approximation block

back to Groups of PLC Blocks

Other Functions Blocks Examples

Basic use of Ana Switch 8

The AnaSwitch8 block could be aslo used as switch between pre-defined constants.



The input analog signal LoadShedingState is passed through the Decomposer block and its outputs are used as binary switches for AnaSwitch8 block.

> **IMPORTANT: Please note the first input of AnaSwitch8 (Input 1) is selected for I-SW 1 = 0, I-SW 2 = 0 and I-SW 3 = 0**

Basic use of PolyAppx

The Polynomial Approximation block is intended for use as non-linear conversion functional block e.g. for relatively complex sensor characteristics.

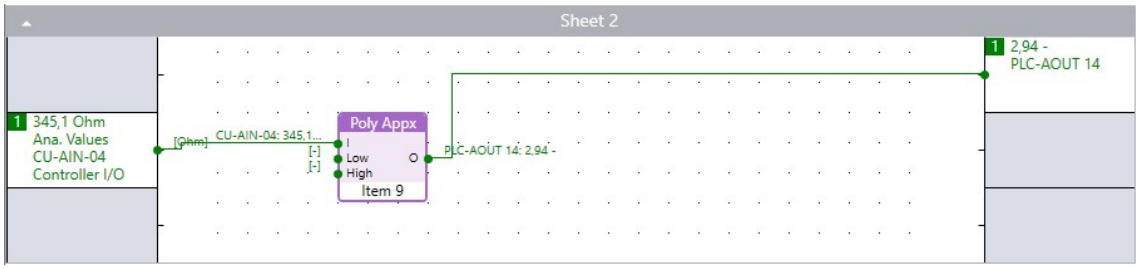


Image 19.19 PLC Polynomial Approximation block usage

The above diagram.

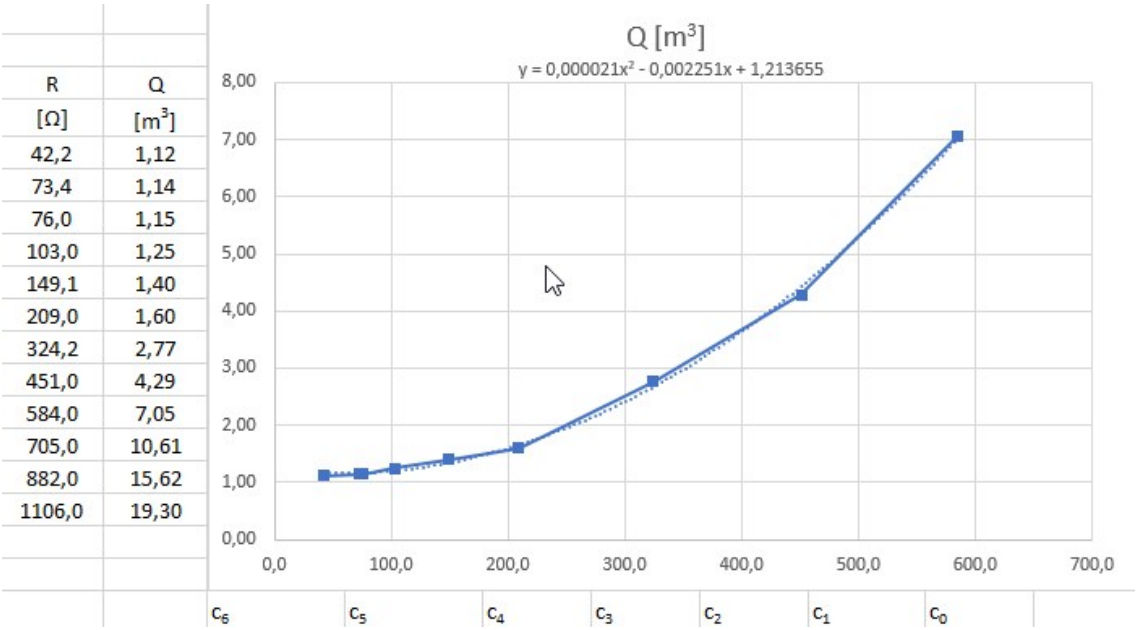


Image 19.20 Excel Sheet polynomial trendline

The polynomial is defined as

$$y = 0.000021.x^2 - 0.002251.x + 1.213655$$

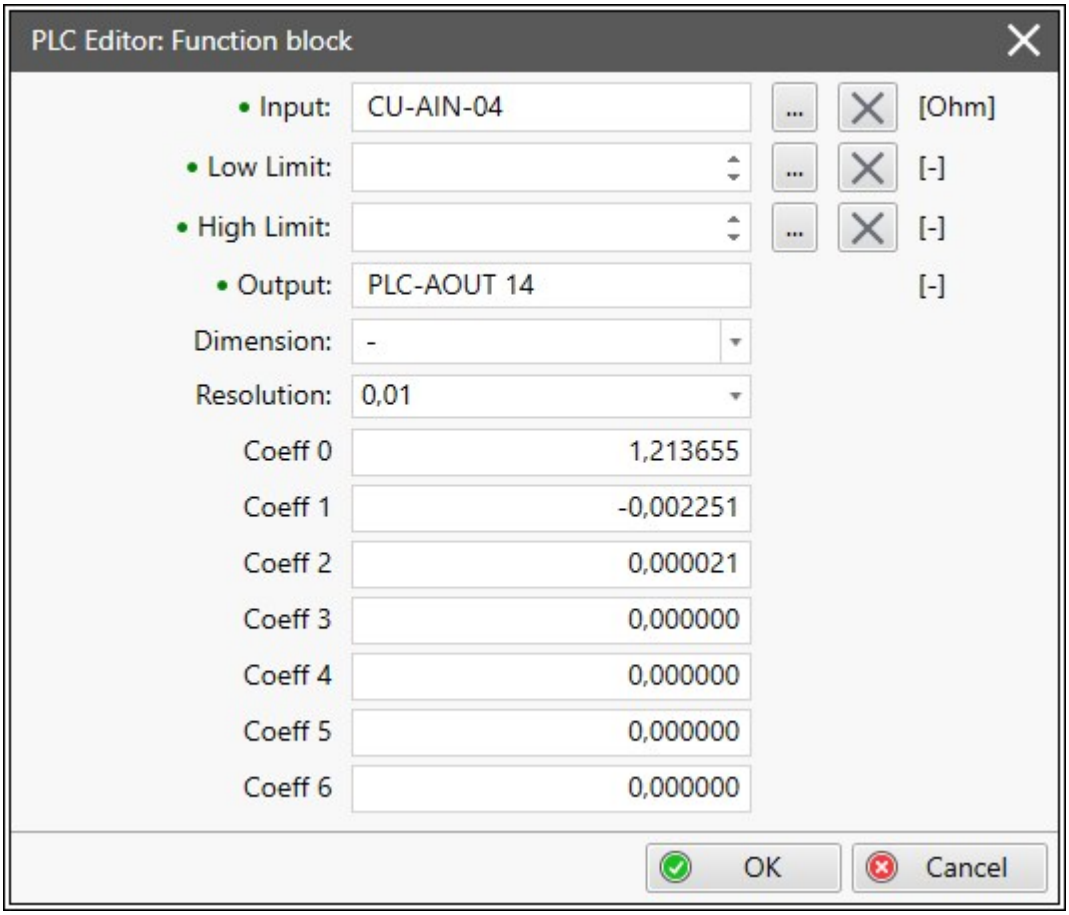


Image 19.21 PLC Polynomial Approximation block configuration

8 Grid Codes

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8.1 What are Grid Codes

Grid Codes are technical specifications which defines the parameters a facility connected to a public electric network has to meet to ensure safe, secure and economic proper functioning of the electric system. The facility can be an power generation plant, a solar farm, or any other grid connected source.**Controller Name**

8.2 Testing of Grid Codes

Grid Codes functions can be tested. To enable Grid Codes testing setpoint **Grid Codes Test** has to be Enabled. When testing mode is active, alarm **Wrn Test UPQF** is present in the alarmlist.

LAIs related to testing:

- LAI TESTF
- LAI TESTP
- LAI TESTQ
- LAI TESTU

8.3 Power Regulation Based On Over/Under Frequency

In case of over/under frequency, BESS must be able to reduce/increase the **BESS P**.

To enable these functions, setpoint **Power Over/Under Frequency** has to be Enabled.

8.3.1 Power reduction by over frequency - PoF

The BESS must be able to reduce **BESS P** in **Mains/Bus Frequency** - range of <**Nominal Frequency** + 0,2 Hz, **Nominal Frequency** + 1,5 Hz>. When **Mains/Bus Frequency** is in range defined by PoF for time longer than **Power Over/Under Frequency Delay**, power reduction will begin. If the **Mains/Bus Frequency** is over **Nominal Frequency** + 1,5 Hz, BESS can disconnect from the mains.

Note: *Power Over/Under Frequency has to be Enabled, otherwise PoF is not applied.*

Power reduction is defined by Application Curve POWER OVER FREQUENCY which shall be adjusted according to this formula:

$$\Delta P_{rel} = \frac{2000 * [(\text{Nominal Frequency} + 0,2) - \text{Mains/Bus Frequency}]}{\text{Nominal Frequency}} [\%]$$

After **Mains/Bus Frequency** reaches (**Nominal Frequency** + 0,2 Hz), **BESS P** is stored in **Pmom** and from this value is the power decreased.

Power is decreased/increased based on ramp (**BESS Required P** is ramped to **BESS Required P Target**) that is corresponding with actual active event.

Note: *If representative priority setpoint of actual active event is adjusted to OFF, then **BESS Required P** is ramped to **BESS Required P Target** based on **Load Ramp PTM**.*

Event	Used Ramp
LBO EVENT MAINS FREQUENCY RISE	**Mains Frequency Rise Ramp**
LBO EVENT MAINS FREQUENCY FALL	**Mains Frequency Fall Ramp**

While power is reduced due to over frequency, LBO **P OVER FREQUENCY ACTIVE** is closed.

PoF related settings

Setpoints	Values
Power Over/Under Frequency	**Pmom**
Power Over/Under Frequency Delay	**P Over Frequency Curve**
Mains Frequency Rise Priority	**BESS Required P**
Mains Frequency Rise Ramp	**BESS Required P Target**
Mains Frequency Fall Priority	LBOs
Mains Frequency Fall Ramp	**P OVER FREQUENCY ACTIVE**
Application Curves	**P OVER FREQUENCY CURVE INVALID**

POWER OVER FREQUENCY

EVENT MAINS FREQUENCY RISE

EVENT MAINS FREQUENCY FALL

Grid Codes Test = Enabled
LAI TESTF
LAI TESTP

8.3.2 Power increase by under frequency - PuF

The BESS must be able to increase **BESS P** in **Mains/Bus Frequency** range of <**Nominal Frequency** - 2,5 Hz, **Nominal Frequency** - 0,2 Hz>. When **Mains/Bus Frequency** is in range defined by PuF for time longer than **Power Over/Under Frequency Delay**, power increase will begin. If the **Mains/Bus Frequency** is under **Nominal Frequency** - 2,5 Hz, BESS can disconnect from the mains.

Note: *Power Over/Under Frequency has to be Enabled, otherwise PuF is not applied.*

Power increase is defined by Application Curve POWER UNDER FREQUENCY which shall be adjusted according to this formula:

$$\Delta P_{rel} = \frac{2000 * [(\text{Nominal Frequency} - 0,2) - \text{Mains/Bus Frequency}]}{\text{Nominal Frequency}} [\%]$$

After **Mains/Bus Frequency** drops below (**Nominal Frequency** - 0,2 Hz), **BESS P** is stored in **Pmom** and from this value is the power increased.

Power is decreased/increased based on ramp (**BESS Required P** is ramped to **BESS Required P Target**) that is corresponding with actual active event.

Note: *If representative priority setpoint of actual active event is adjusted to OFF, then **BESS Required P** is ramped to **BESS Required P Target** based on **Load Ramp PTM**.*

Event	Used Ramp
LBO EVENT MAINS FREQUENCY RISE	**Mains Frequency Rise Ramp**
LBO EVENT MAINS FREQUENCY FALL	**Mains Frequency Fall Ramp**

While power is increased due to under frequency, LBO **P UNDER FREQUENCY ACTIVE** is closed.

PuF related settings

Setpoints

Power Over/Under Frequency

Power Over/Under Frequency Delay

Mains Frequency Rise Priority

Mains Frequency Rise Ramp

Mains Frequency Fall Priority

Mains Frequency Fall Ramp

Application Curves

POWER UNDER FREQUENCY

Values

Pmom

P Over Frequency Curve

BESS Required P

BESS Required P Target

LBOs

P UNDER FREQUENCY ACTIVE

P UNDER FREQUENCY CURVE INVALID

EVENT MAINS FREQUENCY RISE

EVENT MAINS FREQUENCY FALL

Grid Codes Test = Enabled
LAI TESTF
LAI TESTP

8.3.3 Return from over/under frequency

After **Mains/Bus Frequency** returns into range (**Nominal Frequency** - 0,2 Hz, **Nominal Frequency** + 0,2 Hz), EVENT RETURN OVER/UNDER FREQUENCY begins.

The start of the event can be delayed by the setpoint **Return Over/Under Frequency Delay**, once the delay timer is elapsed the LBO EVENT RETURN OVER/UNDER FREQUENCY is closed for the period given by the setpoint **Return Over/Under Frequency Period**. When the event is active, **BESS Required P** is always ramped to the **BESS Required P Target** based on **Return From Over/Under Frequency Ramp**.

Each Grid Code has its priority over the other Grid Codes. The priority of the Return from over/under frequency is given by the setpoint **Return From Over/Under Frequency Priority**.

> ***Note:*** *If **Return From Over/Under Frequency Priority** = OFF, then **BESS Required P** is ramped to **BESS Required P Target** based on **Load Ramp PTM**.*

8.4 Power Regulation Based On Actual Mains Voltage

The BESS's **BESS P** is regulated based on value **+Mains/Bus Voltage Relative**. In case that **+Mains/Bus Voltage Relative** is over 100 %, application curve **P(Um)** is activated and **BESS P** becomes limited. Ramping of value **BESS Required P** to **BESS Required P Target** is affected by setpoint **P Ramp Filter**.

There are two modes modes of this function.

8.4.1 P Instal (Um)

Setpoint **P(Um)** has to be adjusted to P Instal (Um). This mode is then related to the setpoint **Installed Power**. Maximal allowed **BESS P** is calculated as:

$$\text{Maximal BESS } P \;=\; \text{Installed Power} + (P(Um)\text{Curve } \frac{\text{Installed Power}}{100})$$

P Instal (Um) related settings

Setpoints	Values
Installed Power	**P(Um) Curve**
P(Um)	LBOs
P Ramp Filter	**EVENT P(UM)**
P(Um) Priority	
P(Um) Ramp	**Grid Codes Test** = Enabled
Application Curves	LAI **TESTU**
P(UM)	

8.4.2 P Actual (Um)

Setpoint **P(Um)** has to be adjusted to P Instal (Um). This mode is then related to value **Pmom**. Value **Pmom** is filled with **BESS P** at the moment of activation of this function. Maximal allowed **BESS P** is calculated as:

$$\text{Maximal BESS } P \;=\; \text{P mom} + (P(Um)\text{Curve } \frac{\text{P mom}}{100})$$

PuF related settings

Setpoints	Values

P(Um)
P Ramp Filter
P(Um) Priority
P(Um) Ramp
Application Curves
POWER UNDER FREQUENCY

Pmom
P(Um) Curve
LBOs
EVENT P(UM)

Grid Codes Test = Enabled
LAI **TESTU**

8.5 Load Reduction

The controller allows remote load control of the BESS. This mechanism is dedicated for purposes when utility company wants to control the BESS's load on predefined load levels. To enable this function it is necessary to set setpoint **Load Reduction** to Enabled and activate the LBI **LOAD REDUCTION ENABLE**.

Each state of the Load Reduction is activated by the specific LBI Load Reduction and each LBI is connected with the same named setpoint which adjust relative maximal power produced by the BESS. Or the maximal allowed load of the BESS can be defined by the LAI **LOAD REDUCTION**. Always the lowest load defined by the LAI or by LBIs is allowed. If more than 1 LBI Load Reduction is activated, then reduction with the smallest setpoint value is applied. When any Load Reduction state is active the LBO **LOAD REDUCTION ACTIVE** is closed.

Note: *The LAI **LOAD REDUCTION** allows the power reduction on the analog signal, but the statistic will not be fulfilled.*

The activation of the Load Reduction event is being signalized by closing the LBO **EVENT LOAD REDUCTION**. Once the LBO is closed the **BESS Required P** will be ramped to the **BESS Required P Target** according to the ramp which maximum is given by the setpoint **Installed Power** or by the setpoint **Nominal power** if the Installed Power is OFF. The duration of the whole ramp (from the maximum to the 0) is given by the setpoint **Load Reduction Ramp**.

The event and LBO **EVENT LOAD REDUCTION** stays active after deactivation of all LBIs until **BESS Required P** is ramped to the new unreduced **BESS Required P Target** according to **Load Reduction Ramp**. So, the event Load Reduction is active for both reducing and increasing the power.

Each Grid Code has its priority over the other Grid Codes. The priority of the Load Reduction is given by the setpoint **Load Reduction Priority**. If this priority is set to OFF, then **BESS Required P** will be ramped to the **BESS Required P Target** according to the **Load Ramp PTM**.

IMPORTANT: LBI LOAD REDUCTION ENABLE has to be closed and setpoint Load Reduction has to be Enabled, otherwise Load Reduction is not activated by any of LBIs mentioned below.

List of LBIs and related setpoints

LBI	Setpoint
LOAD REDUCTION 1	Load Reduction 1
LOAD REDUCTION 2	Load Reduction 2
LOAD REDUCTION 3	Load Reduction 3
LOAD REDUCTION 4	Load Reduction 4

Example: When LBI **LOAD REDUCTION 1** is activated and setpoint **Load Reduction 1** = 50%, then BESS's load will be limited to 50% of **Installed Power** or **Nominal power**.

8.6 Dynamic Support - VRT

Dynamic Support keeps the BESS voltage during short Mains failures on medium or high voltage site for unwanted disconnection of big power sources which could reduce Mains unbalances.

There are 4 kinds of Dynamic Support protections. To enable any of them setpoint **Dynamic Support** != Disabled and behavior of the protections is adjusted via **Dynamic Support Protection Type**.

For a critical undervoltage there is special setpoint **LVRT Level Severe** when relative mains voltage drops below this limit, LBO **LVRT SEVERE** is closed for at least 500 ms, no further action is taken.

Note: *You can deactivate PF/Q regulation while VRT function is active, use setpoint **Dynamic Support PF/Q Control** to select whether **Voltage Regulator Output** will be frozen at the moment of activation of the VRT function.*

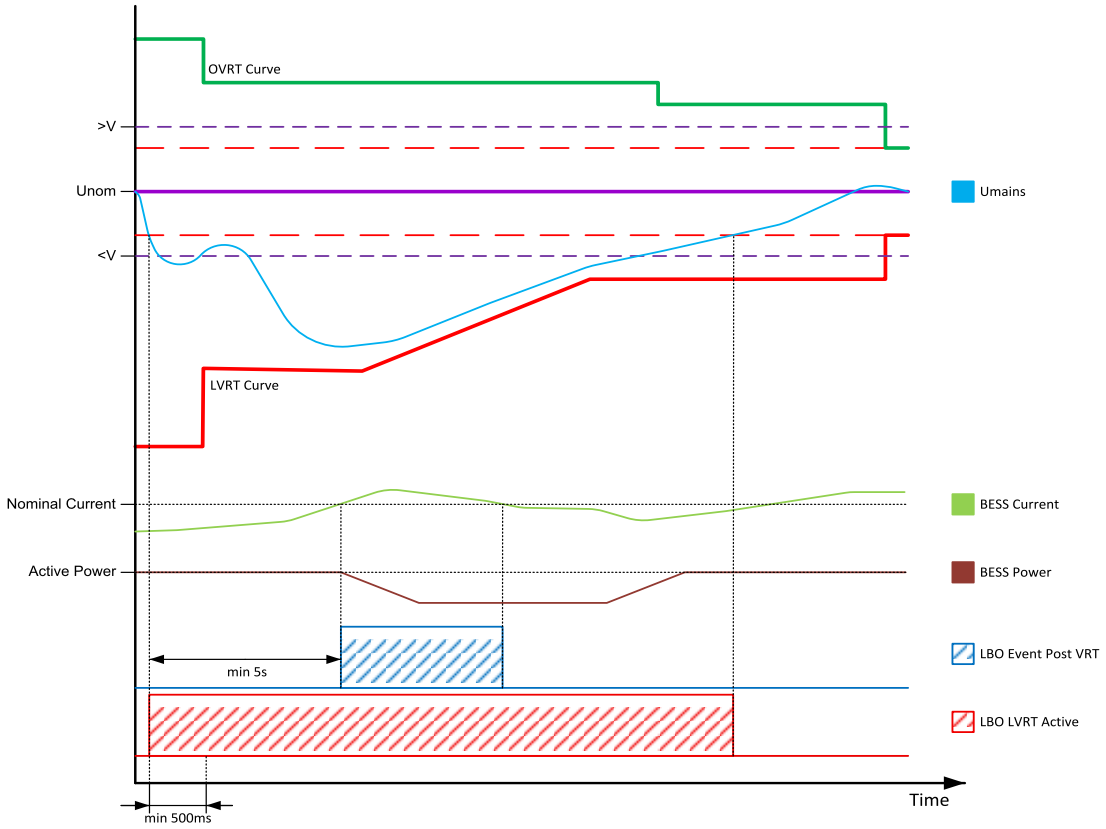

Image 20.1 VRT - Under voltage failure

8.6.1 3-pole undervoltage failure ride through - LVRT-3ph

This protection is defined by **LVRT 3-PHASE** curve and requires all **three** phases to be below allowed limit in order to activate the protection.

- Relative value of **Mains/Bus Voltage L1-N**, **Mains/Bus Voltage L2-N** and **Mains/Bus Voltage L3-N** to **Mains/Bus Nominal Voltage Ph-N**
- Relative value of **Mains/Bus Voltage L1-L2**, **Mains/Bus Voltage L2-L3** and **Mains/Bus Voltage L3-L1** to **Mains/Bus Nominal Voltage Ph-Ph**

When the curve is tripped, LBO **LVRTCURVETRIP** is closed, for at least 3 seconds, together with LBO **LVRT ACTIVE**, which stays closed for whole time the protection is active. Proper alarm/history record is activated based on **Dynamic Support Protection Type**.

Note: *Mains <V Protection and Mains <V Protection are still being evaluated! In case that LVRT 3-PHASE is not configured correctly or is missing, LBO LVRT 3-PHASE INVALID is closed and the protection is not evaluated.*

8.6.2 2-pole undervoltage failure ride through - LVRT-2ph

This protection is defined by **LVRT 2-PHASE** curve and requires at least **two** phases to be below allowed limit in order to activate the protection.

- Relative value of **Mains/Bus Voltage L1-N**, **Mains/Bus Voltage L2-N** and **Mains/Bus Voltage L3-N** to **Mains/Bus Nominal Voltage Ph-N**
- Relative value of **Mains/Bus Voltage L1-L2**, **Mains/Bus Voltage L2-L3** and **Mains/Bus Voltage L3-L1** to **Mains/Bus Nominal Voltage Ph-Ph**

When the curve is tripped, LBO **LVRTCURVETRIP** is closed, for at least 3 seconds, together with LBO **LVRT ACTIVE**, which stays closed for whole time the protection is active. Proper alarm/history record is activated based on **Dynamic Support Protection Type**.

Note: *Mains <V Protection and Mains <V Protection are still being evaluated! In case that LVRT 2-PHASE is not configured correctly or is missing, LBO LVRT 2-PHASE INVALID is closed and the protection is not evaluated.*

8.6.3 1-pole undervoltage failure ride through - LVRT-1ph

This protection is defined by **LVRT 1-PHASE** curve and requires at least **one** phase to be below allowed limit in order to activate the protection.

- Relative value of **Mains/Bus Voltage L1-N**, **Mains/Bus Voltage L2-N** and **Mains/Bus Voltage L3-N** to **Mains/Bus Nominal Voltage Ph-N**
- Relative value of **Mains/Bus Voltage L1-L2**, **Mains/Bus Voltage L2-L3** and **Mains/Bus Voltage L3-L1** to **Mains/Bus Nominal Voltage Ph-Ph**

When the curve is tripped, LBO **LVRTCURVETRIP** is closed, for at least 3 seconds, together with LBO **LVRT ACTIVE**, which stays closed for whole time the protection is active. Proper alarm/history record is activated based on **Dynamic Support Protection Type**.

Note: *Mains <V Protection and Mains <V Protection are still being evaluated! In case that LVRT 1-PHASE is not configured correctly or is missing, LBO LVRT 1-PHASE INVALID is closed and the protection is not evaluated.*

8.6.4 Overvoltage failure ride through - OVRT

This protection is defined by **OVRT** curve and requires at least **one** phase to be above allowed limit in order to activate the protection.

- Relative value of **Mains/Bus Voltage L1-N**, **Mains/Bus Voltage L2-N** and **Mains/Bus Voltage L3-N** to **Mains/Bus Nominal Voltage Ph-N**
- Relative value of **Mains/Bus Voltage L1-L2**, **Mains/Bus Voltage L2-L3** and **Mains/Bus Voltage L3-L1** to **Mains/Bus Nominal Voltage Ph-Ph**

When the curve is tripped, LBO **OVRTCURVETRIP** is closed, for at least 3 seconds, together with LBO **OVRT ACTIVE**, which stays closed for whole time the protection is active. Proper alarm/history record is activated based on **Dynamic Support Protection Type**.

Note: *Mains >V Protection and Mains >>V Protection are still being evaluated! In case that OVRT is not configured correctly or is missing, LBO OVRT INVALID is closed and the protection is not evaluated.*

8.6.5 Post VRT

If the **Application Mode** = MPTM, the protection is activated once LBO **OVRT ACTIVE** or LBO **LVRT ACTIVE** is closed for a period longer than 5 seconds and BESS's current is higher than the nominal current. In this case, the LBO **EVENT POST VRT** is closed and **BESS P** is decreased in order to keep circuit breakers closed. So, the **BESS Required P** is ramped to the **BESS Required P Target** based on the ramp which maximum is given by the setpoint **Installed Power** or by the setpoint **Nominal power** if the Installed Power is OFF and the duration of the ramp is given by the setpoint **Post VRT Ramp**. The Post VRT is active for the maximal time period of 60 seconds, after this period the standard Mains protection has to be evaluated.

If the **Application Mode** = MINT the Post VRT can be activated only by activating the LBI **POST VRT**. In this case, the Post VRT is activated (the LBO **EVENT POST VRT** is closed) if BESS's current is higher than the nominal current and the LBI is active.

8.7 P For Q

The Grid codes connection requirements, namely for the medium voltage system, require a possibility of BESS **BESS P** reduction in order to achieve required **BESS Q**.

The function is enabled/disabled by setpoint **P For Q Limitation** and behavior is adjusted by **P For Q Deadband**.

If relative value of **BESS Required Q** will be over limit, **BESS P** will be decreased to reach **BESS Required Q**. To prevent oscilation of **BESS P** adjust properly **P For Q Deadband**.

8.7.1 UQ Area

UQ area defines maximal reachable **BESS Q** based on actual Mains voltage (Um). This area is adjusted by **P FOR Q UQ L** - inductive part, and **P FOR Q UQ C** - capacity part.

> ***Note:*** *Um is counted as average of **Mains/Bus Voltage L1-N**, **Mains/Bus Voltage L2-N** and **Mains/Bus Voltage L3-N** related to **Mains/Bus Nominal Voltage Ph-N**.*

The area is used while **BESS P** = +-5% of **Installed Power** and **BESS P** can be reduced only if the required **BESS Q** is inside this area, otherwise LBO **UQ-C AREA LIMIT** respectively LBO **UQ-L AREA LIMIT** is closed and **BESS P** is not reduced. In case this is fulfilled, LBO **P FOR Q ACTIVE** is closed and **BESS P** begins to be reduced using **P For Q Ramp**. LBO **EVENT P FOR Q** is closed while **P For Q Ramp** is being used.

> ***Note:*** ***P For Q Ramp*** *has priority given by **P For Q Priority**, different ramp with higher priority can be active.*

8.7.2 PQ Area

PQ area defines maximal reachable **BESS Q** based on actual **BESS P** related to **Installed Power**. This area is adjusted by **P FOR Q PQ L** - inductive part, and **P FOR Q PQ C** - capacity part.

The area is used while **BESS P** is below **Installed Power** and **BESS P** can be reduced only if the required **BESS Q** is inside this area, otherwise LBO **PQ-C AREA LIMIT** respectively LBO **PQ-L AREA LIMIT** is closed and **BESS P** is not reduced. In case this is fulfilled, LBO **P FOR Q ACTIVE** is closed and **BESS P** begins to be reduced using **P For Q Ramp**. LBO **EVENT P FOR Q** is closed while **P For Q Ramp** is being used.

> ***Note:*** ***P For Q Ramp*** *has priority given by **P For Q Priority**, different ramp with higher priority can be active.*

8.8 Q&U Protection

This protection watches behavior of the BESS in case of the drop of Mains Voltage and uses measurement method of **Symmetrical components**.

BESS must be disconnected from the mains in case that Mains Voltage drops below a certain value of **Mains/Bus Nominal Voltage Ph-N** or **Mains/Bus Nominal Voltage Ph-Ph** and BESS is under excited.

The protection is enabled by setpoint **Q&U Protection** and the behavior is adjusted by setpoints **Q&U < V**, **Q&U < Q**, **Q&U Protection Delay** and **Q&U CB Selector**.

When **Mains/Bus Voltage L1-N** drops below relative limit given by **Q&U < V** and at the same time **BESS Q** drops below limit given by **Q&U < Q** minimally for period set by **Q&U Protection Delay**, then breaker, selected by **Q&U CB Selector**, will be opened and alarm **Wrn Q&U Protection** is activated.

Note: *Breaker can not be reclosed if the alarm **Wrn Q&U Protection** is still present in alarm list.*

8.9 Synchronization & Connection Conditions

Grid codes requires specific conditions to be fulfilled in order to synchronize BESS to the Mains. These conditions take effect when BESS is running if setpoint **Mains Params/MP Synchronization** = Enabled.

This protection is checking mains voltage and frequency, if the parameters are not within limits, BESS is not allowed to synchronize with the Mains. The alarm **SyncNotAllowed** is activated and stays active until the problem persists or BESS is stopped, then LBO **Sync To Mains Allowed** is opened.

Note: *This protection is evaluated only if BESS is running and is not synchronized with Mains.*

8.9.1 Network connection/reconnection conditions

Synchronization is forbidden if:

Mains Params/MP Synchronization = Enabled and

- At least one of the Ph-N voltages such as **Mains/Bus Voltage L1-N** or Ph-Ph voltages such as **Mains/Bus Voltage L1-L2** (depends on the type of wiring) is out of the relative limit adjusted by **Mains Synchronization V Max** and **Mains Synchronization V Min**.
- **Mains/Bus Frequency** is out of the limit adjusted by **Mains Synchronization f Max** and **Mains Synchronization f Min**.

Note: *Alarm **SyncNotAllowed** is active while synchronization is forbidden.*

Note: ***Network connection/reconnection conditions after Mains Fail*** *has higher priority while it is active.*

8.9.2 Network connection/reconnection conditions after Mains Fail

When the Mains Fail occurs (**Mains/Bus HealthyMains Healthy**) is opened), there is a requirement to prevent the connection to the unstable mains. Timer **After MP Synchronization Period** is activated and synchronization to Mains is forbidden for this time (LBO **Sync To Mains Allowed** is opened and alarm **SyncNotAllowed** is active).

For **Mains Params/MP Synchronization** = Enabled the synchronization is allowed only if all Mains parameters are within the limit for the whole time of the **After MP Synchronization Period**.

- All of the Ph-N voltages such as **Mains/Bus Voltage L1-N** and Ph-Ph voltages such as **Mains/Bus Voltage L1-L2** (depends on the type of wiring) have to be within the limit adjusted by **After MP**

Synchronization V Max and **After MP Synchronization V Min**.

- **Mains/Bus Frequency** have to be within the limit adjusted by **After MP Synchronization f Max** and **After MP Synchronization f Min**.

Note: *Timer **After MP Synchronization Period** resets every time parameters are not within limits.*

8.10 After Mains Trip Period

When the Mains returns from failure, it is recommended to load it slowly to prevent another failure. To activate this function it is necessary to set setpoint **After Mains Trip** to Enabled. Once the Mains is healthy (LBO **Mains/Bus HealthyMains Healthy** is closed) and timer **After MP Synchronization Period** is elapsed or **Mains Params/MP Synchronization** is disabled the LBO **Event Mains Trip** is closed for time given by the setpoint **After Mains Trip Period**.

Note: *Timer **After Mains Trip Period** resets every time **Mains/Bus HealthyMains Healthy** re-closes.*

If the BESS starts to being unloaded in order to transfer Load to Mains and the LBO **Event Mains Trip** is closed, the **BESS Required P** will be ramped to the **BESS Required P Target** according to the ramp. So, the Mains is loaded according to the ramp which maximum is given by the setpoint **Installed Power** or by the setpoint **Nominal power** if the Installed Power is OFF and the duration of the ramp is given by the setpoint **After Mains Trip Period Ramp**.

Each Grid Code has its priority over the other Grid Codes. The priority of the After Mains Trip Period is given by the setpoint **After Mains Trip Period Priority**.

8.11 Pave

The Pave function controls whether exported power to the grid is inside allowed range. The setpoint **Pave Protection** **!=** Disabled in order to enable this function. Maximal allowed exported power is adjusted by setpoint **Pave**. Exported power has to be measured in all 3 phases and preferably by using InteliPro Sync and send via **CAN Intercontroller Communication** to LAI **Pmom**. From LAI **Pmom** and setpoint **Pave** is calculated value **Pmom/Pave** which is used in application curve **P Mom/Pave Max**. When **Pmom/Pave** is above the curve **P Mom/Pave Max**, LBO **Pave** is closed and if the value is above allowed limit for period longer than is allowed by the application curve, the MCB is opened and alarm **Hst Pave** is activated.

Note: *When **Pave Protection** **!=** Disabled but LAI **Pmom** is not configured or has invalid value, LBO **Pave FLS** is closed.*

Pave related settings

Setpoints	Values
Pave Protection	**Pmom/Pave**
Pave	LBOs
Application Curves	**Pave**
P Mom/Pave Max	**Pave FLS**
	LAIs
	Pmom

8.12 Moving Average

The controller is measuring moving averages of selected values. This means that in specific time window is measured value stored and average is counted from these data.

After reaching maximal amount of samples, i.e. value has been measured for whole required time, oldest sample is always replaced with new sample.

8.12.1 10-minutes averages

These values hold average of corresponding physical quantity for last 10 minutes.

BESS P 10 min Avg

Calculation is started with closing BCB breaker and is stopped after the breaker opens. The calculation is stored in value **BESS P 10min Avg**.

> **IMPORTANT: The value BESS P 10min Avg is erased every time BCB breaker opens.**

BESS Q 10 min Avg

Calculation is started with closing BCB breaker and is stopped after the breaker opens. The calculation is stored in value **BESS Q 10min Avg**.

> **IMPORTANT: The value BESS Q 10min Avg is erased every time BCB breaker opens.**

BESS S 10 min Avg

Calculation is started with closing BCB breaker and is stopped after the breaker opens. The calculation is stored in value **BESS S 10min Avg**.

> **IMPORTANT: The value BESS S 10min Avg is erased every time BCB breaker opens.**

Mains Voltage 10 min Avg

Calculation is carried out continuously whole time the controller is powered on. The calculation is made separately for each phase and depends on setpoint **Connection type**.

Ph-Ph connection types uses values **Mains Voltage 10min Avg L1-L2**, **Mains Voltage 10min Avg L2-L3** and **Mains Voltage 10min Avg L3-L1**.

Ph-N connection types uses values **Mains Voltage 10min Avg L1-N**, **Mains Voltage 10min Avg L2-N** and **Mains Voltage 10min Avg L3-N**.

> **IMPORTANT: The values mentioned above are erased when the controller is switched off.**

8.12.2 1-minute averages

These values hold average of corresponding physical quantity for last 1 minute.

Mains Voltage 1 min Avg

Calculation is carried out continuously whole time the controller is powered on. The calculation is made separately for each phase and depends on setpoint **Connection type**.

Ph-Ph connection types uses values **Mains Voltage 1min Avg L1-L2**, **Mains Voltage 1min Avg L2-L3** and **Mains Voltage 1min Avg L3-L1**.

Ph-Pn connection types uses values **Mains Voltage 1min Avg L1-N**, **Mains Voltage 1min Avg L2-N** and **Mains Voltage 1min Avg L3-N**.

> **IMPORTANT: The values mentioned above are erased when the controller is switched off.**

8.13 BESS Operation Area

It is possible to adjust the BESS operation area in more details, using application curves. The curves represent inductive and capacitive halves of the PQ diagram.

- Inductive operation area is adjusted by **Capability L** and if the required **BESS Power Factor** with **BESS Load Character** = L are behind the limit, LBO **BESS Capability L LimitGenerator Capability L Limit** is closed and actual power factor stays on the edge of the curve.
- Inductive operation area is adjusted by **Capability C** and if the required **BESS Power Factor** with **BESS Load Character** = C are behind the limit, LBO **BESS Capability C LimitGenerator Capability C Limit** is closed and actual power factor stays on the edge of the curve.

> **IMPORTANT: The both Capability C and L curves have to be setup according to the Capability curves of the worst (weakest) BESS in order to ensure right functionality of the whole system.**

9 Communication

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9.1 PC

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9.1.1 Direct communication

Computer can be connected to InteliNeo6000 via USB, RS485 or ethernet interface.

Connection via USB

USB A to B cable can be used for communication via USB ports. The InteliNeo6000 is using Human Interface Devices (HID) protocol which support auto detection of the connected HW. The USB is not industrial interface and it is not recommended to use it for long term purposes because of interference which can cause lost of communication.

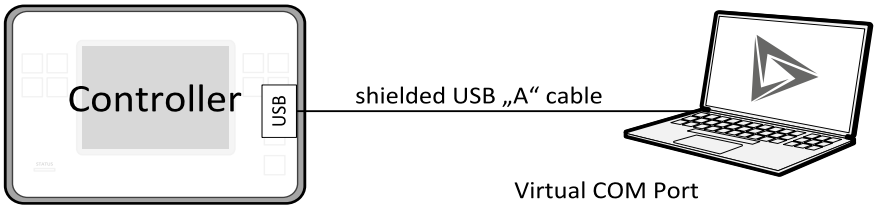

Image 21.1 Shielded USB type A cable is used

Connection via RS485

On board RS485 connector can be used for communication via RS485 connection. This interface uses **RS485 Modbus Mode** port of the controller. It is also possible to use RS485-USB convertor.

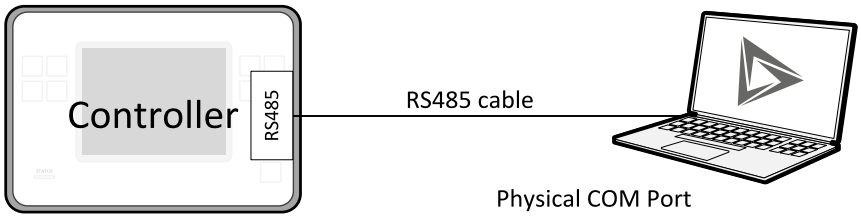

Image 21.2 Built-in RS485 is used

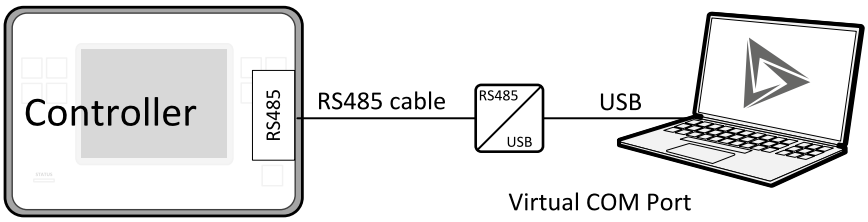

Image 21.3 RS485 and USB is used

Connection via Ethernet

Ethernet Cat5/Cat6 cable fitted with the RJ45 connector can be used for communication via Ethernet. Controllers in local network are automatically detected byInteliConfig PC tool. For the direct connection it is recommended to use **Trusted** interface which is in default configured to port **Communication peripherals**. This communication is more reliable than the USB because it is more robust against interference.

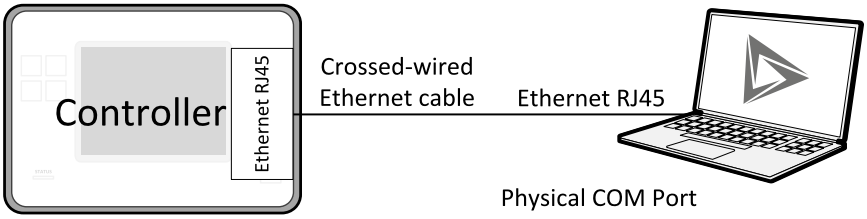

Image 21.4 Ethernet cable is used

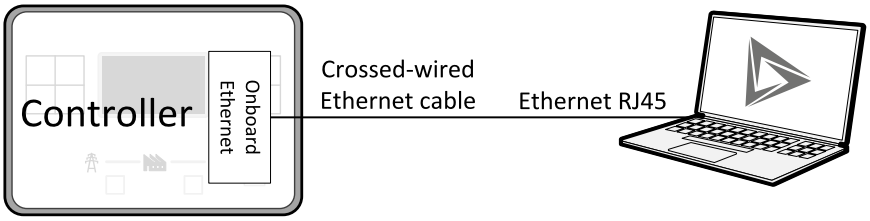

Image 21.5 Onboard Ethernet cable is used

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9.1.2 Remote communication

The InteliNeo6000 can be connected also remotely via built-in ethernet ports. For remote connection the **Untrusted** interface which is in default configured to port **Ethernet 2** should be used.

Ethernet LAN connection

Direct IP LAN connection is intended to be used to connect more than one controller at the same time while controllers are connected to the local are network (LAN). For LAN connections, it is recommended to use **Trusted** interface which is in default configured to port Ethernet 1. If there is not any device which would provide DHCP for the LAN the static (manual) IP address must be used.

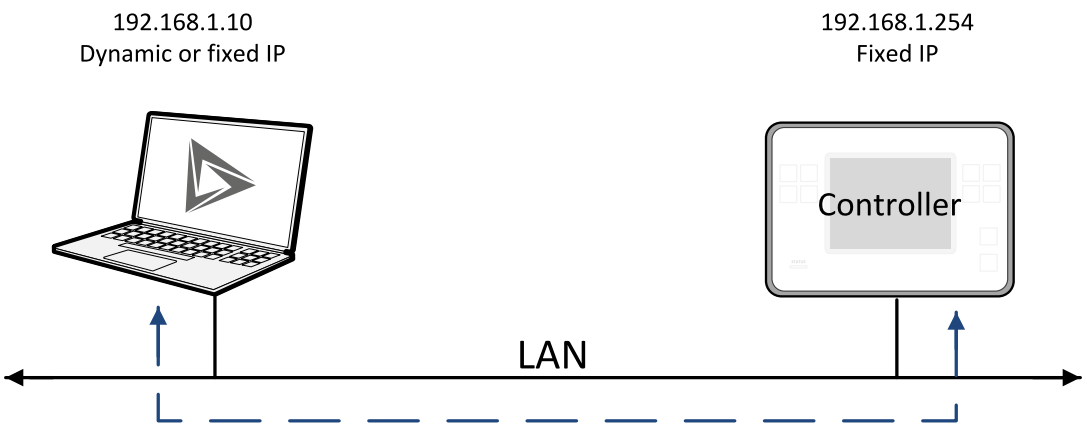

Image 21.6 Ethernet LAN connection

Setting-up static IP address

This settings is related to **Group: ETH Interface 1 - Trusted**, **Group: ETH Interface 2 - Untrusted** and **Group: ETH Interface 3 - Modbus** .

There are two basic ways how to setup static IP address for remote ethernet connection. The first way is to switch the Ethernet to manual IP address mode. Adjust the setpoint IP Address Mode to Manual option. In this moment values for related Ethernet port are immediately changed to the default or previously setup values of setpoints IP Address, Subnet Mask, Gateway IP, DNS IP, etc. If you are using this Ethernet port for connection to the controller you will lost the connection.

If this method is used several basic rules should be kept to avoid conflicts with the remaining network infrastructure:

- The static IP used in the controller must be selected in accordance with the local network in which the controller is connected.
- The static IP used in the controller must be excluded from the pool of addresses which is assigned by DHCP server, which is in charge of the respective local network.
- The local infrastructure must generally allow using devices with manually assigned IP addresses.
- There must not be any other device using the same static IP address. This can be tested from a computer connected to the same network using "ping <required_ip_address>" command issued from the command line. The IP address is not occupied if there is not any response to the ping command.

Note: *The list above contains only basic rules. Other specific restrictions/rules may take place depending on the local network security policy, technology used, topology etc.*

The second way is to switch the Ethernet to manual IP address mode. Adjust the setpoint IP Address Mode to Manual option. In this moment values for related Ethernet port are immediately changed to values given by the DHCP server for the LAN. If you are using this Ethernet port for connection to the controller you will lost the connection. It is possible to configure the DHCP server to assign always the same IP address (i.e. static IP address) to the particular controller according to it's MAC address.

Internet WAN connection

WAN connection is intended to be used to connect the controller using the internet. It is recommended to use Ethernet 2 (untrusted interface) for remote connection using internet.

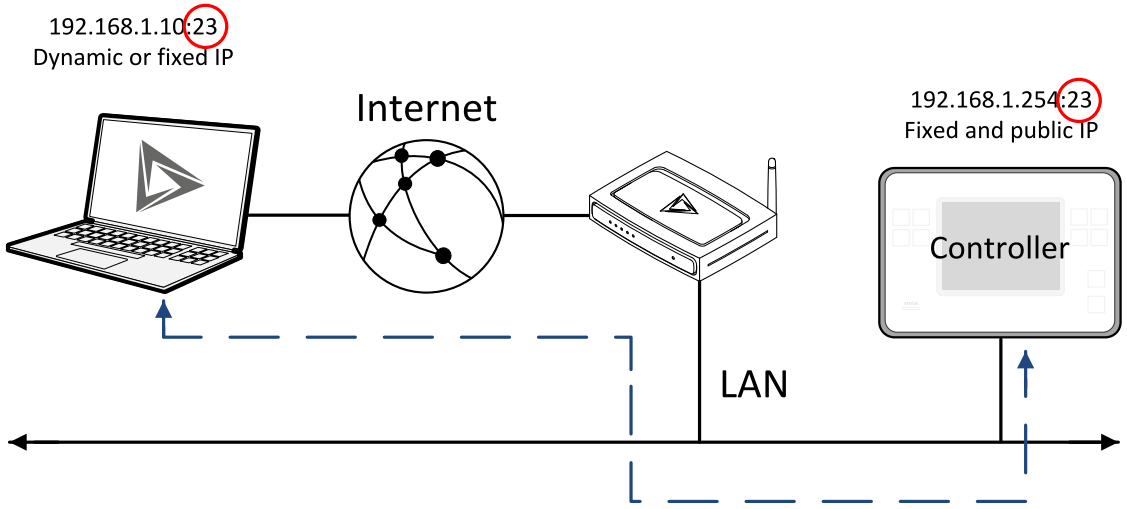

Image 21.7 Ethernet WAN connection

Public static IP

If public static IP connection is to be used from the Internet, the IP address, which is entered into the client computer, must be static and public in scope of the Internet.

If the controller is connected to Internet via a local ethernet network then in most cases port forwarding must be created from the public IP address of the network gateway to the local IP address of the controller at the port specified for ComAp protocol. Different port numbers can be used to create multiple port forwarding rules in the same local network.

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9.2 Connection to 3rd party systems

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9.2.1 SNMP

SNMP is an UDP-based client-server protocol used for providing data and events into a supervisory system (building management system). The controller plays the role of a "SNMP Agent" while the supervisory system plays the role of a "SNMP Manager".

- Supported versions – SNMP v1, SNMP v2c and SNMP v3

The SNMP Agent function is to be enabled by the setpoint **SNMP Agent**. The setpoints **SNMP RD Community String** and **SNMP WR Community String** in the same group can be used to customize the "community strings" for the read and write operations which have function like "passwords". All requests sent from the SNMP Manager have to contain community string which match with the community string adjusted in the controller otherwise the controller refuses the operation.

MIB table

The "MIB table" (Management Information Base) is a table which gives to the Manager description of all objects provided by the Agent.

- The MIB table is specific for each controller type and configuration
- The MIB table is to be exported from the controller configuration using InteliConfig
- Controllers with identical firmware and configuration share also identical MIB table, however if the configuration and/or firmware is not identical the MIB table is different and must be exported separately for each controller.

The root node of the MIB table of InteliLite controller is enterprises.comapProjekt.il, which is 1.3.6.1.4.1.28634.14. Under this node there are following sub-nodes :

- Notifications group (SMI v2 only) contains definitions of all notification-type objects that the Agent may send to the Manager.
- GroupRdFix contains read-only objects that exist in all controller regardless of the firmware version/type and configuration.
- GroupRdCfg contains read-only objects that depend on the firmware version/type and configuration.
- GroupWrFix contains read-write objects that exist in all controller regardless of the firmware version/type and configuration.
- GroupWrCfg contains read-write objects that depend on the firmware version/type and configuration.
- GroupW contains write-only objects.
- NotificationData group contains objects that are accessible only as bindings of the notification messages.

SMI version

In InteliConfig the MIB table may be exported in two different formats – SMI v1 and SMI v2. The format which shall be used for export depends on the SNMP Manager and SMI version that it does support.

Typically, SMI v1 is used for SNMP v1 and vice versa, but it is not a rule and SMI v2 may be also used for SNMP v1.

SNMP reserved objects

Name	OID	Access	Data type	Meaning
pfActionArgument	groupWrFix.24550	read,write	Gauge32	Writing: command argument Reading: command return value
pfActionCommand	groupW.24551	write	Integer32	Command code 1)
pfPassword	groupW.24524	write	Integer32	Password

1) For list of commands, arguments and description of the procedure of invoking commands see the description of the MODBUS protocol.

SNMP notifications

Except the request-response communication model, in which the communication is controlled by the Manager, there are also messages that the Agent sends without any requests. These messages are called „Notifications“ and inform the Manager about significant events occurred in the Agent.

The controller can send notifications to two different SNMP Managers (two different IP addresses). The addresses are to be adjusted in the **Group: ETH Interface 2 - Untrusted** by the setpoints **SNMP Traps IP Address 1** and **SNMP Traps IP Address 2**. If the Manager address is not adjusted the particular notification channel is off. The controller will send the notifications in format adjusted by the setpoint **SNMP Trap Format**.

- Each notification (kind of event) is identified by an unique identifier (Trap ID in SNMPv1 or Notification OID in SNMPv2/v3). This unique identifier gives the specific meaning to the notification message, e.g. Protection 1. level - Fuel Level - alarm activated.
- All possible notifications and their identifiers are listed in the MIB table.
- The notification message also contains controller name, serial number and textual description of the event.

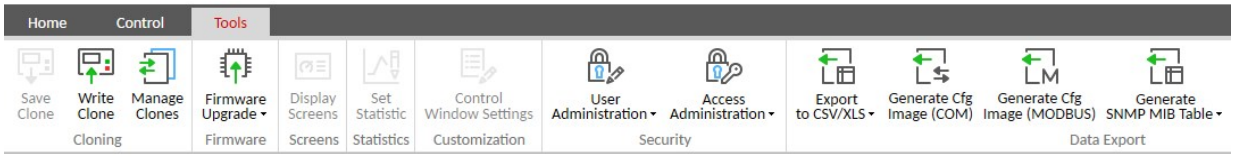
Operational events

This events are used for SNMP traps. See the list below:

- Start commands
  - Start button
  - Remote start
- Stop commands
  - Stop button
  - Remote stop
- Breaker records
  - Load on Microgrid
  - Load on Mains
- Others
  - Mains fail
  - Mains returned

9.2.2 Modbus-RTU, Modbus/TCP

To generate the Modbus register list, click on **Generate Cfg Image (MODBUS)** button in the Tools ribbon.



Modbus protocol is used for integration of the controller into a building management system or for remote monitoring via 3rd party monitoring tools.

- Modbus-RTU can be used via ⑮ **RS 485** . The serial speed for Modbus-RTU communication is adjusted by the setpoint **RS485 Modbus Speed** and the serial mode is adjusted by the setpoint **RS485 Modbus Mode**. Only 1 client can be connected at once through this type of connection.

- Modbus/TCP (Modbus server) can be used with the **Communication peripherals** / **Ethernet 2** / **Communication peripherals**. Up to 3 clients can be connected simultaneously through each Ethernet interface. The Modbus Server must be activated by the appropriate setpoint **Modbus Server** related to the respective Ethernet interface. Timeout after which controller would terminate an inactive connection (when client is not sending any requests) is set by setpoint **ComAp Client Inactivity Timeout**.

  Note: *Setpoint **Modbus Client Inactivity Timeout** is common for both **Communication peripherals**, **Ethernet 2** and **Communication peripherals** interfaces.*

DO NOT READ ALARM LIST FROM MORE THAN 1 CLIENT! LOSS OF INFORMATION MAY OCCUR.

Modbus, Modbus/TCP protocol can be used simultaneously with direct Ethernet connection and the SNMP agent.

Note: *Recommended timeout for Modbus client is 300 ms.*

> **IMPORTANT: Do not use setpoints for real-time control from super-ordinate systems. Frequent repeated writing of setpoints would cause the history file getting overwritten and losing important records.**

In the image below you can see the topology using all 3 Ethernet ports. The ETH1 is used for Modbus Server, connection of displays (IV5.2), or it can be also used for remote LAN connection. The ETH2 is used for remote connection using the internet (WAN). The ETH3 is used for Modbus Client which is connected to the LAN.

In the image below you can see the topology using all 3 Ethernet ports with one Modbus Client. The ETH1 is used for connection of displays (IV5.2) or it can be also used for remote LAN connection. The ETH2 is used for remote connection using the internet (WAN). The ETH3 is used for Modbus Server and Client which are connected to the LAN with Modbus Devices.

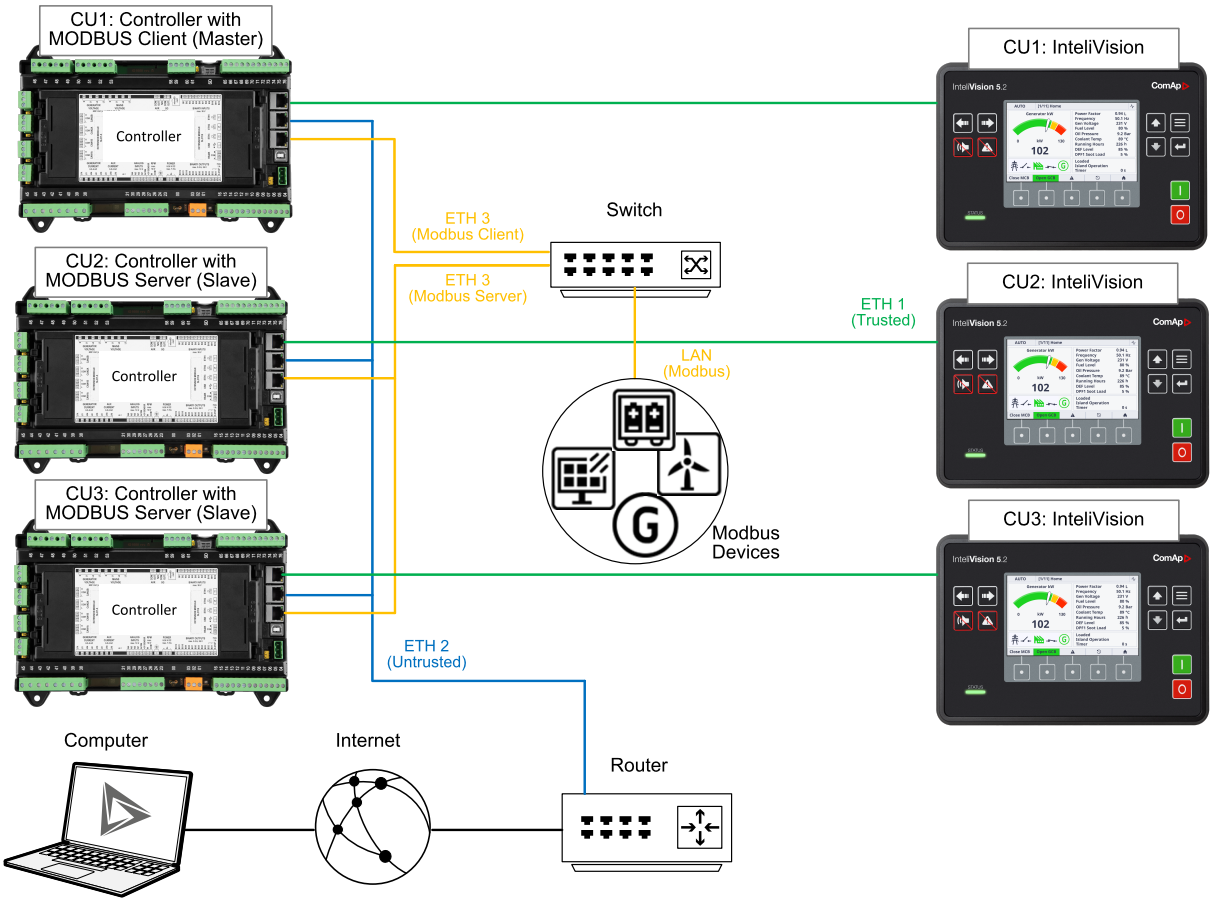


Image 21.8 Advanced Ethernet Topology With One Modbus Client

In the image below you can see the topology using all 3 Ethernet ports with multiple Modbus Clients (CU 1 is the first level client, CU 2 and CU 3 are second level clients). The ETH1 is used for Modbus Server, connection of displays (IV5.2), or it can be also used for remote LAN connection. The ETH2 is used for remote connection using the internet (WAN). The ETH3 is used for Modbus Clients which are connected between CU 1 and other CUs, and between other CUs and Modbus Devices.

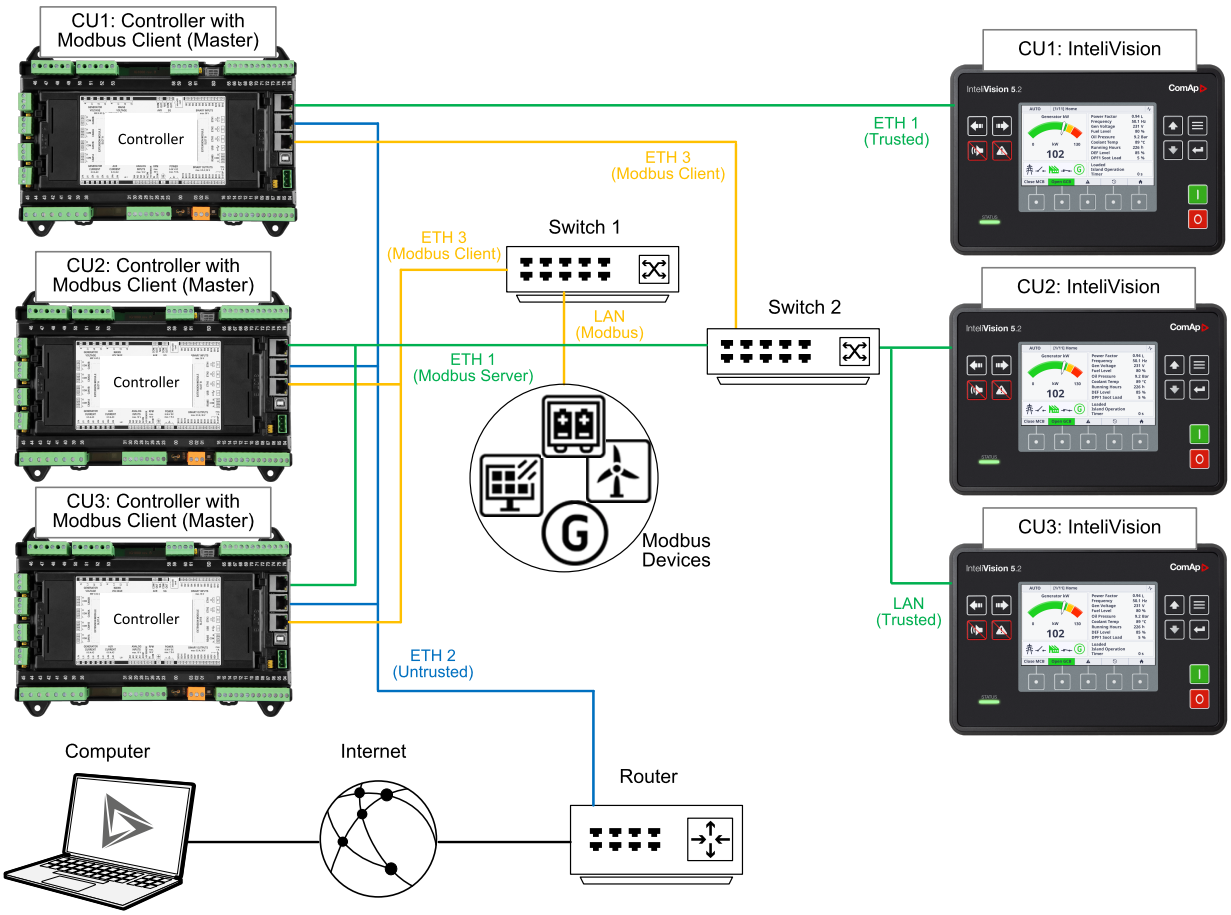


Image 21.9 Advanced Ethernet Topology With Multiple Modbus Clients

Note: *The IP address of each device in the same network must vary.*

Note: *InteliVision 5.2 is used for illustrative purposes, the same wiring diagrams apply for all supported displays mentioned in* ***Displays****.*

Address space

The object address space is separated into several areas as described in the table below. The actual mapping of specific controller data objects to specific Modbus addresses, which depends on configuration, can be exported into a text file from the appropriate controller archive using InteliConfig. There are several special registers with fixed meaning (reserved registers) which are listed in a separate table in this chapter.

Modbus address	Meaning	Access	MODICON object type	Modbus function
0000 .. 0999	Binary objects	Read only	Discrete Inputs	Read: 01, 02
1000 .. 2999	Values	Read only	Input Registers	Read: 03, 04
3000 .. 3999	Setpoints	Read/Write	Holding Registers	Read: 03, 04 Write: 06, 16
4200 .. 7167	Reserved registers	Read/Write, depends on each specific register	Input Registers Holding Registers	Read: 03, 04 Write: 06, 16

Configurable part of the map

The contents of the configurable part of the map is specified in the configuration table. It can be changed by the customer as well as exported in a human-readable format using the configuration tool.

Discrete inputs

The discrete inputs are read-only objects located in the address range 0-999. The source ComAp objects for discrete inputs can be:

- Single bit of any value of any binary type.
- Protection (e.g. 2nd-level protection of the state "xyz"). The input is high if the protection is active regardless of if it is configured or not.

Input registers

The input registers are read-only numeric values located in the address range 1000-2999. The source ComAp objects can be:

- Any controller value of any data type. The mapping of the particular data type into registers is described in **Mapping data types to registers**.

Holding registers

The holding registers are read-write numeric values located in the address range 3000-3999. The source ComAp objects can be:

- Any controller setpoint of a primitive data type. The mapping of the particular data type into registers is described in **Mapping data types to registers**.

Note: *Setpoint must be configured with access level 0 to allow writing it via MODBUS.*

Mapping data types to registers

As there are multiple data types in the controller but only one data type in MODBUS (the register, which is 2 byte long), a mapping table is necessary to compose and decompose the MODBUS messages correctly.

Data type	Meaning	Number of registers	Data maping
Integer8	1-byte signed integer	1	MSB = sign extension LSB = value
Unsigned8	1-byte unsigned integer	1	MSB = 0 LSB = value
Integer16	2-byte signed integer	1	MSB = value, MSB LSB = value, LSB
Unsigned16	2-byte unsigned integer	1	MSB = value, MSB LSB = value, LSB
Integer32	4-byte signed integer	2	MSB1 = value, byte 3 (MSB) LSB1 = value, byte 2 MSB2 = value, byte 1 LSB2 = value, byte 0 (LSB)
Unsigned32	4-byte unsigned integer	2	MSB1 = value, byte 3 (MSB)

Data type	Meaning	Number of registers	Data maping
			LSB1 = value, byte 2 MSB2 = value, byte 1 LSB2 = value, byte 0 (LSB)
Binary8	8-bit binary value	1	MSB = 0 LSB = value, bits 0-7
Binary16	16-bit binary value	1	MSB = value, bits 8-15 LSB = value, bits 0-7
Binary32	32-bit binary value	2	MSB1 = value, bits 24-31 LSB1 = value, bits 16-23 MSB2 = value, bits 8-15 LSB2 = value, bits 0-7
Char	1-byte ASCII character	1	MSB = 0 LSB = ASCII value of the character
StrList	Index into a list of strings	1	MSB = 0 LSB = index into the list
ShortStr	Zero-terminated string of max 15 ASCII characters.	8	MSB1 = ASCII value of the 1. character LSB1 = ASCII value of the 2. character MSB2 = ASCII value of the 3. character LSB2 = ASCII value of the 4. character …
LongStr	Zero-terminated string of max 31 ASCII characters.	16	MSB1 = ASCII value of the 1. character LSB1 = ASCII value of the 2. character MSB2 = ASCII value of the 3. character LSB2 = ASCII value of the 4. character …
Date	Date (dd-mm-yy)	2	MSB1 = BCD (dd) LSB1 = BCD (mm) MSB2 = BCD (yy) LSB2 = 0
Time	Time (hh-mm-ss)	2	MSB1 = BCD (hh) LSB1 = BCD (mm) MSB2 = BCD (ss) LSB2 = 0
Alarm	An item of the Alarmlist	27	MSB1 = reserved for future use LSB1 = reserved for future use MSB2 = Alarm level *) LSB2 = Alarm status **) MSB3 = alarm string ***)

Data type	Meaning	Number of registers	Data maping
			LSB3 = alarm string MSB4 = alarm string LSB5 = alarm string …

*) 1 .. level 1 (yellow), 2 .. level 2 (red)

**) Bit0 – alarm is active, Bit1 – alarm is confirmed

***) String encoding is UTF-8

Error codes (exception codes)

Exception code is returned by the controller (server) if the query sent from the client could not be completed successfuly.

The controller responds with the error codes in as follows:

- 01 – Ilegal function is returned if an incompatible type of operation is applied for a specific object, e.g. if function 03 is applied to a binary object.
- 02 – illegal address is returned if the client tries to perform an operation with a object address that is not related to any existing object or that is located inside an object which is composed by multiple addresses (registers).
- 04 – device error is returned in all other errorneous situations. More detailed specification of the problem can be consequently obtained by reading the registers 4205 – 4206.

Reserved registers

There are several registers with specific meaning. These registers are available in all controllers regardless of the configuration.

Register addresses	Number of registers	Access	Data type	Meaning
4200 - 4201	2	read/write	Time	RTC Time in BCD code
4202 - 4203	2	read/write	Date	RTC Date in BCD code
4204	1	read/write	Unsigned8	Index of the language that is used for text data provided by Modbus (e.g. alarmlist messages).
4205 - 4206	2	read	Unsigned32	Last application error. To be read after the device returns the exception code 04. It contains specific information about the error.
4207 - 4208	2	read/write	Unsigned32	Writing:command argument Reading: command return value
4209	1	write	Unsigned16	Command code
4010	1	-	-	Not implemented
4211	1	write	Unsigned16	Password
4212 - 4213	2	read	Unsigned32	Communication status

Register addresses	Number of registers	Access	Data type	Meaning
4214	1	read/write	Unsigned8	Reading: Number of items in the Alarmlist Writing: Required record format, 0 = text (default), 1 = binary
4215 - 4241	27	read	Alarm	1. record in alarm list
4242 - 4268	27	read	Alarm	2. record in alarm list
4269 - 4295	27	read	Alarm	3. record in alarm list
4296 - 4322	27	read	Alarm	4. record in alarm list
4323 - 4349	27	read	Alarm	5. record in alarm list
4350 - 4376	27	read	Alarm	6. record in alarm list
4377 - 4403	27	read	Alarm	7. record in alarm list
4404 - 4430	27	read	Alarm	8. record in alarm list
4431 - 4457	27	read	Alarm	9. record in alarm list
4458 - 4484	27	read	Alarm	10. record in alarm list
4485 - 4511	27	read	Alarm	11. record in alarm list
4512 - 4538	27	read	Alarm	12. record in alarm list
4539 - 4565	27	read	Alarm	13. record in alarm list
4566 - 4592	27	read	Alarm	14. record in alarm list
4593 - 4619	27	read	Alarm	15. record in alarm list
4620 - 4646	27	read	Alarm	16. record in alarm list
4700	1	write	Bool	Remote start/Stop: Suplements the set of starting requests in AUTO mode (e.g. Remote Start/Stop. Set the coil to log1 to start the BESS, set the coil to log0 to stop the BESS. There are no conditions in relation to user access settings.
5000	1	read/write	Int16	**RemoteControl2B 1**
5001	1	read/write	Int16	**RemoteControl2B 2**
5002	1	read/write	Int16	**RemoteControl2B 3**
5003	1	read/write	Int16	**RemoteControl2B 4**
5004	1	read/write	Int16	**RemoteControl2B 5**
5005	1	read/write	Int16	**RemoteControl2B 6**
5006	1	read/write	Int16	**RemoteControl2B 7**
5007	1	read/write	Int16	**RemoteControl2B 8**
5100 - 5101	2	read/write	Int32	**RemoteControl4B 1**
5102 - 5103	2	read/write	Int32	**RemoteControl4B 2**
5104 - 5105	2	read/write	Int32	**RemoteControl4B 3**
5106 - 5107	2	read/write	Int32	**RemoteControl4B 4**
5200	1	read/write	Binary16	**RemoteControlBin**

Alarmlist reading

An item of the Alarmlist has the following structure:

Byte	Value	Meaning
MSB 1	0	Always zero for reverse compatibility
LSB 1	0	ComAp Text
	1	ComAp Binary
	2	ECU Text
	3	ECU Binary
MSB 2	0	Undefined
	1	Level 1
	2	Level 2
	3	Sensor fail
LSB 2	0	Inactive
	1	Active, Confirmed
	2	Inactive, Unconfirmed
	3	Active, Unconfirmed

If Alarm format = ComAp Text or ECU Text:

MSB 3		alarm string
LSB 3		alarm string
...	...	...
MSB 27		alarm string
LSB 27		alarm string

If Alarm format = ECU Binary:

MSB 3	FC[3]	error ID (SPN) high word
LSB 3	FC[2]	
MSB 4	FC[1]	error ID (SPN) low word
LSB 4	FC[0]	
MSB 5	0	
LSB 5	FMI	failure mode identifier
MSB 6	0	
LSB 6	OC	occurence
MSB 7	0	
LSB 7	SRC_ADDR	ECU address
MSB 8	0	
LSB 8	SRC_IDX	ECU unit index

If Alarm format = ComAp Binary:

MSB 3	REASON_TEXT_IDX[1]	Reason Text IDX* *configuration-dependent, can be found in exported data from InteliConfig (CFG Image), table "AlarmReasonNames"
LSB 3	REASON_TEXT_IDX[0]	

List of commands and arguments

IMPORTANT: Only commands configured with access level 0 can be invoked via Modbus.

"Commands" are used to invoke a specific action in the controller via the communication channel. The list of available actions is in the table below. The general procedure of writing a command via Modbus is as follows:

1. Write the command argument into the registers 44208-44209 (register addresses 4207-4208). Use function 16.
2. Write the command code into the register 44210 (register address 4209). Use function 6.
3. (Optional) Read the command return value from the registers 44208-44209 (register addresses 4207-4208). Use function 3.
4. If the command was executed the return value is as listed in the table. If the command was accepted but there was an error during execution the return value indicates the reason:
   a. 0x00000001 – invalid argument
   b. 0x00000002 – command refused (e.g. controller not in MAN, breaker can not be closed in the specific situation etc.)

Command code	Action	Argument
BESS cmd 0x01	BESS start*	0x01FE 0000
	BESS stop*	0x02FD 0000
	Fault reset*	0x08F7 0000
	Horn reset*	0x04FB 0000
Breaker cmd 0x02	BCB toggle*	0x11EE 0000
	BCB on	0x11EF 0000
	BCB off	0x11F0 0000
Breaker cmd 0x02	MCB toggle*	0x12ED 0000
	MCB on	0x12EE 0000
	MCB off	0x12EF 0000
Mode cmd 0x03	OFF Mode	0x0000 0000
	MAN Mode	0x0001 0000
	AUTO Mode	0x0003 0000
Access lock 0x197	Remove Access lock	0x0010 0000
	Set Access lock	0x0020 0000

User Buttons 1 .. 8 0x0047	User Button 1: Pulse	0x000A 0000
	User Button 1: ON/OFF	0x000B 0000
	User Button 1: ON	0x000C 0000
	User Button 1: OFF	0x000D 0000
	User Button 2: Pulse	0x0014 0000
	User Button 2: ON/OFF	0x0015 0000
	User Button 2: ON	0x0016 0000
	User Button 2: OFF	0x0017 0000
	User Button 3: Pulse	0x001E 0000
	User Button 3: ON/OFF	0x001F 0000
	User Button 3: ON	0x0020 0000
	User Button 3: OFF	0x0021 0000
	User Button 4: Pulse	0x0028 0000
	User Button 4: ON/OFF	0x0029 0000
	User Button 4: ON	0x002A 0000
	User Button 4: OFF	0x002B 0000
	User Button 5: Pulse	0x0032 0000
	User Button 5: ON/OFF	0x0033 0000
	User Button 5: ON	0x0034 0000
	User Button 5: OFF	0x0035 0000
	User Button 6: Pulse	0x003C 0000
	User Button 6: ON/OFF	0x003D 0000
	User Button 6: ON	0x003E 0000
	User Button 6: OFF	0x003F 0000
	User Button 7: Pulse	0x0046 0000
	User Button 7: ON/OFF	0x0047 0000
	User Button 7: ON	0x0048 0000
	User Button 7: OFF	0x0049 0000
	User Button 8: Pulse	0x0050 0000
	User Button 8: ON/OFF	0x0051 0000
	User Button 8: ON	0x0052 0000
	User Button 8: OFF	0x0053 0000

User Buttons 9 .. 16 0x0048	User Button 9: Pulse	0x005A 0000
	User Button 9: ON/OFF	0x005B 0000
	User Button 9: ON	0x005C 0000
	User Button 9: OFF	0x005D 0000
	User Button 10: Pulse	0x0064 0000
	User Button 10: ON/OFF	0x0065 0000
	User Button 10: ON	0x0066 0000
	User Button 10: OFF	0x0067 0000
	User Button 11: Pulse	0x006E 0000
	User Button 11: ON/OFF	0x006F 0000
	User Button 11: ON	0x0070 0000
	User Button 11: OFF	0x0071 0000
	User Button 12: Pulse	0x0078 0000
	User Button 12: ON/OFF	0x0079 0000
	User Button 12: ON	0x007A 0000
	User Button 12: OFF	0x007B 0000
	User Button 13: Pulse	0x0082 0000
	User Button 13: ON/OFF	0x0083 0000
	User Button 13: ON	0x0084 0000
	User Button 13: OFF	0x0085 0000
	User Button 14: Pulse	0x008C 0000
	User Button 14: ON/OFF	0x008D 0000
	User Button 14: ON	0x008E 0000
	User Button 14: OFF	0x008F 0000
	User Button 15: Pulse	0x0096 0000
	User Button 15: ON/OFF	0x0097 0000
	User Button 15: ON	0x0098 0000
	User Button 15: OFF	0x0099 0000
	User Button 16: Pulse	0x00A0 0000
	User Button 16: ON/OFF	0x00A1 0000
	User Button 16: ON	0x00A2 0000
	User Button 16: OFF	0x00A3 0000

User Buttons 17 .. 24 0x00A8	User Button 17: Pulse	0x00AA 0000
	User Button 17: ON/OFF	0x00AB 0000
	User Button 17: ON	0x00AC 0000
	User Button 17: OFF	0x00AD 0000
	User Button 18: Pulse	0x00B4 0000
	User Button 18: ON/OFF	0x00B5 0000
	User Button 18: ON	0x00B6 0000
	User Button 18: OFF	0x00B7 0000
	User Button 19: Pulse	0x00BE 0000
	User Button 19: ON/OFF	0x00BF 0000
	User Button 19: ON	0x00C0 0000
	User Button 19: OFF	0x00C1 0000
	User Button 20: Pulse	0x00C8 0000
	User Button 20: ON/OFF	0x00C9 0000
	User Button 20: ON	0x00CA 0000
	User Button 20: OFF	0x00CB 0000
	User Button 21: Pulse	0x00D2 0000
	User Button 21: ON/OFF	0x00D3 0000
	User Button 21: ON	0x00D4 0000
	User Button 21: OFF	0x00D5 0000
	User Button 22: Pulse	0x00DC 0000
	User Button 22: ON/OFF	0x00DD 0000
	User Button 22: ON	0x00DE 0000
	User Button 22: OFF	0x00DF 0000
	User Button 23: Pulse	0x00E6 0000
	User Button 23: ON/OFF	0x00E7 0000
	User Button 23: ON	0x00E8 0000
	User Button 23: OFF	0x00E9 0000
	User Button 24: Pulse	0x00F0 0000
	User Button 24: ON/OFF	0x00F1 0000
	User Button 24: ON	0x00F2 0000
	User Button 24: OFF	0x00F3 0000

User Buttons 25 .. 32 0x00A9	User Button 25 Pulse	0x00FA 0000
	User Button 25 ON/OFF	0x00FB 0000
	User Button 25 ON	0x00FC 0000
	User Button 25 OFF	0x00FD 0000
	User Button 26: Pulse	0x0104 0000
	User Button 26: ON/OFF	0x010540 0000
	User Button 26: ON	0x010640 0000
	User Button 26: OFF	0x010740 0000
	User Button 27: Pulse	0x0101E 0000
	User Button 27: ON/OFF	0x010F 0000
	User Button 27: ON	0x0110 0000
	User Button 27: OFF	0x0111 0000
	User Button 28: Pulse	0x0118 0000
	User Button 28: ON/OFF	0x0119 0000
	User Button 28: ON	0x011A 0000
	User Button 28: OFF	0x011B 0000
	User Button 29: Pulse	0x0122 0000
	User Button 29: ON/OFF	0x0123 0000
	User Button 29: ON	0x0124 0000
	User Button 29: OFF	0x0125 0000
	User Button 30: Pulse	0x012C 0000
	User Button 30: ON/OFF	0x012D 0000
	User Button 30: ON	0x012E 0000
	User Button 30: OFF	0x012F 0000
	User Button 31: Pulse	0x0136 0000
	User Button 31: ON/OFF	0x0137 0000
	User Button 31: ON	0x0138 0000
	User Button 31: OFF	0x0139 0000
	User Button 32: Pulse	0x0140 0000
	User Button 32: ON/OFF	0x0141 0000
	User Button 32: ON	0x0142 0000
	User Button 32: OFF	0x0143 0000
User Button 33	User Button 33: Pulse	0x014A 0000
	User Button 33: ON/OFF	0x014B 0000
	User Button 33: ON	0x014C 0000
	User Button 33: OFF	0x014D 0000

User Button 34	User Button 34: Pulse	0x0154 0000
	User Button 34: ON/OFF	0x0155 0000
	User Button 34: ON	0x0156 0000
	User Button 34: OFF	0x0157 0000
User Button 35	User Button 35: Pulse	0x015E 0000
	User Button 35: ON/OFF	0x015F 0000
	User Button 35: ON	0x0160 0000
	User Button 35: OFF	0x0161 0000
User Button 36	User Button 36: Pulse	0x0168 0000
	User Button 36: ON/OFF	0x0169 0000
	User Button 36: ON	0x016A 0000
	User Button 36: OFF	0x016B 0000
User Button 37	User Button 37: Pulse	0x0172 0000
	User Button 37: ON/OFF	0x0173 0000
	User Button 37: ON	0x0174 0000
	User Button 37: OFF	0x0175 0000
User Button 38	User Button 38: Pulse	0x017C 0000
	User Button 38: ON/OFF	0x017D 0000
	User Button 38: ON	0x017E 0000
	User Button 38: OFF	0x017F 0000
User Button 39	User Button 39: Pulse	0x0186 0000
	User Button 39: ON/OFF	0x0187 0000
	User Button 39: ON	0x0188 0000
	User Button 39: OFF	0x0189 0000
User Button 40	User Button 40: Pulse	0x0190 0000
	User Button 40: ON/OFF	0x0191 0000
	User Button 40: ON	0x0192 0000
	User Button 40: OFF	0x0193 0000
User Button 41	User Button 41: Pulse	0x019A 0000
	User Button 41: ON/OFF	0x019B 0000
	User Button 41: ON	0x019C 0000
	User Button 41: OFF	0x019D 0000
User Button 42	User Button 42: Pulse	0x01A4 0000
	User Button 42: ON/OFF	0x01A5 0000
	User Button 42: ON	0x01A6 0000
	User Button 42: OFF	0x01A7 0000

User Button 43	User Button 43: Pulse	0x01AE 0000
	User Button 43: ON/OFF	0x01AF 0000
	User Button 43: ON	0x01B0 0000
	User Button 43: OFF	0x01B1 0000
User Button 44	User Button 44: Pulse	0x01B8 0000
	User Button 44: ON/OFF	0x01B9 0000
	User Button 44: ON	0x01BA 0000
	User Button 44: OFF	0x01BB 0000
User Button 45	User Button 45: Pulse	0x01C2 0000
	User Button 45: ON/OFF	0x01C3 0000
	User Button 45: ON	0x01C4 0000
	User Button 45: OFF	0x01C5 0000
User Button 46	User Button 46: Pulse	0x01CC 0000
	User Button 46: ON/OFF	0x01CD 0000
	User Button 46: ON	0x01CE 0000
	User Button 46: OFF	0x01CF 0000
User Button 47	User Button 47: Pulse	0x01D6 0000
	User Button 47: ON/OFF	0x01D7 0000
	User Button 47: ON	0x01D8 0000
	User Button 47: OFF	0x01D9 0000
User Button 48	User Button 48: Pulse	0x01E0 0000
	User Button 48: ON/OFF	0x01E1 0000
	User Button 48: ON	0x01E2 0000
	User Button 48: OFF	0x01E3 0000

* This action is an equivalent of pressing the front panel button

Modbus RTU examples

- **Reading of Battery voltage**
  - Export table of values from InteliConfig

Table: Values									
Allowed MODBUS functions: 03, 04									
Register (s)	Com.Obj.	Name	Dimension	Type	Len	Dec	Min	Max	Group
01036	8213	**BatteryVoltage**	**V**	Integer	2	**1**	0	400	Controller I/O

Request: (Numbers in Hex)							
01	03	04	1D	00	01	15	3C
Controller address	Modbus function	Register address $041D_{hex}$ **1053_{dec}**		Number of registers		CRC	

Response: (Numbers in Hex)						
01	03	02	00	F0	B8	00
Controller address	Modbus function	Length of data 02_{hex} 2 bytes read	Data $00F0_{hex}$ **240_{dec}**		CRC	

We read value 240 from register 01036. From table of modbus registers we get dimension of read value and "Dec". Dec=1 means shift one decimal place to the right. So battery voltage is **24.0 V**.

Reading Nominal power

- Export table of values from InteliConfig

Table: Values									
Allowed MODBUS functions: 03, 04									
Register (s)	Com.Obj.	Name	Dimension	Type	Len	Dec	Min	Max	Group
01228	9018	**Nominal Power**	**kW**	Integer	2	**0**	0	32767	Basic Settings

Request: (Numbers in Hex)							
01	03	04	CC	00	01	45	05
Controller address	Modbus function	Register address $04CC_{hex}$ $\mathbf{1228}_{dec}$		Number of registers		CRC	

Response: (Numbers in Hex)						
01	03	02	00	C8	B9	D2
Controller address	Modbus function	Length of data 02_{hex} 2 bytes read	Data $00C8_{hex}$ $\mathbf{200}_{dec}$		CRC	

Read nominal power is 200 kW.

Reading all binary inputs as modbus register

Table: Values									
Allowed MODBUS functions: 03, 04									
Register (s)	Com.Obj.	Name	Dimension	Type	Len	Dec	Min	Max	Group
01068	8235	**Binary Inputs**		Binary#2	2	**0**	-	-	Controller I/O

Request: (Numbers in Hex)							
01	03	04	2C	00	01	44	F3
Controller address	Modbus function	Register address $042C_{hex}$ **1068_{dec}**		Number of registers		CRC	

Response: (Numbers in Hex)						
01	03	02	00	12	38	49
Controller address	Modbus function	Length of data 02_{hex} 2 bytes read	Data 0012_{hex} **00010010_{bin}**		CRC	

Binary inputs is 00010010. It means Binary input 2 and binary input 5 are active.

Note: *You can use Modbus function 4 instead of 3, rest of data remain same (CRC differs).*

Reading specific binary inputs

Table: Binaries						
Allowed MODBUS functions: 01, 02						
Addresses Modbus Addr. Prot. Addr.	Source = Value = State	C.O.# State #	Name of Value Name of State	Bit #	Bit Name Activated by protection (s):	Group
00000	Value	8235	Binary Inputs	0	BCB Feedback	Controller I/O
00001	Value	8235	Binary Inputs	1	MCB	Controller I/O
00002	Value	8235	Binary Inputs	2	BESS Ready To Load	Controller I/O

We will read state of BCB Feedback binary input.

Request: (Numbers in Hex)							
01	01	00	01	00	01	AC	0A
Controller address	Modbus function	Register address 0001_{hex} **0001_{dec}**		Number of registers		CRC	

Response: (Numbers in Hex)					
01	01	01	01	90	48
Controller address	Modbus function	Length of data 01_{hex} 1 byte read	Data 01_{hex} active	CRC	

The readed data is 01, it means this binary input is active.

Note: *You can use Modbus function 2 instead of 1, rest of data remains same (CRC differs).*

Starting the BESS

User with access level 0 must have full access for BESS Cmd otherwise the command will not be invoked.

Table **Reserved registers**

Register addresses	Number of registers	Access	Data type	Meaning
4207 - 4208	2	read/write	Unsigned32	Writing:command argument Reading: command return value
4209	1	write	Unsigned16	Command code

Table **List of commands and arguments**

Action	Command code	Argument	Return value
BESS start	0x01	0x01FE0000	0x000001FF
BESS stop	0x01	0x02FD0000	0x000002FE

Request 1/2: (Numbers in Hex)

01	10	10	6F	00	03	06
Controller address	Modbus function $10_{hex} = 16_{dec}$	Register address $106F_{hex} = \mathbf{4207}_{dec}$		Number of registers		Data length in bytes

Request 2/2: (Numbers in Hex)

01	FE	00	00	00	01	68	0B
Argument				Command code		CRC	

Note: *Command and argument may be written as one "packet" (function 16) or you can split it and write argument (function 16) and after that write command code (function 6).*

Nominal Power – writing

Table: Setpoints									
Allowed MODBUS functions: 03, 04, 06, 16									
Register (s)	Com.Obj.	Name	Dimension	Type	Len	Dec	Min	Max	Group
03008	8276	**Nominal Power**	**kW**	Unsigned	2	**0**	1	5000	Basic Settings

Request: (Numbers in Hex)							
01	06	0B	C0	00	64	8A	39
Controller address	Modbus function	Register address $0BC0_{hex}$ = $\mathbf{3008}_{dec}$		Data 0064_{hex} = $\mathbf{100}_{dec}$		CRC	

Response: (Numbers in Hex)							
01	06	0B	C0	00	00	8B	D2
Controller address	Modbus function	Register address $0BC0_{hex}$ = $\mathbf{3008}_{dec}$		Allways zero		CRC	

Writen setpoint nominal power is 100 kW.

CRC calculation

The check field allows the receiver to check the validity of the message. The check field value is the Cyclical Redundancy Check (CRC) based on the polynomial $x^{16}+x^{15}+x^{2}+1$. CRC is counted from all message bytes preceding the check field.

Online CRC calculator: http://www.lammertbies.nl/comm/info/crc-calculation.html Use CRC-16 (Modbus)

Write LSB first.

For writing nominal power 100 kW the CRC is calculated from this data: $01060BC00064_{hex}$

back to Connection to 3rd party systems

10 Technical data

Power supply

Power supply range	8-36 V DC
Power consumption	16 W
RTC battery	Replaceable, type CR1632 3V
Fusing power	8 A
Consumption	2.5 A Controller + 10 x 0.5 A BOUTs @ 8 V
Fusing E-STOP	1 A
Max. Heat Dissipation	16 W

Operating conditions

Operating temperature	-40 °C to +70 °C
Storage temperature	-40 ˚C to +80 ˚C
Operating humidity (norm 60068-2-30)	25/55°C, 48hours,95 % non-condensing (EN 60068-2-30)
Protection degree	IP20
Vibration	5-25 Hz, ± 1.6 mm 25-100 Hz, a = 4 g
Shocks	a = 500 m/s^2
Surrounding air temperature rating 70 °C.	
Suitable for pollution degree 2.	

AC Current measurement

Measurement inputs	3ph BESS current 1ph Mains current (Auxiliary current)
Measurement range	1 A / 5 A
Maximum continuous current	2 A / 10 A
Allowed overload	18 A for 15 sec.
Accuracy	±3 mA / ±15 mA for 0.0 to 0.4 A / 0.0 to 2.0 A0.75 % of value for 0.4 to 1.0 A / 2.0 to 5.0 A
Frequency range	40-70 Hz (accuracy 0.002 %)
Sampling frequency	6.4kHz (50Hz) / 7.68kHz (60Hz)
Input impedance	0.68 MΩ ph-ph , 0.34 MΩ ph-n

AC Voltage measurement

Measurement inputs	3ph-n BESS voltage 3ph-n Mains voltage
Measurement range	115 V ph-N / 200 V ph-ph suitable also for VTs output
	231 V ph-N / 400 V ph-ph
	UL, cUL: 346 V ph-N / 600 V ph-ph
Linear measurement and protection range (maximal voltage)	433 V ph-N / 750 V ph-ph
Accuracy	0.25 %
Frequency range	40-70 Hz (accuracy 0.002 %)
Sampling frequency	6.4kHz (50Hz) / 7.68kHz (60Hz)
Input impedance	0.72 MΩ ph-ph , 0.36 MΩ ph-n
Upper-harmonics filtering	Active Low-Pass filter, Cutoff frequency 3100Hz (-3bB)
Measurement category CAT III, overvoltage category III	

E-Stop

Dedicated terminal for safe Emergency Stop input.
Physically disconnects BO 1 & BO 2 from power supply.

Binary inputs

Number	12, non-isolated
Close/Open indication	0-2 V DC close contact 6-36 V DC open contact
Configurable	Pull-up / Pull-down
Pulse input	Bin 9 and 10 max. 50 Hz

Binary outputs

Number	12, non-isolated
Max. current	0.5 A
Switching to	Positive supply terminal

Analog inputs

Number	4, switchable (R/U/I)
Range	R = 0-10000 Ω; U = 0-10 V; I = 0-20 mA
Accuracy	R: 2 % from value for 0-250 Ω R: 4% from value for 250-2500 Ω R: 6 % from value for 5000-10000 Ω U: 1% from value ±100 mV I: 1% from value ±200 uA

Analog output 1

Protection	Reinforced isolation
Type	Switchable: U ±10 V, I ±20 mA, PWM: 0 V/5 V
Accuracy	U: 1 % from value ±100 mV I: 1 % from value ±200 uA

Analog output 2

Protection	Basic isolation
Type	Switchable: U ±10 V, I ±20 mA, PWM: 0 V/5 V
Accuracy	U: 1 % from value ±100 mV I: 1 % from value ±200 uA

Communications

USB Device	Basic isolation, USB type B
RS 485	Basic isolation
ETH1 **ETH2** **ETH3**	10/100 Mbit
CAN 1A **CAN 2A** **CAN 1B** **CAN 2B**	Basic isolation, 1000/250/50 kbps , nominal impedance 120 Ω

Weight

Controller	750 g
Package	920 g

Controller handles 300 million records into the History, which represents roughly 1 record per second during 9,5 years. Shall be the History recording faster, the controller lifetime will become smaller.

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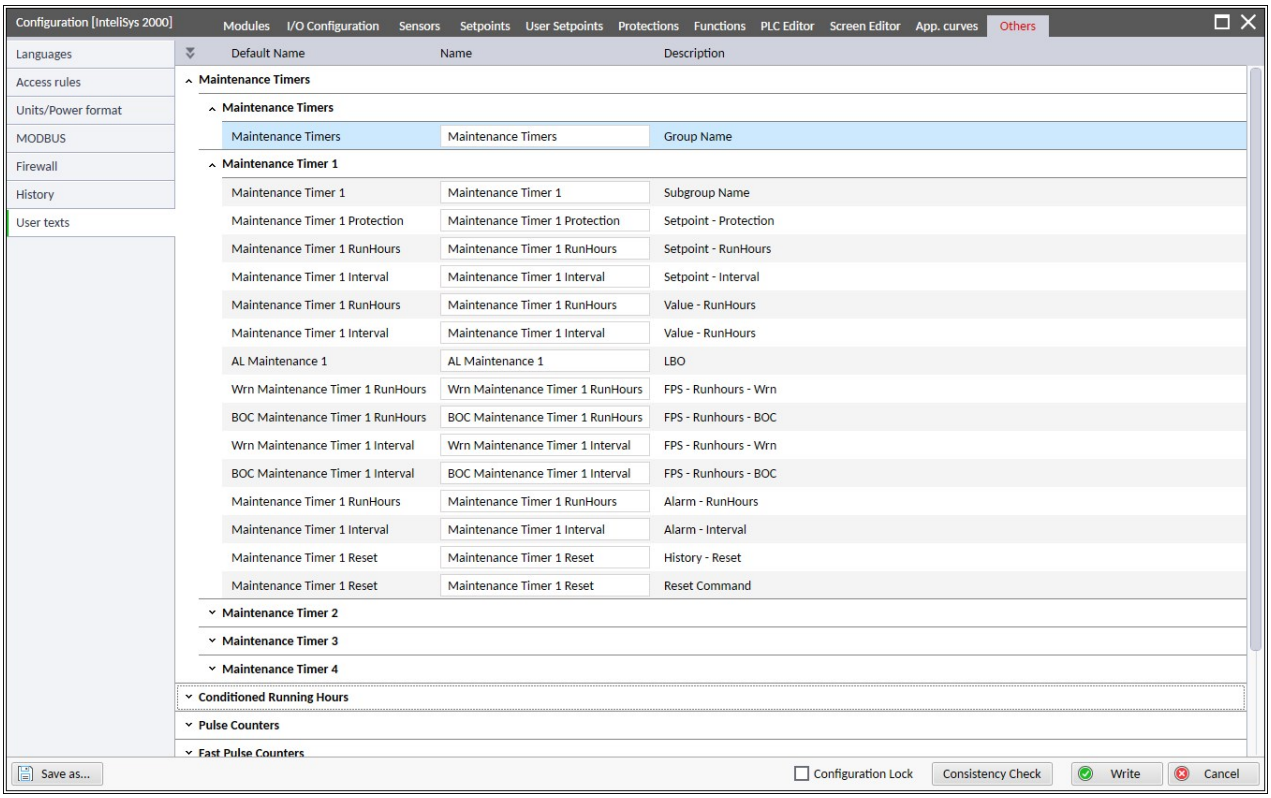
11.1.2 Renameable controller objects

It is possible to rename some controller objects in InteliConfig under **Controller Configuration** -> **Others** -> **User texts** tab. The User texts include communication objects, group names, subgroup names, alarms, etc. The user can name those objects according his needs.



11.1.3 Setpoints

What setpoints are:

Setpoints are analog, binary or special data objects which are used for adjusting the controller to the specific environment. Setpoints are organized into groups according to their meaning. Setpoints can be adjusted from the controller front panel, PC, MODBUS, etc.

All setpoints can be protected by a password against unauthorized changes. Password protection can be assigned to the setpoints during the configuration procedure.

> **IMPORTANT: Do not write setpoints repeatedly (e.g. power control from a PLC by repeated writing of baseload setpoint via Modbus). The setpoints are stored in FRAM memory, which is designed to withstand up to 10^{14} read/write cycles without risk of damage or data loss, but it may become damaged, when the allowed number of reading/writing cycles is exceeded.**

For full list of setpoints go to the chapter **List of setpoints**.

List of group of setpoints

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Group: Process Control

Subgroup: Application Selector

Default Application Select

Setpoint group	Process Control	**Related FW**	2.2.0
Range [units]	MPTM / MINT [-]		
Default value	MINT	**Force value**	NO
Step	[-]		
Comm object	12157	**Related applications**	MINT, MPTM
Config level	Advanced		
Setpoint visibility	Always		
Description			

This setpoint selects default controller's application mode while any application LBI is not activated. Current controller's application mode is stored in value **Application Mode**.

> **IMPORTANT: Controller Mode has to be OFF, otherwise controller application can not be changed.**

MPTM	Single parallel to mains application. The controller controls up to three breakers – a mains breaker (MCB), BESS breaker (BCB), and/or PV breaker (PVCB). Feedbacks from all used breakers are required.
MINT	Multiple island-parallel application without mains and multiple parallel application with mains. The controller controls up to two breakers – a BESS breaker and/or PV breaker. For parallel to mains operation also mains breaker feedback is required.

Note: *For more information about Applications, see chapter **Applications overview**.*

Note: *The controller also controls the NCB, check the chapter **Breaker Control** for more information about breakers.*

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Subgroup: Load Control

Load Control PTM Mode

Setpoint group	Process Control	**Related FW**	2.2.0
Range [units]	Baseload / Imp / Exp [-]		
Default value	Baseload	**Force value**	YES
Step	[-]		
Comm object	8638	**Related applications**	MPTM
Config level	Standard		
Setpoint visibility	Only if **Application Mode** = MPTM		
Description			

This setpoint adjusts the type of load control.

0 – Baseload	Request for constant power delivered to the Point of Connection (POC) by the sources. Power is distributed among sources according to their configuration. The requested value input the system either via setpoint **#System Baseload** or LAI **LOAD CONTROL: ANEXT BASELOAD**, depends on **Load Request Source** settings.
1 –Import/ Export	Request for constant power from the grid. The requested value input the system either via setpoint **Import Load** or LAI **LOAD CONTROL: ANEXT IMP/EXP LOAD**, depends on **Load Request Source** settings.
2 – Zero Import	The goal is zero power import from the grid. Power is supplied exclusively by local sources.
3 – Min Import	Grid import is constant and equal to the value of **Mains Import Min**.
4 – Max Import	Grid import is constant and equal to the value of **Mains Import Max**.

5 – Mains preference	In this mode, the load consumption is primarily covered by the grid, with maximum utilization of PV output. The grid power is maintained within the defined range between **Mains Import Min** and **Mains Import Max**. › When the grid power remains within this range, the power delivered by the BESS is zero. › **Charging of BESS** begins when the grid power reaches the **Mains Import Min** limit, utilizing any excess power. › **Discharging of BESS** starts when the grid power reaches the **Mains Import Max** limit. › **Curtailment of PV** occurs only when the grid power is pushed below **Mains Import Min** and BESS is already charging at its maximum capacity. › If a **genset** is present in the system, its power is maintained at the level defined by **Gen P Optimal**. › In case of PV overproduction, the genset power gradually decreases down to **#Gen P Min**, after which PV curtailment begins.
6 – BESS Max Charging	This mode closely resembles **Mains Preference**, with a key difference in the behavior of the BESS. › In this mode, **the BESS charges at maximum possible rate**, determined both by its internal limits and the upper grid limit defined by **Mains Import Max**. › This charging occurs while maintaining maximum PV production. › The genset operates at the **Gen P Optimal** level, providing a stable contribution to the overall power balance.
7 – BESS Max Discharging	This mode is similar in structure to **Mains Preference**, but focuses on maximizing the discharging of the BESS. › In this mode, **the BESS discharges at maximum possible rate**, determined by its internal limits and system demand › The grid power is maintained above the lower limit defined by **Mains Import Min**. › The genset operates at **Gen P Optimal**, ensuring a stable baseline contribution. › All of this occurs while maintaining **maximum possible PV production**, meaning the BESS discharges only to the extent necessary to avoid curtailing PV output.

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Load Request Source

Setpoint group	Process Control	**Related FW**	2.2.0
Range [units]	Setpoint / Analog External Value [-]		
Default value	Setpoint	**Force value**	YES
Step	[-]		
Comm object	20727	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Always		
Description			

This setpoint adjusts source type of requested load control.

- **Application Mode** = MPTM

Load Request Source	Load Control PTM Mode	Source
Setpoint	Baseload	**BESS Charge Power/BESS Discharge Power**
	Imp/Exp	**Import Load**
Analog External Value	Baseload	**LOAD CONTROL: ANEXT BASELOAD**
	Imp/Exp	**LOAD CONTROL: ANEXT IMP/EXP LOAD**

- **Application Mode** = MINT

Load Request Source	Source
Setpoint	**#System Baseload**
Analog External Value	**LOAD CONTROL ANEXT: LOCAL BASELOAD**

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#System Load Control PTM

Setpoint group	Process Control	**Related FW**	2.2.0
Range [units]	Baseload / IM Loadsharing / IM Request		
Default value	Baseload	**Force value**	NO
Step	[-]		
Comm object	8774	**Related applications**	MINT
Config level	Standard		
Setpoint visibility	Only if **Application Mode** = MINT		
Description			

Load control mode in parallel to Mains operation of the whole controller group.

Baseload	The total power of the group is controlled to constant level given by the setpoint **#System Baseload**. Each loaded unit takes equal part (relative to their nominal power) from this requested value. The load is regulated locally in each controller by Load control regulation loop, load-sharing is not active. The setpoint **#System Baseload** is also used for determining which unit have to run or not.
IM Loadsharing	The load is controlled by the supervisor (IM1010) controller to share the total load (given by the setpoint **#System Baseload**) with other loaded units in such a way, that all loaded units will be loaded at the same level (relative to their nominal power). Load-sharing regulation loop is active.
IM Request	This mode must be used to ensure the full compatibility of InteliNeo and the other controllers like InteliGen 1000 and Inteli Mains 1010. This mode is introduced in the system starting version 2.0.0 for InteliNeo and 3.3.0 for InteliGen 1000 and InteliMains 1010. Refer the chapter **Active Power Control in On-grid application**.

Note: *The Load Shar mode shall be used in case the supervisor (IM1010) controller is present in the system. In systems without the supervisor (IM1010) controller the setpoint must be setup to the Baseload option.*

Note: *The power factor (PF) is regulated to constant level given by the setpoint **#System PF Control PTM** in parallel to Mains operation and does not depend on active load control mode.*

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Baseload

Setpoint group	Process Control	**Related FW**	2.2.0
Range [units]	0 .. **Nominal power**[kW] (depends on the selected **Power Formats And Units**)		
Default value	100 kW (depends on the selected **Power Formats And Units**)	**Force value**	YES
Step	1 kW (depends on the selected **Power Formats And Units**)		
Comm object	8639	**Related applications**	MPTM
Config level	Standard		
Setpoint visibility	Only if **Application Mode** = MPTM		
Description			
According to the Baseload setpoint, the power demand supplied by the BESS, PV, and VT sources is regulated in the Baseload power control mode. › Setpoint must be set **Load Request Source** = Setpoint			

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Import Load

Setpoint group	Process Control	**Related FW**	2.2.0
Range [units]	-32 000 .. 32 000 [kW] (depends on the selected **Power Formats And Units**)		
Default value	0 kW (depends on the selected **Power Formats And Units**)	**Force value**	NO
Step	1 kW (depends on the selected **Power Formats And Units**)		
Comm object	8641	**Related applications**	MPTM
Config level	Standard		
Setpoint visibility	Only if **Application Mode** = MPTM		
Description			
Defines the target power to be imported from the grid. This setpoint is used in Import/Export mode to maintain a constant grid power level. **Import/Export Limitation**: The behavior of the Import Load request is directly influenced by the status of the **Import/Export Limitation** setting: › If **Import/Export Limitation** is set to **Disabled**: » The system allows the requested import value to exceed the defined grid range — both below **Mains Import Min** and above **Mains Import Max**. The full requested value is accepted without restriction. › If **Import/Export Limitation** is set to **Enabled**: » The system enforces the grid import limits. If the requested value falls outside the range defined by **Mains Import Min** and **Mains Import Max**, it will be clamped to stay within this range. This ensures that the grid power remains within safe and predefined boundaries.			

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#System Baseload

Setpoint group	Process Control	**Related FW**	2.2.0
Range [units]	0 .. 32 000 [kW] (depends on the selected **Power Formats And Units**)		
Default value	1 000 kW (depends on the selected **Power Formats And Units**)	**Force value**	NO
Step	1 kW (depends on the selected **Power Formats And Units**)		
Comm object	8775	**Related applications**	MINT
Config level	Standard		
Setpoint visibility	Only if **Application Mode** = MINT		
Description			

Required total active power of the controller group in parallel to Mains operation in Baseload mode.

Import/Export Limitation:

The behavior of the baseload request is directly influenced by the status of the Import/Export Limitation setting:

- If Import/Export Limitation is set to **Disabled**:
  - The system does not limit the baseload request, so the Mains Import is not restricted.
- If Import/Export Limitation is set to **Enabled**:
  - The system limits the baseload request to keep the Mains Import within the range defined by **Mains Import Min** and **Mains Import Max**, it will be clamped to stay within this range. This ensures that the grid power remains within safe and predefined boundaries.

Note: *The **Import/Export Limitation** only works if the Baseload Control is done by the InteliMains. The Setpoint **#System Load Control PTM** must be set as IM-LoadSharing or IM_Request.*

Note: *The # setpoints with # at the beginning are shared with all ComAp controllers on site via Intercontroller communication line.*

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Import/Export Limitation

Setpoint group	Process Control	**Related FW**	2.2.0
Range [units]	Enabled / Disabled [-]		
Default value	Disabled	**Force value**	NO
Step	[-]		
Comm object	9592	**Related applications**	MPTM
Config level	Standard		
Setpoint visibility	Only if **Application Mode** = MPTM		
Description			

Controls whether the system enforces the defined grid import boundaries set by **Mains Import Min** and **Mains Import Max**. This setting directly affects how the system responds to import requests in various control modes.

- **Functionality**:
  - If set to **Disabled**:
  - The system allows import requests to exceed the defined grid range. Requested values for Import Load can go below **Mains Import Min** or above **Mains Import Max** without restriction.
  - If set to **Enabled**:The system enforces the grid import limits.
  - Any import request outside the range defined by **Mains Import Min** and **Mains Import Min** will be clamped to stay within these boundaries.
- **Applicable Modes**:
- This limitation applies in control modes such as *Baseload*, *Import/Export*, and *Zero Import*, where the system does not inherently regulate grid power to stay within limits unless this setting is enabled.

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Mains Import Hysteresis

Setpoint group	Process Control	**Related FW**	2.2.0
Range [units]	0.. 32000 [kW]		
Default value	0 kW (depends on the selected **Power Formats And Units**)	**Force value**	YES
Step	1 kW (depends on the selected **Power Formats And Units**)		
Comm object	17595	**Related applications**	MPTM
Config level	Standard		
Setpoint visibility	Depends on **#System Load Control PTM**		
Description			
Defines the hysteresis margin used to evaluate whether the grid power is approaching or crossing the boundaries defined by **Mains Import Min** and **Mains Import Max**. This setpoint is only applied in modes *Mains Preference*, *BESS Max Charging* and *BESS Max Discharging*. It helps prevent frequent switching or instability when grid power fluctuates near these limits. If the Mains Import hits the lower or the upper limit the control algorithm steps internally in *Import/Export* control to constant value either **Mains Import Min** or **Mains Import Max**. The control algorithm switch back to Mains Preference once the Mains Import value can lie again inside the Mains operation range narrowed by **Mains Import Hysteresis** settings.			

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Mains Import Min

Setpoint group	Process Control	**Related FW**	2.2.0
Range [units]	-32000 ... **Mains Import Max** [kW]		
Default value	0 kW (depends on the selected **Power Formats And Units**)	**Force value**	YES
Step	1 kW (depends on the selected **Power Formats And Units**)		
Comm object	17596	**Related applications**	MPTM
Config level	Standard		
Setpoint visibility	Depends on **#System Load Control PTM**		
Description			
Defines the lower limit of power that can be imported from the grid. This value acts as a boundary for grid interaction in various control modes, especially when **Import/Export Limitation** is enabled. › **Functionality**: » In modes like *Baseload*, *Import/Export*, and *Zero Import*, this setpoint determines the minimum grid power allowed. » If the requested import falls below this value and **Import/Export Limitation** is set enabled, the system will limit the import to this minimum. » It also serves as a reference point for triggering BESS charging and PV curtailment in modes *Mains Preference* and *BESS Max Discharging*.			

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Mains Import Max

Setpoint group	Process Control	**Related FW**	2.2.0
Range [units]	**Mains Import Min** ... 32000 [kW]		
Default value	0 kW (depends on the selected **Power Formats And Units**)	**Force value**	YES
Step	1 kW (depends on the selected **Power Formats And Units**)		
Comm object	17597	**Related applications**	MPTM
Config level	Standard		
Setpoint visibility	Depends on **#System Load Control PTM**		
Description			

Defines the upper limit of power that can be imported from the grid. This value acts as a boundary for grid interaction in various control modes, especially when **Import/Export Limitation** is enabled.

- **Functionality**:
  - In modes like *Baseload*, *Import/Export*, and *Zero Import*, this setpoint determines the maximum grid power allowed.
  - If the requested import exceeds this value and **Import/Export Limitation** is set enabled, the system will limit the import to this maximum.
  - It also serves as a reference point for triggering BESS discharging in modes *Mains Preference* and *BESS Max Charging*.

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Subgroup: PF/Q Control

PF/Q Control PTM Mode

Setpoint group	Process Control	**Related FW**	2.2.0
Range [units]	PF Control / PF(Pm) / Q Control / Q(Um) / Q(P) / Qref / Ulim [-]		
Default value	PF Control	**Force value**	NO
Step	[-]		
Comm object	10120	**Related applications**	MPTM
Config level	Standard		
Setpoint visibility	Only if **Application Mode** = MPTM		
Description			

This setpoint adjust the type of PF/Q control.

PF Control	The **BESS Power Factor** is controlled according to preset required value.
PF(Pm)	Grid Codes specific functionality where the power factor depends on the actual power of the BESS.
Q Control	The **BESS Q** is controlled according to preset required value.
Q(Um)	Grid Codes specific functionality where the **BESS Required Q** depends on the mains voltage (**Mains/Bus Voltage L1-N**, **Mains/Bus Voltage L2-N** and **Mains/Bus Voltage L3-N**).
Q(P)	Grid Codes specific functionality where the **BESS Required Q** depends on the **BESS P**.
Qref/Ulim	Grid Codes specific functionality where the **BESS Required Q** depends on the mains voltage (**Mains/Bus Voltage L1-N**, **Mains/Bus Voltage L2-N** and **Mains/Bus Voltage L3-N**) with a modified behavior.

Actual selected control mode is available in **System PF/Q Control**.

Note: *This description uses the terminology related to the BESS only. In case of BESS operating together with PV and/or WT, the values like BESS P, BESS Q, BESS PF has to be substituted by the* ***System Values****.*

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PF/Q Request Source

Setpoint group	Process Control	**Related FW**	2.2.0
Range [units]	Setpoint / Analog External Value [-]		
Default value	Setpoint	**Force value**	YES
Step	[-]		
Comm object	16130	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Always		
Description			

This setpoint adjust the source type requested of PF/Q control.

- **Application Mode** = MPTM

PF/Q Request Source	**PF/Q Regulation Type**	**PF/Q Control PTM Mode**	**Source**
Setpoint	Base PF/ Q Control	PF Control	**Base Power Factor**
		Q Control	**Base Q**
	Imp/Exp PF/ Q Control	PF Control	**Import Power Factor**
		Q Control	**Import Q**
Analog External Value	Base PF/ Q Control	PF Control	**PF CONTROL: ANEXT BASE PF**
		Q Control	**Q CONTROL: ANEXT BASE Q**
	Imp/Exp PF/ Q Control	PF Control	**PF CONTROL: ANEXT IMP/EXP PF**
		Q Control	**Q CONTROL: ANEXT IMP/EXP Q**

- **Application Mode** = MINT

PF/Q Request Source	**#System PF Control PTM**	**Source**
Setpoint	Base PF	**#System Power Factor**
	Base Q	**#System Base Q**
Analog External Value	Base PF	**PF CONTROL: ANEXT BASE PF**
	Base Q	**Q CONTROL: ANEXT BASE Q**

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PF/Q Regulation Type

Setpoint group	Process Control	**Related FW**	2.2.0
Range [units]	Base PF/Q Control / Import/Export PF/Q Control [-]		
Default value	Base PF/Q Control	**Force value**	YES
Step	[-]		
Comm object	16131	**Related applications**	MPTM
Config level	Standard		
Setpoint visibility	Only if **Application Mode** = MPTM		
Description			

This setpoint adjust the regulation type of PF/Q control.

Base PF/Q Control	BESS produces requested amount of the power, i.e. Mains Import/Export is adjusted so BESS produces exactly requested power.
Import/Export PF/Q Control	Mains Import/Export is exactly as requested, i.e. BESS power is adjusted to fulfill Import/Export requirements.

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#System PF Control PTM

Setpoint group	Process Control	**Related FW**	2.2.0
Range [units]	Base PF / IM Varsharing / Base Q / IM Request		
Default value	Base PF	**Force value**	NO
Step	[-]		
Comm object	8779	**Related applications**	MINT
Config level	Standard		
Setpoint visibility	Only if **Application Mode** = MINT		
Description			

Power factor control mode in parallel to Mains operation of the whole controller group.

Base PF	PF of the BESS is controlled by their PF control loops to provide constant system power factor adjusted by setpoint **#System Power Factor**.
IM Varsharing	PF of the BESS (reactive power) is controlled through the VAr sharing line.
Base Q	Reactive power of the BESS is controlled by their Q control loops to provide constant BESSs reactive power adjusted by setpoint **#System Base Q**.
IM Request	This mode must be used to ensure the full compatibility of InteliNeo and the other controllers like InteliGen 1000 and Inteli Mains 1010. This mode is introduced in the system starting version 2.0.0 for InteliNeo and 3.3.0 for InteliGen 1000 and InteliMains 1010. Refer the chapter **Reactive Power Control in On-grid application**.

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Base Power Factor

Setpoint group	Process Control	**Related FW**	2.2.0
Range [units]	0,001 .. 1,999 [-]		
Default value	1 [-]	**Force value**	YES
Step	0,001 [-]		
Comm object	8640	**Related applications**	MPTM
Config level	Standard		
Setpoint visibility	Only if **Application Mode** = MPTM		
Description			
Required BESS power factor when the BESS is running in parallel to the mains in PF Control BASE mode. The value from this Setpoint is used if: › Setpoint **PF/Q Regulation Type** = Base PF/Q Control and › Setpoint **PF/Q Control PTM Mode** = PF Control.			

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Import Power Factor

Setpoint group	Process Control	**Related FW**	2.2.0
Range [units]	0,001 .. 1,999 [-]		
Default value	1 [-]	**Force value**	NO
Step	0,001 [-]		
Comm object	8642	**Related applications**	MPTM
Config level	Standard		
Setpoint visibility	Only if **Application Mode** = MPTM		
Description			
Defines required power factor in parallel to Mains operation in PF Control IMP/EXP mode. The value from this Setpoint is used if: › Setpoint **PF/Q Regulation Type** = Import/Export PF/Q Control and › Setpoint **PF/Q Control PTM Mode** = PF Control. ***Note:*** *If the setpoint value is >1 the Mains Load Character is C, if the setpoint value is <0 the Mains Load Character is L.*			

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#System Power Factor

Setpoint group	Process Control	**Related FW**	2.2.0
Range [units]	0,60 .. 1,20 [-]		
Default value	1,00 [-]	**Force value**	NO
Step	0,01 [-]		
Comm object	8776	**Related applications**	MINT
Config level	Standard		
Setpoint visibility	Only if **Application Mode** = MINT		
Description			

Required total power factor of the controller group in parallel to Mains operation in PF Control BASE mode.

The value from this Setpoint is used if:

- Setpoint **#System PF Control PTM** = Base PF

Note: *If the setpoint value is >1 the BESS Load Character is C, if the setpoint value is <0 the BESS Load Character is L.*

Note: *The # setpoints are shared with all ComAp controllers on site via intercontroller communication line.*

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Base Q

Setpoint group	Process Control	**Related FW**	2.2.0
Range [units]	-32 000 .. 32 000 [kVAr] (depends on the selected **Power Formats And Units**)		
Default value	0 kVAr (depends on the selected **Power Formats And Units**)	**Force value**	YES
Step	1 kVAr (depends on the selected **Power Formats And Units**)		
Comm object	13026	**Related applications**	MPTM
Config level	Standard		
Setpoint visibility	Only if **Application Mode** = MPTM		
Description			

Required Gen-set reactive power in parallel to mains operation in Q Control BASE mode.

The value from this Setpoint is used if:

- Setpoint **PF/Q Regulation Type** = Base PF/Q Control and
- Setpoint **PF/Q Control PTM Mode** = Q Control.

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Import Q

Setpoint group	Process Control	**Related FW**	2.2.0
Range [units]	-32000 .. 32000 [kVAr] (depends on the selected **Power Formats And Units**)		
Default value	0 kVAr	**Force value**	NO
Step	1 kVAr (depends on the selected **Power Formats And Units**)		
Comm object	14143	**Related applications**	MPTM
Config level	Standard		
Setpoint visibility	Only if **Application Mode** = MPTM		
Description			

Defines actual imported (exported) reactive power in parallel to Mains operations in Q Control IMP/EXP Mode.

The value from this Setpoint is used if:

- Setpoint **PF/Q Regulation Type** = Import/Export PF/Q Control and
- Setpoint **PF/Q Control PTM Mode** = Q Control.

Note: *If the value of the setpoint is >0 the power is imported from the Mains, if the setpoint value is <0, then the power is exported to the Mains.*

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#System Base Q

Setpoint group	Process Control	**Related FW**	2.2.0
Range [units]	-32 000 .. 32 000 [kVAr] (depends on the selected **Power Formats And Units**)		
Default value	0 kVAr (depends on the selected **Power Formats And Units**)	**Force value**	NO
Step	1 kVAr (depends on the selected **Power Formats And Units**)		
Comm object	16407	**Related applications**	MINT
Config level	Standard		
Setpoint visibility	Only if **Application Mode** = MINT		
Description			

Required total reactive power of the controller group in parallel to Mains operation in Q Control BASE mode.

The value from this Setpoint is used if:

- Setpoint **#System PF Control PTM** = Base Q

Note: *The # setpoints are shared with all ComAp controllers on site via intercontroller communication line.*

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Local Base Q

Setpoint group	Process Control	**Related FW**	2.2.0
Range [units]	OFF / -32001 .. 32000 [kVAr] (depends on the selected **Power Formats And Units**)		
Default value	OFF / -32001 kVAr (depends on the selected **Power Formats And Units**)	**Force value**	YES
Step	1 kVAr (depends on the selected **Power Formats And Units**)		
Comm object	16480	**Related applications**	MINT
Config level	Standard		
Setpoint visibility	Only if **Application Mode** = MINT		
Description			
This setpoint is used to adjust local base reactive power level. The BESS maintains this reactive power independently on the **#System Base Q**. Reactive power variations are then equalized by the Gen-sets with lower priority (higher number) or by Gen-sets with Local Base Q switched off. If the setpoint is adjusted to -32001 (OFF) the function is off.			

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Local Base Power Factor

Setpoint group	Process Control	**Related FW**	2.2.0
Range [units]	OFF / 0 .. 1.999 [-]		
Default value	OFF / 0	**Force value**	YES
Step	0,001		
Comm object	16479	**Related applications**	MINT
Config level	Standard		
Setpoint visibility	Only if **Application Mode** = MINT		
Description			
This setpoint is used to adjust local base power factor level. The BESS maintains this PF independently on the **#System Power Factor**. Power factor variations are then equalized by units with lower priority (higher number) or by Gen-sets with Local Base Power Factor switched off. If the setpoint is adjusted to 0 (OFF) the function is off.			

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Subgroup: Neutral Contactor

#Neutral Contactor Control

Setpoint group	Process Control	**Related FW**	2.2.0
Range [units]	Each / Common [-]		
Default value	Each	**Force value**	NO
Step	[-]		
Comm object	9890	**Related applications**	MINT
Config level	Standard		
Setpoint visibility	Only if **Application Mode** = MINT		
Description			

This setpoint changes the behavior of binary output **NCB CLOSE/OPEN** which is used for neutral contactor control.

See more information in the chapter **Neutral Contactor Breaker**.

- The **EACH** option should be used if each Gen-set and BESS has its own neutral contactor. The **NCB CLOSE/OPEN** output on each Gen-set and BESS is given by an internal algorithm, which ensures, that always exactly one Gen-set or BESS connected to the bus with the lowest CAN address has the neutral contactor closed.
- The **COMMON** option should be used if there is only one common neutral contactor for the whole site. The **NCB CLOSE/OPEN** outputs from all controllers are combined together and the combined signal is used to control the breaker. If at least one Gen-set or BESS in the site is running and has a proper voltage, the neutral contactor is closed.

Note: *LBI **NCB FEEDBACK** and LBO **NCB CLOSE/OPEN** has to be configured for proper functionality.*

Note: *This setpoint is available only for the MINT application, in case of the MPTM application the NCB automatically behaves like this setpoint is set to **COMMON** option.*

Note: *The # setpoints are shared with all controllers on site via intercontroller CAN line.*

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Subgroup: Process Limitation

CB Control In MAN Mode

Setpoint group	Process Control	**Related FW**	2.2.0
Range [units]	Full Ctrl / Aut Trans / Islnd Disl [-]		
Default value	Aut Trans	**Force value**	YES
Step	[-]		
Comm object	14962	**Related applications**	MPTM
Config level	Standard		
Setpoint visibility	Only if **Application Mode** = MPTM		
Description			

The behavior of transition of load in MAN mode is adjusted via this setpoint.

Full Ctrl	No limitation of CB control in MAN mode (operator can close any breaker manually or evoke the synchronization and consequential operation in parallel to Mains)
Aut Trans	Operator can control both MCB or BCB breaker. However once transition is evoked the controller performs the automatic transfer of the load (depends on adjustment of setpoints **Transfer BESS To Mains** and **Transfer Mains To BESS**). Controller performs synchronization across MCB, if BCB is closed and MCB button is pushed. Load transfer is done after synchronization and BCB is opened automatically. Controller performs synchronization across BCB , if MCB is closed and BCB button is pushed. Load transfer is done after synchronization and MCB is opened automatically. It is also possible to open currently closed breaker and keep the load non-energized. Then it is possible to close MCB or BCB to energize the load from a healthy source. ***Note:*** *Parallel operation with Mains continues, if system already operates in parallel with Mains and setting is changed to Aut Trans. It is necessary to push MCB or BCB button to open a breaker.* ***Note:*** *Open transfer is performed, if the Open option is selected with* ***Transfer BESS To Mains*** *or* ***Transfer Mains To BESS***
Islnd Disl	Behaves like the full manual control but the Island operation is disabled. **Example:** When MCB is opened and BCB is pressed, controller does not go to island. **Example:** In parallel operation when MCB button is pressed, MCB is not opened.

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Subgroup: Mains Import Measurement

Mains Measurement P

Setpoint group	Process Control	**Related FW**	2.2.0
Range [units]	None / Mains CT / Analog Input [-]		
Default value	None	**Force value**	NO
Step	[-]		
Comm object	10599	**Related applications**	MPTM
Config level	Advanced		
Setpoint visibility	Only if **Application Mode** = MPTM		
Description			

Defines source value of the **Mains Import P**.

None	The value **Mains Import P** is not measured. The duration of the load transfer in direction Mains to BESS is given exactly by the setpoint **Close Transfer Max Duration**.
Mains CT	The value **Mains Import P** is measured via Mains CT which is located on phase L1. The load transfer in direction Mains to BESS is considered to be finished when the Mains is unloaded under certain level.
Analog Input	The value **Mains Import P** is measured via analog input, accordingly LAI: **MAINS MEASUREMENT P**. The load transfer in direction Mains to BESS is considered to be finished when the Mains is unloaded under certain level.

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Mains Measurement Q

Setpoint group	Process Control	**Related FW**	2.2.0
Range [units]	None / Mains CT / Analog Input [-]		
Default value	None	**Force value**	NO
Step	[-]		
Comm object	10598	**Related applications**	MPTM
Config level	Advanced		
Setpoint visibility	Only if **Application Mode** = MPTM		
Description			

Defines source value of the **Mains Import Q**.

None	The value **Mains Import Q** is not measured. The duration of the load transfer in direction Mains to BESS is given exactly by the setpoint **Close Transfer Max Duration**.
Mains CT	The value **Mains Import Q** is measured via Mains CT which is located on phase L1. The load transfer in direction Mains to BESS is considered to be finished when the Mains is unloaded under certain level.
Analog Input	The value **Mains Import Q** is measured via analog input, accordingly LAI: **MAINS MEASUREMENT Q**. The load transfer in direction Mains to BESS is considered to be finished when the Mains is unloaded under certain level.

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Subgroup: Peak Shaving

Peak Shaving

Setpoint group	Process Control	**Related FW**	2.2.0
Range [units]	Enabled / Disabled [-]		
Default value	Disabled	**Force value**	YES
Step	[-]		
Comm object	11601	**Related applications**	SPTM
Config level	Advanced		
Setpoint visibility	Only if **Application Mode** = MPTM		
Description			

This setpoint enables/disables peak shaving function.

Enabled	The Peak shaving function is active and its behaviour is set by setpoints **Peak Shaving Start Level**, **Peak Shaving Stop Level** and **Peak Shaving Start/Stop Delay**.
Disabled	The Peak shaving function is BLOCKED and the start command can not be activated even the conditions for Peaks Shaving activation were fulfilled.

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Peak Shaving Start Level

Setpoint group	Process Control	**Related FW**	2.2.0
Range [units]	**Peak Shaving Stop Level** .. 32000 [kW] (depends on the selected **Power Formats And Units**)		
Default value	1000 kW (depends on the selected **Power Formats And Units**)	**Force value**	YES
Step	1 kW (depends on the selected **Power Formats And Units**)		
Comm object	8643	**Related applications**	SPTM
Config level	Advanced		
Setpoint visibility	Only if **Application Mode** = MPTM and **Peak Shaving** = Enabled		
Description			
This setpoint starts BESS, when the value of the load consumption **Load P** exceeds the value given by this setpoint for the time of **Peak Shaving Start/Stop Delay**. The BESS is synchronized to the Mains (kept in the parallel to the Mains) and the BESS power is controlled according to the settings in the Groups Process Control and Speed/Load Control. The BESS stays running until the conditions for Peak Shaving run are active. Conditions of deactivation are given by the setpoint **Peak Shaving Stop Level** and **Peak Shaving Start/Stop Delay**.			

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Peak Shaving Stop Level

Setpoint group	Process Control	**Related FW**	2.2.0
Range [units]	0 .. **Peak Shaving Start Level** [kW] (depends on the selected **Power Formats And Units**)		
Default value	900 kW (depends on the selected **Power Formats And Units**)	**Force value**	YES
Step	1 kW (depends on the selected **Power Formats And Units**)		
Comm object	8644	**Related applications**	SPTM
Config level	Advanced		
Setpoint visibility	Only if **Application Mode** = MPTM and **Peak Shaving** = Enabled		
Description			
This setpoint stops BESS, of the load consumption **Load P** decreases under the value given by this setpoint for the time of **Peak Shaving Start/Stop Delay**.			

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Peak Shaving Start/Stop Delay

Setpoint group	Process Control	**Related FW**	2.2.0
Range [units]	0 .. 600 [s]		
Default value	600 s	**Force value**	YES
Step	1 s		
Comm object	9989	**Related applications**	SPTM
Config level	Advanced		
Setpoint visibility	Only if **Application Mode** = MPTM and **Peak Shaving** = Enabled		
Description			

Defines the delay of activation or deactivation of the Peak shaving.

Starts when	The value of the load consumption **Load P** exceeds the value given by the setpoint **Peak Shaving Start Level**.
Stop when	The value of the load consumption **Load P** decreases under the value given by the setpoint **Peak Shaving Stop Level**

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Subgroup: Breaker Control

MCB Logic

Setpoint group	Process Control	**Related FW**	2.2.0
Range [units]	Close-On / Close-Off [-]		
Default value	Close-Off	**Force value**	YES
Step	[-]		
Comm object	8444	**Related applications**	MPTM
Config level	Advanced		
Setpoint visibility	Only if **Application Mode** = MPTM		
Description			

This setpoint adjusts the behavior of LBO **MCB CLOSE/OPEN** and LBI **MCB FEEDBACK**.

Close On	When LBO **MCB CLOSE/OPEN** is closed – LBI **MCB FEEDBACK** should be closed.
Close Off	When LBO **MCB CLOSE/OPEN** is closed – LBI **MCB FEEDBACK** should be opened.

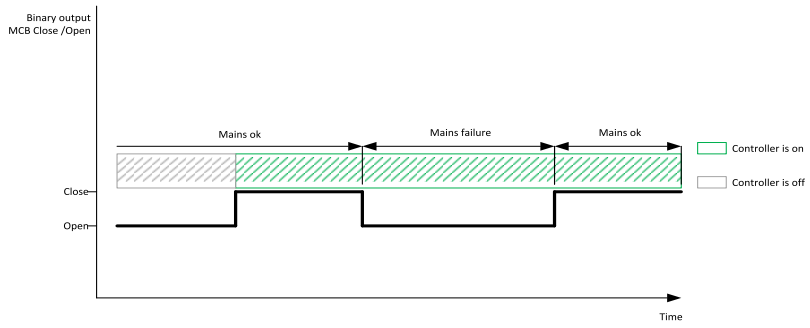

Image 22.1 Close-On

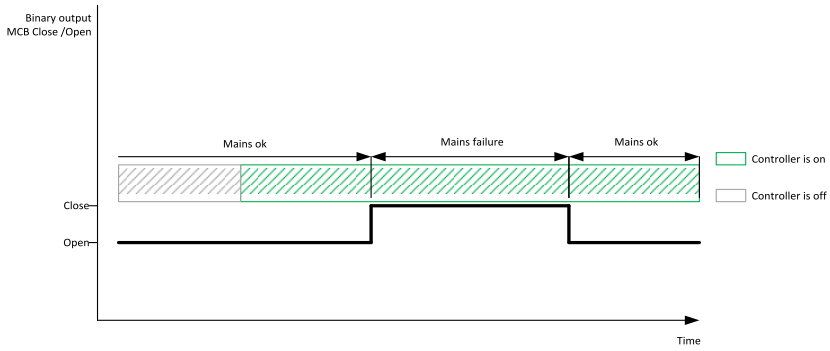

Image 22.2 Close-Off

Note: *LBO **MCB CLOSE/OPEN** as well as this setpoint is used only for contactors.*

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MCB Control Mode

Setpoint group	Process Control	**Related FW**	2.2.0
Range [units]	Internal / External [-]		
Default value	Internal	**Force value**	YES
Step	[-]		
Comm object	9873	**Related applications**	MPTM
Config level	Advanced		
Setpoint visibility	Only if **Application Mode** = MPTM		
Description			

This setpoint adjusts control mode of MCB.

Internal	The MCB breaker is controlled by controller. The controller accepts the opening of MCB from the external device (Mains relay). When the MCB is opened externally then: › The event "MCB opened Externally" is recorded in history log › Controller starts to count down the MCB Close Delay and is going to be closed to the MCB once it elapses. Incorrect reaction of the **MCB FEEDBACK** to internal MCB Close/Open command causes **Wrn MCB Fail**

External	Controller does not control the MCB at all. The MCB is controlled externally, when the **MCB FEEDBACK** gets changed, then the event "MCB Opened" or "MCB Closed" is recorded to the history log. Controller always accepts the **MCB FEEDBACK** without of issuing any alarm. The controller informs the superordinate system about the status of the breaker automaton using the signals › LBO FORWARD SYNCHRONIZATION › LBO REVERSE SYNCHRONIZATION

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BCB Type

Setpoint group	Process Control	**Related FW**	2.2.0
Range [units]	Breaker / Fuse/Disc. [-]		
Default value	Breaker	**Force value**	YES
Step	[-]		
Comm object	18051	**Related applications**	MINT
Config level	Advanced		
Setpoint visibility	Always		
Description			

This setpoint determines what type of BCB is present in the BESS.

Breaker type	There is an electrically controllable contactor or motorized circuit breaker that the controller will operate.
Fuse/Disc type	There is a fuse or manually operated circuit breaker/isolator that the controller will not expect to operate. LBI **BCB Feedback** is expected to be active indicating that the connecting is closed.

> **IMPORTANT: When Fuse/Disc. is selected, Precharge Sequence must be set to Starting Sequence BCB Control = Start with Closed BCB or a configuration warning will be given. Also, forward synchronization will not be possible.**

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BCB Control Mode

Setpoint group	Process Control	**Related FW**	2.2.0
Range [units]	Internal / Follow / External [-]		
Default value	Internal	**Force value**	YES
Step	[-]		
Comm object	11771	**Related applications**	MINT, MPTM
Config level	Advanced		
Setpoint visibility	Always		
Description			

This setpoint adjusts control mode of BCB.

Internal	The breaker is controlled only from controller. Any unexpected change of **BCB FEEDBACK** causes **Stp BCB Fail** immediately. Incorrect reaction of the **BCB FEEDBACK** on internal BCB Close/Open command causes **Stp BCB Fail**
Follow	BCB Openning **BCB FEEDBACK** = 0 is accepted from external devices with history record "BCB Opened Externally". Incorrect reaction of the **BCB FEEDBACK** to internal BCB Close/Open command causes **Stp BCB Fail**
External	Controller does not control the BCB is controlled externally, when the **BCB FEEDBACK** get changed, then the event "BCB Opened" or "BCB Closed" is recorded to the history log. Controller always accept the **BCB FEEDBACK** without of issuing any alarm. When the Sd protection shuts down the BESS, the BCB stays closed. BCB stays closed until it is opened externally. **IMPORTANT: BESS with closed BCB is not blocked against starting.**

IMPORTANT: Anytime when the controller is synchronizing via BCB the External BCB closing is being accepted in all BCB control modes.

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PVCB Control Mode

Setpoint group	Process Control	**Related FW**	2.2.0
Range [units]	Internal / External [-]		
Default value	Internal	**Force value**	YES
Step	[-]		
Comm object	19451	**Related applications**	MPTM
Config level	Advanced		
Setpoint visibility	Only if **Application Mode** = PVCB		
Description			

This setpoint allows you to manage the circuit breaker in your PV system in three different ways: Internal, Follow, and Not Installed.

Internal	The controller takes full control of the PV Circuit Breaker (PVCB), using its built-in settings and logic. It doesn't listen to external commands; it operates by itself.
Follow	The controller still manages the PVCB, just like in "Internal" mode. However, it can also listen to external command for opening the circuit breaker.
Not Installed	The PV Circuit Breaker isn't part of your system. In this case, the controller runs your PV system on its own, as if the PVCB doesn't exist.

Note: *The setpoint can be changed only if the Controller Mode is set to OFF.*

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Delay Between Closing Attempts

Setpoint group	Process Control	**Related FW**	2.2.0
Range [units]	20 .. 60 [s]		
Default value	20 [s]	**Force value**	NO
Step	1 [s]		
Comm object	19883	**Related applications**	MINT, MPTM
Config level	Advanced		
Setpoint visibility	Always		
Description			
This setpoint adjusts the delay between breaker closing attempts the controller performs when a breaker is requested to be closed. Delay is one second longer than you set here due to breakers safety. **Example:** If this setpoint is set to 10 seconds, the delay between another attempt to close the breaker will be 11 seconds.			

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Subgroup: Controller Redundancy

Hot Swap Redundancy

Setpoint group	Process Control	**Related FW**	2.2.0
Range [units]	Disabled / Master / Backup / Master + Modules Redundancy / Backup + Modules Redundancy [-]		
Default value	Disabled	**Force value**	YES
Step	-		
Comm object	16716	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Always		
Description			

This setpoint adjusts behavior of **Hot Swap Redundancy** function.

Disabled	The Hot Swap Redundancy function is disabled.
Master	The controller is expected to be used as Master controller in the hot swap function. One set of CAN modules for a Master-Backup pair is used.
Backup	The controller is expected to be used as Backup controller (redundant controller) in the hot swap function. One set of CAN modules for a Master-Backup pair is used.
Master + Modules Redundancy	The controller is expected to be used as Master controller in the hot swap function. Separate set of CAN modules is used for each controller in a Master-Backup pair.
Backup + Modules Redundancy	The controller is expected to be used as Backup controller (redundant controller) in the hot swap function. Separate set of CAN modules is used for each controller in a Master-Backup pair.

Note: *Hot Swap Redundancy function can be enabled only if you have correct **SW Key**.*

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Subgroup: System Variability

BESS

Setpoint group	Process Control	**Related FW**	2.2.0
Range [units]	Installed / Not Installed		
Default value	Installed	**Force value**	NO
Step	[-]		
Comm object	15918	**Related applications**	MINT, MPTM
Config level	Advanced		
Setpoint visibility	Always		
Description			
This setpoint defines the topology of the Microgrid system. If the BESS is included in the system this setpoint should be set to Installed. The visibility of the setpoints and values related to the BESS is dependent on this setpoint.			

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Universal Genset Address

Setpoint group	Process Control	**Related FW**	2.2.0
Range [units]	Not Installed; 1 .. 64 [-]		
Default value	Not Installed	**Force value**	NO
Step	1		
Comm object	23832	**Related applications**	MINT
Config level	Standard		
Setpoint visibility	Always		
Description			
This Setpoint has to be set to the specific address. The Universal Gensets will be then represented across the whole system as a genset with this address. It is recommended to set the Address as CAN Address of InteliNeo + 1. The default settings 0 = Not Installed means that the Universal Genset Support Function is not in use. The InteliNeo actually creates the virtual genset inside the system. The information about this virtual genset can be observed in all genset related information inside the system like CAN 16, CAN32, GL 16, GL 32, Reg 16, Reg 32 Values. Universal genset is always located in the same control group as InteliNeo which integrates it into the system.			

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PV Address

Setpoint group	Process Control	**Related FW**	2.2.0
Range [units]	Not Installed / 1 .. 64		
Default value	Not Installed	**Force value**	NO
Step	[-]		
Comm object	23831	**Related applications**	MINT, MPTM
Config level	Advanced		
Setpoint visibility	Always		
Description			
This setpoint determines which is the CAN addres on the CAN intercontroller line under which the PV integrated by one specific InteliNeo is represented. The settings uses the full range of the CAN controller adresses. The addres has to be uniqe over all the system (over all CAN line). The "0 = Not Installled" setttings then determines that the PV is not integrated in the systm by this InteliNeo. All the refferences, about the PV settings and values as like as the PV drawings in the SLD on all HMI terminals are hidden.			

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WT Address

Setpoint group	Process Control	**Related FW**	2.2.0
Range [units]	Not Installed / 1 .. 64		
Default value	Not Installed	**Force value**	NO
Step	[-]		
Comm object	23830	**Related applications**	MINT, MPTM
Config level	Advanced		
Setpoint visibility	Always		
Description			
This setpoint determines which is the CAN address on the CAN intercontroller line under which the WT (Wind Turbine) integrated by one specific InteliNeo is represented. The settings use the full range of the CAN controller addresses. The address has to be unique over all the system (over all CAN line). The “0 = Not Installed” setting then determines that the WT is not integrated into the system by this InteliNeo. All the references about the WT settings and values, as well as the WT drawings in the SLD on all HMI terminals, are hidden.			

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Subgroup: Bus Meas Error Protection

Bus Meas Error Delay

Setpoint group	Process Control	**Related FW**	2.2.0
Range [units]	20 .. 60 [s]		
Default value	20	**Force value**	YES
Step	[1]		
Comm object	19001	**Related applications**	MINT
Config level	Standard		
Setpoint visibility	Always		
Description			
This setpoint determines the timeout of the **Bus Meas Error** protection.			

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Group: Basic settings

Subgroup: Name

Controller Name

Setpoint group	Basic settings	**Related FW**	2.2.0
Range [units]	0 .. 15 characters [-]		
Default value	InteliNeo6000	**Force value**	NO
Step	[-]		
Comm object	8637	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Always		
Description			
User defined name, used for the controller identification at remote phone or mobile connection. Controller Name is maximally 15 characters long and can be entered using InteliConfig or from controller's configuration menu.			

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Subgroup: Power settings

Samax

Setpoint group	Basic settings	**Related FW**	2.2.0
Range [units]	OFF; 0 .. 32000 [kVA] (depends on the selected **Power Formats And Units**)		
Default value	200 kVA (depends on the selected **Power Formats And Units**)	**Force value**	YES
Step	1 kVA (depends on the selected **Power Formats And Units**)		
Comm object	13208	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Always		
Description			
Maximal apparent power of the BESS.			

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Nominal power

Setpoint group	Basic settings	**Related FW**	2.2.0
Range [units]	1 .. 32 000 [kW] (depends on the selected **Power Formats And Units**)		
Default value	200 kW (depends on the selected **Power Formats And Units**)	**Force value**	YES
Step	1 kW (depends on the selected **Power Formats And Units**)		
Comm object	8276	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Always		
Description			
Nominal power of the BESS. BESS protections/functions such as **IDMT Overload Protection** and **2POverload Start Evaluation Level**, etc are related to this setpoint.			

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Installed Power

Setpoint group	Basic settings	**Related FW**	2.2.0
Range [units]	OFF; 1 .. **Nominal power** [kW] (depends on the selected **Power Formats And Units**)		
Default value	OFF	**Force value**	Yes
Step	1 [kW] (depends on the selected **Power Formats And Units**)		
Comm object	16183	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Always		
Description			
This setpoint adjusts the maximum power agreed for parallel to mains mode i.e. **Breaker state** = ParalOper/MultParOp. This setpoint influences: › **Load Shedding** › **BESS Unload BCB Open Level** › **Grid Codes**			

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Subgroup: AC BESS Measurement

BESS AC Measurement

Setpoint group	Basic settings	**Related FW**	2.2.0
Range [units]	Measured by CT/VT / CT Analog Inputs/ CT/VT Analog Inputs [-]		
Default value	Measured by CT/VT	**Force value**	NO
Step	[-]		
Comm object	19136	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Always		
Description			

This setpoint is related to the function of **BESS AC values measurement over modbus**.More information can be read in **BESS AC values measured over LAIs**

The setpoint has these options:

Measured by CT/VT	All AC values are measured in the standard way, and none of the LAIs listed below are configured.
CT Analog Inputs	BESS Current L1/L2/L3, BESS P, BESS Q, BESS Power Factor are measured or calculated not via CTs but via LAIs.
CT/VT Analog Inputs	BESS Current L1/L2/L3, BESS Voltage L1/L2/L3, BESS P, BESS Q, BESS S, BESS Power Factor are measured or calculated not via CTs but via LAIs.

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Subgroup: Current settings

Nominal Current

Setpoint group	Basic settings	**Related FW**	2.2.0
Range [units]	1 .. 10000 [A]		
Default value	350A	**Force value**	YES
Step	1 A		
Comm object	8275	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Always		
Description			

Current limit for BESS current protections and maximal continuous BESS current. Nominal current can be different from mains rated current value.

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BESS CT Ratio Prim

Setpoint group	Basic settings	**Related FW**	2.2.0
Range [units]	1 .. 15000 [A]		
Default value	500A	**Force value**	NO
Step	1 A		
Comm object	8274	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Always		
Description			

This setpoint defines the primary range of the current transformer used for the BESS current measurement.

Note: *The setpoint is applied on all three phases of the BESS current.*

Note: *The CT is usually described by this definition:* ***CT Ratio Prim / CT Ratio Sec****: Example: 100/5, 500/5, 1000/1*

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BESS CT Ratio Sec

Setpoint group	Basic settings	**Related FW**	2.2.0
Range [units]	/5A or /1A [-]		
Default value	/5A	**Force value**	NO
Step	[-]		
Comm object	10556	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Always		
Description			

This setpoint defines the secondary range of the current transformer used for the BESS current measurement.

Note: *This setpoint is applied on all three phases of the BESS current.*

Note: *The CT is usually described by this definition:* ***CT Ratio Prim / CT Ratio Sec****: Example: 100/5, 500/5, 1000/1*

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Mains/Bus CT Ratio Prim / EFC

Setpoint group	Basic settings	**Related FW**	2.2.0
Range [units]	1 .. 15000 [A]		
Default value	300 A	**Force value**	YES
Step	1 A		
Comm object	8566	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Always		
Description			

This setpoint is used for settings of primary CT ratio of **Mains L1 Current** measurement, which is used for **Mains Import P** calculation for needs of Soft Unload function.

> **IMPORTANT: L1 Mains current must be measured otherwise the power will be calculated wrongly.**

Note: *The CT is usually described by this definition:* ***CT Ratio Prim / CT Ratio Sec****: Example: 100/5, 500/5, 1000/1*

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Mains/Bus CT Ratio Sec / EFC

Setpoint group	Basic settings	**Related FW**	2.2.0
Range [units]	/1A or /5A [-]		
Default value	/5A	**Force value**	YES
Step	[-]		
Comm object	10557	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Always		
Description			

This setpoint is used for settings of secondary CT ratio of **Mains L1 Current** measurement, which is used for **Mains Import P** calculation for needs of Soft Unload function.

> **IMPORTANT: L1 Mains current must be measured otherwise the power will be calculated wrongly.**

Note: *The CT is usually described by this definition:* ***CT Ratio Prim / CT Ratio Sec****: Example: 100/5, 500/5, 1000/1*

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3Ph CT Location

Setpoint group	Basic settings	**Related FW**	2.2.0
Range [units]	BESS/Mains		
Default value	BESS	**Force value**	YES

Step	[-]		
Comm object	11625	**Related applications**	MPTM
Config level	Advanced		
Setpoint visibility	Always		
Description			

This setpoint is used to switch the 3 phase measurement point to be on Mains or BESS side. If measurement is on the Mains Import three phases then the BESS Power is measured by 4th CT (AUX) where the value is multiplied by 3. Online changing of this setpoint always causes the alarm **Wrn Controller Restart Required**. Controller must go over initialization sequence to apply this change.

Note: *The controller has to be power cycled after changing this setpoint.*

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Subgroup: Voltage settings

Connection type

Setpoint group	Basic settings	**Related FW**	2.2.0
Range [units]	3ph4Wire / High Leg D / 3ph3Wire / SplitPhase / MonoPhase [-]		
Default value	3Ph4Wire [-]	**Force value**	NO
Step	[-]		
Comm object	11628	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Always		
Description			

This setpoint defines connection type of the installation.

3Ph4Wire	Grounded Star (Grounded Wye) connection – 3PY Three phase voltage measurement L1,L2,L3 with 120° phase shift 3x CT (Current Transformer)
High Leg D	High Leg Delta connection Three phase voltage measurement L1,L2,L3 3x CT (Current Transformer)
3Ph3Wire	Ungrounded Delta connection Open Delta Ungrounded Wye Corner-Grounded Delta Split Phase Delta Three phase voltage measurement L1,L2,L3 with 120° phase shift No neutral is available 3x CT (Current Transformer)
SplitPhase	Double Delta connection Split Phase Two phase voltage measurement L1,L3 with 180° phase shift

	2x CT (Current Transformer)
Mono Phase	Single phase voltage measurement L1-N 1x CT (Current Transformer)

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Evaluated Voltage Protections

Setpoint group	Basic settings	**Related FW**	2.2.0
Range [units]	Both / Phase-Phase / Phase-Neutral [-]		
Default value	Both [-]	**Force value**	NO
Step	[-]		
Comm object	10647	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Only in case Setpoint **Connection type** is set to 3Ph4Wire / High Leg D / SplitPhase		
Description			

This setpoint defines which voltage protections are evaluated.

> **Example: Connection type** is 3Ph4Wire and **Evaluated Voltage Protections** is set to Phase-Phase, the voltage protections will be evaluated only from Phase-Phase voltage, does not matter what is the Phase-Neutral voltage.

> **IMPORTANT: Controller Mode has to be OFF, otherwise Evaluated Voltage Protections can not be changed and the failure dialog window is issued.**

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BESS Nominal Voltage Ph-N

Setpoint group	Basic settings	**Related FW**	2.2.0
Range [units]	10 .. 34641 [V]		
Default value	231 V	**Force value**	YES
Step	1 V		
Comm object	8277	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Only if**Connection type** != High Leg D or **Connection type** != MonoPhase		
Description			

Nominal BESS voltage (phase to neutral).

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BESS Nominal Voltage Ph-Ph

Setpoint group	Basic settings	**Related FW**	2.2.0
Range [units]	10 .. 60000 [V]		
Default value	400 V	**Force value**	YES
Step	1 V		
Comm object	11657	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Always		
Description			
Nominal BESS voltage (phase to phase).			

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Mains/Bus Nominal Voltage Ph-N

Setpoint group	Basic settings	**Related FW**	2.2.0
Range [units]	10 .. 34641 [V]		
Default value	231 V	**Force value**	YES
Step	1 V		
Comm object	9888	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Only if**Connection type** != High Leg D or **Connection type** != MonoPhase		
Description			
Nominal Mains/Bus voltage (phase to neutral).			

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Mains/Bus Nominal Voltage Ph-Ph

Setpoint group	Basic settings	**Related FW**	2.2.0
Range [units]	10 .. 60000 [V]		
Default value	400 V	**Force value**	YES
Step	1 V		
Comm object	9907	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Always		
Description			
Nominal Mains/Bus voltage (phase to phase).			

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BESS VT Ratio

Setpoint group	Basic settings	**Related FW**	2.2.0
Range [units]	0.001 .. 6000.000 [V/V]		

Default value	1.000 V/V	**Force value**	NO
Step	0.001 V/V		
Comm object	20281	**Related applications**	MINT, MPTM
Config level	Advanced		
Setpoint visibility	Always		
Description			

This setpoint adjusts the converting ratio of the voltage meas transformer used on ① **BESS VOLTAGE**

Note: *This setpoint is applied on all three phases of BESS voltage.*

Example:

- No VT is in use - voltage conversion is 1/1
  BESS VT Ratio = 1.000
- VT 22kV/100V - voltage conversion is 22000/100
  BESS VT Ratio = 220.000
- VT 3.3kV/110V - voltage conversion is 3300/110
  BESS VT Ratio = 30.000

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BESS Voltage Input Range Select

Setpoint group	Basic settings	**Related FW**	2.2.0
Range [units]	200V / 400V / 600V [-]		
Default value	400 V	**Force value**	YES
Step	[-]		
Comm object	10662	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Always		
Description			

This setpoint adjusts the range of Ph-Ph **AC Voltage measurement settings** on the ① **BESS VOLTAGE** .

Note: *It is possible to accurately measure Ph-Ph voltage which is maximally 25 % above the selected range. So the maximal accurately measured voltage for the controller is 433 V Ph-N / 750 V Ph-Ph with the selected range 600 V.*

Note: *If MonoPhase wiring is used the ranges are approximately corresponding to 116 V, 231 V, and 346 V Ph-N.*

IMPORTANT: The range has to be set to fit the expected range of the AC voltage.

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Mains/Bus VT Ratio

Setpoint group	Basic settings	**Related FW**	2.2.0
Range [units]	0.001 .. 6000.000 [V/V]		

Default value	1.000 V/V	**Force value**	NO
Step	0.001 V/V		
Comm object	20282	**Related applications**	MINT, MPTM
Config level	Advanced		
Setpoint visibility	Always		
Description			

This setpoint adjusts the converting ratio of the voltage meas transformer used on ② **MAINS/BUS VOLTAGE**

Note: *This setpoint is applied on all three phases of Mains/Bus voltage.*

Example:

- No VT is in use - voltage conversion is 1/1
  Bus VT Ratio = 1.000
- VT 22kV/100V - voltage conversion is 22000/100
  Bus VT Ratio = 220.000
- VT 3.3kV/110V - voltage conversion is 3300/110
  Bus VT Ratio = 30.000

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Mains/Bus Voltage Input Range

Setpoint group	Basic settings	**Related FW**	2.2.0
Range [units]	200V / 400V / 600V [-]		
Default value	400 V	**Force value**	YES
Step	[-]		
Comm object	10663	**Related applications**	MINT, MPTM
Config level	Advanced		
Setpoint visibility	Always		
Description			

This setpoint adjusts the range of Ph-Ph **AC Voltage measurement settings** on the ② **MAINS/BUS VOLTAGE**.

Note: *It is possible to accurately measure Ph-Ph voltage which is maximally 25 % above the selected range. So, the maximal accurately measured voltage for the controller is 433 V Ph-N / 750 V Ph-Ph with the selected range 600 V.*

Note: *If MonoPhase wiring is used the ranges are approximately corresponding to 116 V, 231 V, and 346 V Ph-N.*

IMPORTANT: The range has to be set to fit the expected range of the AC voltage.

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Bus Dead Level

Setpoint group	Basic settings	**Related FW**	2.2.0

Range [units]	0.0 .. 13.0 [%] of **Mains/Bus Nominal Voltage Ph-N** and **Mains/Bus Nominal Voltage Ph-Ph**		
Default value	6.5 % of **Mains/Bus Nominal Voltage Ph-N** and **Mains/Bus Nominal Voltage Ph-Ph**	**Force value**	NO
Step	0.1 % of **Mains/Bus Nominal Voltage Ph-N** and **Mains/Bus Nominal Voltage Ph-Ph**		
Comm object	14473	**Related applications**	MINT, MPTM
Config level	Advanced		
Setpoint visibility	Always		
Description			
This setpoint defines the percentage voltage level below which is Bus considered as dead.			

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Subgroup: Phase Rotation

Phase Rotation

Setpoint group	Basic settings	**Related FW**	2.2.0
Range [units]	Clockwise / Counterclockwise [-]		
Default value	Clockwise	**Force value**	YES
Step	[-]		
Comm object	15122	**Related applications**	MINT, MPTM
Config level	Advanced		
Setpoint visibility	Always		
Description			
This setpoint adjust the phase sequence of voltage terminals.			

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Subgroup: Frequency settings

Nominal Frequency

Setpoint group	Basic settings	**Related FW**	2.2.0
Range [units]	45.00 .. 65.00 [Hz]		
Default value	50,00 Hz	**Force value**	YES
Step	0.01 Hz		
Comm object	8278	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Always		
Description			
Nominal frequency of system (usually 50 or 60 Hz). **IMPORTANT: While BESS is running, this setpoint can be changed only inside currently selected range. The ranges are 45-54 Hz and 55-65 Hz.**			

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Subgroup: Controller settings

Controller Mode

Setpoint group	Basic settings	**Related FW**	2.2.0
Range [units]	OFF / MAN / AUTO [-]		
Default value	OFF	**Force value**	NO
Step	[-]		
Comm object	8315	**Related applications**	MINT, MPTM
Config level	Advanced		
Setpoint visibility	Always		
Description			
This setpoint can be used for changing the controller's mode remotely, e.g. via Modbus. **InteliConfig**: Use the mode selector on the main screen for changing the mode from the front panel. **Display**: Use mode selector by pressing (Right arrow) and (Left arrow). Confirm it by pressing (enter).			

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Power On Mode

Setpoint group	Basic settings	**Related FW**	2.2.0
Range [units]	Previous / OFF [-]		
Default value	Previous	**Force value**	NO
Step	[-]		
Comm object	13000	**Related applications**	MINT, MPTM
Config level	Advanced		
Setpoint visibility	Always		
Description			

This setpoint adjusts controller mode after power on of controller.

Previous	Controller is switched into the last mode before power off.
OFF	Controller is switched into OFF mode.

Note: *Remote modes - In case that some LBI remote mode is activated during power on of controller than this LBI has higher priority than this setpoint - controller mode is forced into mode selected via LBI. After deactivation of LBI, controller is switched into value selected via setpoint Power On Mode*

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Fault Reset To Manual

Setpoint group	Basic settings	**Related FW**	2.2.0
Range [units]	Disabled / Enabled [-]		
Default value	Disabled	**Force value**	YES
Step	[-]		
Comm object	9983	**Related applications**	MINT, MPTM
Config level	Advanced		
Setpoint visibility	Always		
Description			

If this function is enabled, the controller will switch automatically to MAN mode when there is a red alarm in the alarm list and fault reset button is pressed. This is a safety function that prevents the BESS starting again automatically in specific cases when fault reset button is pressed.

> **Example:** Controller is in AUTO mode, there is red inactive unconfirmed alarm, and fault reset button is pressed. The BESS will start automatically if LBI **Universal Genset Start/Stop** is active.

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Horn Timeout

Setpoint group	Basic settings	**Related FW**	2.2.0
Range [units]	Disabled = 0; 1 .. 600; Horn Reset [s]		
Default value	10 s	**Force value**	NO
Step	1 s		
Comm object	8264	**Related applications**	MINT, MPTM
Config level	Advanced		
Setpoint visibility	Always		
Description			

This setpoint affects horn's behavior.

Disabled	Horn sound is disabled e.g. LBO **HORN** is never activated
1 .. 600 [s]	Timeout for LBO **HORN**. Output opens after this time elapses
Horn Reset	LBO **HORN** is active until button Horn Reset is pressed.

Note: *Horn timeout starts again from the beginning if any new alarm appears before previous Horn timeout has elapsed.*

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Fail Safe Binary State

Setpoint group	Basic settings	**Related FW**	2.2.0
Range [units]	Log0 / Log1 / Last Valid State [-]		
Default value	Last Valid State	**Force value**	YES
Step	[-]		
Comm object	21215	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Always		
Description			

This setpoint adjusts behavior of all binary inputs while the received value is invalid (communication lost). Changes of the setpoint will not be applied on peripherals which are already in fail safe binary state.

Log0	The value is logical zero.
Log1	The value is logical one.
Last Valid State	The value is replaced by last valid state.

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Run Hours Source

Setpoint group	Basic settings	**Related FW**	2.2.0
Range [units]	AUTO / ECU / INTERNAL [-]		
Default value	AUTO	**Force value**	YES
Step	[-]		
Comm object	13345	**Related applications**	MINT, MPTM
Config level	Advanced		
Setpoint visibility	Always		
Description			

This setpoint adjusts source for **Running Hours**.

AUTO	Source is selected automatically between INTERNAL and ECU. ECU source is prioritized.
ECU	Source is forced to be always ECU. ECU provides **Running Hours**.
INTERNAL	Source is forced to be always INTERNAL. Controller provides **Running Hours**.

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SW Key

Setpoint group	Basic settings	**Related FW**	2.2.0
Range [units]	31 characters [-]		
Default value	AUTO	**Force value**	NO
Step	[-]		
Comm object	24258	**Related applications**	MINT, MPTM
Config level	Advanced		
Setpoint visibility	Always		
Description			

This setpoint is designed for SW Key which unlocks premium features.

Note: *The controller has to be power cycled after inserting the SW Key.*

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User Logging Record

Setpoint group	Basic settings	**Related FW**	2.2.0
Range [units]	Enabled / Disabled		
Default value	Enabled	**Force value**	NO
Step	[-]		
Comm object	23885	**Related applications**	MINT, MPTM
Config level	Basic		
Setpoint visibility	Always		
Description			
This setpoint enables recording of user login in/out to the controller history. **Example:** The fallowing records will be shown in the history if enabled: User with user index (0) loegged in via ETH.			

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Force Value Logging

Setpoint group	Basic settings	**Related FW**	2.2.0
Range [units]	Enabled/Disabled		
Default value	Enabled	**Force value**	NO
Step	-		
Comm object	18724	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Always		
Description			
This setpoint enables recording of forced values into the controller's history.			

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System Use Notification Text

Setpoint group	Basic settings	**Related FW**	2.2.0
Range [units]	31 characters [-]		
Default value	AUTO	**Force value**	NO
Step	[-]		
Comm object	23810	**Related applications**	MINT, MPTM
Config level	Advanced		
Setpoint visibility	Always		
Description			
This setpoint is adjusts text which is visible during login in InteliConfig. When this setpoint is empty, no additional text is displayed. **Example:** Authorize person only, etc.			

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Fuel Genset Consumption

Setpoint group	Basic settings	**Related FW**	2.2.0
Range [units]	0,0 .. 10 000,0 g/kWh		
Default value	237,3 [g/kWh]	**Force value**	
Step	0,1 [g/kWh]		
Comm object	19895	**Related applications**	MINT, MPTM
Config level	Advanced		
Setpoint visibility	Always		
Description			
Fuel consumed by the Gen-set per 1 kWh.			

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Subgroup: Power Supply Protection

Battery Undervoltage

Setpoint group	BESS settings	**Related FW**	2.2.0
Range [units]	8.0 V .. **Battery Overvoltage** [V]		
Default value	18.0 V	**Force value**	NO
Step	0.1 V		
Comm object	8387	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Always		
Description			
Warning threshold for low battery/power supply voltage.			

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Battery Overvoltage

Setpoint group	BESS settings	**Related FW**	2.2.0
Range [units]	**Battery Undervoltage** .. 40.0 [V]		
Default value	36.0 V	**Force value**	NO
Step	0.1 V		
Comm object	9587	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Always		
Description			
Warning threshold for high battery/power supply voltage.			

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Battery <> Voltage Delay

Setpoint group	BESS settings	**Related FW**	2.2.0
Range [units]	0 .. 600 [s]		
Default value	5 s	**Force value**	NO
Step	1 s		
Comm object	8383	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Always		
Description			
Delay for which battery/power supply voltage can be out of range given by setpoints **Battery Undervoltage** and **Battery Overvoltage**. After this delay elapses, appropriate alarm (**Wrn Battery Undervoltage** or **Wrn Battery Overvoltage**) is activated.			

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Subgroup: Pulse counters

Conversion Coeff. Fast Pulse 1

Setpoint group	BESS settings	**Related FW**	2.2.0
Range [units]	OFF / 0 .. 65000 [-]		
Default value	OFF	**Force value**	YES
Step	1 [-]		
Comm object	20307	**Related applications**	MINT, MPTM
Config level	Advanced		
Setpoint visibility	Always		
Description			
This setpoint adjusts the rate of increasing of the **Fast Pulse Counter 1** which is physically configured to binary input 9. Set this setpoint to OFF to turn the function off. See the chapter **Pulse Counters** for more information.			

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Conversion Coeff. Fast Pulse 2

Setpoint group	BESS settings	**Related FW**	2.2.0
Range [units]	OFF / 0 .. 65000 [-]		
Default value	OFF	**Force value**	YES
Step	1 [-]		
Comm object	20308	**Related applications**	MINT, MPTM
Config level	Advanced		
Setpoint visibility	Always		
Description			
This setpoint adjusts the rate of increasing of the **Fast Pulse Counter 2** which is physically configured to binary input 10. Set this setpoint to OFF to turn the function off. See the chapter **Pulse Counters** for more information.			

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Conversion Coefficient Pulse 1

Setpoint group	BESS settings	**Related FW**	2.2.0
Range [units]	OFF / 0 .. 65000 [-]		
Default value	OFF	**Force value**	NO
Step	1 [-]		
Comm object	10994	**Related applications**	MINT, MPTM
Config level	Advanced		
Setpoint visibility	Always		
Description			
This setpoint adjusts the rate of increasing of the "slow" **Pulse Counter 1** which is connected with LBI **PULSE COUNTER 1**. Set this setpoint to OFF to turn the function off. See the chapter **Pulse Counters** for more information.			

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Conversion Coefficient Pulse 2

Setpoint group	BESS settings	**Related FW**	2.2.0
Range [units]	OFF / 0 .. 65000 [-]		
Default value	OFF	**Force value**	NO
Step	1 [-]		
Comm object	10995	**Related applications**	MINT, MPTM
Config level	Advanced		
Setpoint visibility	Always		
Description			
This setpoint adjusts the rate of increasing of the "slow" **Pulse Counter 2** which is connected with LBI **PULSE COUNTER 2**. Set this setpoint to OFF to turn the function off. See the chapter **Pulse Counters** for more information.			

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Subgroup: Shared Setpoints

#SUS Min Power 1

Setpoint group	Basic settings	**Related FW**	2.2.0
Range [units]	1 .. 65000 [kW]		
Default value	100 kW	**Force value**	NO
Step	1 kW		
Comm object	14013	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Only if **SUS Sequence** = Enabled		
Description			

> **IMPORTANT: This is the shared setpoint which does not have any function in this controller, but it is shared across all controllers via Intercontroller Communication line and have a function in Neo controllers.**

This setpoint indicates required minimal **Nominal power** of gen-sets needed to activate the LBO **Ready To Excite**.

Every Gen-set in SUS sequency which activates LBO **Ready To Excite** is counted. When sum of **Nominal power** of these Gen-sets achieves this condition, rest of Gen-sets (without of activated LBO **Ready To Excite** are switched to STANDARD sequence (GCBs are opened) and Gen-sets with active LBO **Ready To Excite** are excited.

If this condition is not met, and on the bus all Gen-sets have LBO **Ready To Excite** activated, timer **#SUS Excitation Delay** is started. After it expires, all Gen-sets with active LBO **Ready To Excite** are excited.

> ***Note:*** *This setpoint is considered only if LBI **SUS Min Power 2** and LBI **SUS Min Power 3** are either not configured or opened.*

> **IMPORTANT: This setpoint is shared via Intercontroller Communication line. Change of this setpoint will be reflected in all controllers on site.**

> **IMPORTANT: Be careful when importing archives into controller connected to the site, shared #setpoints are overwritten like standard setpoints. If archive with default values in shared #setpoints is imported, all controllers on site will switch their #setpoints into default values.**

> **IMPORTANT: When new controller is connected to the site, it will automatically overtake shared #setpoints values from other controllers on site. For the correct sharing of shared #setpoints, firstly turn off the controller, connect it to the Intercontroller Communication line, and then turn it on.**

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#SUS Min Power 2

Setpoint group	Basic settings	**Related FW**	2.2.0
Range [units]	1 .. 65000 [kW]		
Default value	100 kW	**Force value**	NO
Step	1 kW		
Comm object	16414	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Only if **SUS Sequence** = Enabled		
Description			

> **IMPORTANT: This is the shared setpoint which does not have any function in this controller, but it is shared across all controllers via Intercontroller Communication line and have a function in Neo controllers.**

This setpoint indicates required minimal **Nominal power** of gen-sets needed to activate the LBO **Ready To Excite**.

Every Gen-set in SUS sequency which activates LBO **Ready To Excite** is counted. When sum of **Nominal power** of these Gen-sets achieves this condition, rest of Gen-sets (without of activated LBO **Ready To Excite** are switched to STANDARD sequence (GCBs are opened) and Gen-sets with active LBO **Ready To Excite** are excited.

If this condition is not met, and on the bus all Gen-sets have LBO **Ready To Excite** activated, timer **#SUS Excitation Delay** is started. After it expires, all Gen-sets with active LBO **Ready To Excite** are excited.

> ***Note:*** *This setpoint is considered only if LBI **SUS Min Power 2** and LBI **SUS Min Power 3** are either not configured or opened.*

> **IMPORTANT: This setpoint is shared via Intercontroller Communication line. Change of this setpoint will be reflected in all controllers on site.**

> **IMPORTANT: Be careful when importing archives into controller connected to the site, shared #setpoints are overwritten like standard setpoints. If archive with default values in shared #setpoints is imported, all controllers on site will switch their #setpoints into default values.**

> **IMPORTANT: When new controller is connected to the site, it will automatically overtake shared #setpoints values from other controllers on site. For the correct sharing of shared #setpoints, firstly turn off the controller, connect it to the Intercontroller Communication line, and then turn it on.**

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#SUS Min Power 3

Setpoint group	Basic settings	**Related FW**	2.2.0
Range [units]	1 .. 65000 [kW]		
Default value	100 kW	**Force value**	NO
Step	1 kW		
Comm object	16415	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Only if **SUS Sequence** = Enabled		
Description			

> **IMPORTANT: This is the shared setpoint which does not have any function in this controller, but it is shared across all controllers via Intercontroller Communication line and have a function in Neo controllers.**

This setpoint indicates required minimal **Nominal power** of gen-sets needed to activate the LBO **Ready To Excite**.

Every Gen-set in SUS sequency which activates LBO **Ready To Excite** is counted. When sum of **Nominal power** of these Gen-sets achieves this condition, rest of Gen-sets (without of activated LBO **Ready To Excite** are switched to STANDARD sequence (GCBs are opened) and Gen-sets with active LBO **Ready To Excite** are excited.

If this condition is not met, and on the bus all Gen-sets have LBO **Ready To Excite** activated, timer **#SUS Excitation Delay** is started. After it expires, all Gen-sets with active LBO **Ready To Excite** are excited.

> ***Note:*** *This setpoint is considered only if LBI* ***SUS Min Power 2*** *and LBI* ***SUS Min Power 3*** *are either not configured or opened.*

> **IMPORTANT: This setpoint is shared via Intercontroller Communication line. Change of this setpoint will be reflected in all controllers on site.**

> **IMPORTANT: Be careful when importing archives into controller connected to the site, shared #setpoints are overwritten like standard setpoints. If archive with default values in shared #setpoints is imported, all controllers on site will switch their #setpoints into default values.**

> **IMPORTANT: When new controller is connected to the site, it will automatically overtake shared #setpoints values from other controllers on site. For the correct sharing of shared #setpoints, firstly turn off the controller, connect it to the Intercontroller Communication line, and then turn it on.**

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#SUS Excitation Delay

Setpoint group	Basic settings	**Related FW**	2.2.0
Range [units]	0 .. 600 [s] / No Timeout		
Default value	10 s	**Force value**	NO
Step	1 s		
Comm object	14104	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Only if **SUS Sequence** = Enabled		
Description			

> **IMPORTANT: This is the shared setpoint which does not have any function in this controller, but it is shared across all controllers via Intercontroller Communication line and have a function in Gen-set controllers.**

This setpoint adjusts the delay before excitation which starts to be counted down after all active Gen-sets RPM reach the SUS RPM Window or SUS RPM Window Time Out elapses.

> **IMPORTANT: This setpoint is shared via Intercontroller Communication line. Change of this setpoint will be reflected in all controllers on site.**

> **IMPORTANT: Be careful when importing archives into controller connected to the site, shared #setpoints are overwritten like standard setpoints. If archive with default values in shared #setpoints is imported, all controllers on site will switch their #setpoints into default values.**

> **IMPORTANT: When new controller is connected to the site, it will automatically overtake shared #setpoints values from other controllers on site. For the correct sharing of shared #setpoints, firstly turn off the controller, connect it to the Intercontroller Communication line, and then turn it on.**

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#Emergency Droop On Delay

Setpoint group	Basic settings	**Related FW**	2.2.0
Range [units]	0,0 .. 10,0 [s]		
Default value	10,0 s	**Force value**	NO
Step	0,1 s		
Comm object	13954	**Related applications**	MINT
Config level	Advanced		
Setpoint visibility	Only if **Load/Var Sharing Regulation Type** = Emrg Droop		
Description			

> **IMPORTANT: This is the shared setpoint which does not have any function in this controller, but it is shared across all controllers via Intercontroller Communication line and have a function in Gen-set controllers.**

This setpoint adjusts the delay for switching from isonchronous regulation to droop regulation.

When number of controllers detected by the controller on **CAN2A** / **CAN2B** is lower than the number in the setpoint **#Number Of Units On CAN2**.

Note: *This function is available only if* ***Load/Var Sharing Regulation Type*** *= Emrg Droop*

> **IMPORTANT: This setpoint is shared via Intercontroller Communication line. Change of this setpoint will be reflected in all controllers on site.**

> **IMPORTANT: Be careful when importing archives into controller connected to the site, shared #setpoints are overwritten like standard setpoints. If archive with default values in shared #setpoints is imported, all controllers on site will switch their #setpoints into default values.**

> **IMPORTANT: When new controller is connected to the site, it will automatically overtake shared #setpoints values from other controllers on site. For the correct sharing of shared #setpoints, firstly turn off the controller, connect it to the Intercontroller Communication line, and then turn it on.**

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#Emergency Droop Off Delay

Setpoint group	Basic settings	**Related FW**	2.2.0
Range [units]	0,0 .. 10,0 [s]		
Default value	10,0 s	**Force value**	NO
Step	0,1 s		
Comm object	13955	**Related applications**	MINT
Config level	Advanced		
Setpoint visibility	Only if **Load/Var Sharing Regulation Type** = Emrg Droop		
Description			

> **IMPORTANT: This is the shared setpoint which does not have any function in this controller, but it is shared across all controllers via Intercontroller Communication line and have a function in Gen-set controllers.**

This setpoint adjusts the delay for switching from droop regulation to isonchronous regulation.

When number of controllers detected by the controller on **CAN2A** / **CAN2B** is lower than the number in the setpoint **#Number Of Units On CAN2**.

Note: *This function is available only if* ***Load/Var Sharing Regulation Type*** *= Emrg Droop*

> **IMPORTANT: This setpoint is shared via Intercontroller Communication line. Change of this setpoint will be reflected in all controllers on site.**

> **IMPORTANT: Be careful when importing archives into controller connected to the site, shared #setpoints are overwritten like standard setpoints. If archive with default values in shared #setpoints is imported, all controllers on site will switch their #setpoints into default values.**

> **IMPORTANT: When new controller is connected to the site, it will automatically overtake shared #setpoints values from other controllers on site. For the correct sharing of shared #setpoints, firstly turn off the controller, connect it to the Intercontroller Communication line, and then turn it on.**

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Group: Communication Settings

Subgroup: Controller Address

CAN Controller Address

Setpoint group	Communication Settings	**Related FW**	2.2.0
Range [units]	1 .. 64 [-]		
Default value	1 [-]	**Force value**	NO
Step	1 [-]		
Comm object	23999	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Always		
Description			

This setpoint adjusts Controller's CAN Address which is used for **CAN Intercontroller Communication**.

This type of communication is used to share information between other ComAp controllers via CAN interface (**Communication peripherals**).

> ***Note:*** *Each controller connected via CAN has to have unique address, i.e. maximally 64 controllers can be connected together.*

> ***Note:*** *There is an exception, if the function **Hot Swap Redundancy** is used, the Master and Backup controllers has to have same address because they act like one controller unit for the rest of the site.*

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Universal Genset Address

Setpoint group	Process Control	**Related FW**	2.2.0
Range [units]	Not Installed; 1 .. 64 [-]		
Default value	Not Installed	**Force value**	NO
Step	1		
Comm object	23832	**Related applications**	MINT
Config level	Standard		
Setpoint visibility	Always		
Description			

This Setpoint has to be set to the specific address. The Universal Gensets will be then represented across the whole system as a genset with this address.
It is recommended to set the Address as CAN Address of InteliNeo + 1. The default settings 0 = Not Installed means that the Universal Genset Support Function is not in use. The InteliNeo actually creates the virtual genset inside the system. The information about this virtual genset can be observed in all genset related information inside the system like CAN 16, CAN32, GL 16, GL 32, Reg 16, Reg 32 Values. Universal genset is always located in the same control group as InteliNeo which integrates it into the system.

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PV Address

Setpoint group	Process Control	**Related FW**	2.2.0
Range [units]	Not Installed / 1 .. 64		
Default value	Not Installed	**Force value**	NO
Step	[-]		
Comm object	23831	**Related applications**	MINT, MPTM
Config level	Advanced		
Setpoint visibility	Always		
Description			
This setpoint determines which is the CAN addres on the CAN intercontroller line under which the PV integrated by one specific InteliNeo is represented. The settings uses the full range of the CAN controller adresses. The addres has to be uniqe over all the system (over all CAN line). The "0 = Not Installled" setttings then determines that the PV is not integrated in the systm by this InteliNeo. All the refferences, about the PV settings and values as like as the PV drawings in the SLD on all HMI terminals are hidden.			

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WT Address

Setpoint group	Process Control	**Related FW**	2.2.0
Range [units]	Not Installed / 1 .. 64		
Default value	Not Installed	**Force value**	NO
Step	[-]		
Comm object	23830	**Related applications**	MINT, MPTM
Config level	Advanced		
Setpoint visibility	Always		
Description			
This setpoint determines which is the CAN address on the CAN intercontroller line under which the WT (Wind Turbine) integrated by one specific InteliNeo is represented. The settings use the full range of the CAN controller addresses. The address has to be unique over all the system (over all CAN line). The “0 = Not Installed” setting then determines that the WT is not integrated into the system by this InteliNeo. All the references about the WT settings and values, as well as the WT drawings in the SLD on all HMI terminals, are hidden.			

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Terminal Comm Address

Setpoint group	Communication Settings	**Related FW**	2.2.0
Range [units]	1 .. 32 [-]		
Default value	1 [-]	**Force value**	NO
Step	1 [-]		
Comm object	24019	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Always		
Description			
This setpoint adjusts Controller's Terminal Address which is used for communication with other devices using terminals ETH1, ETH2, and RS485 (**Communication peripherals**). This type of communication is used fore remote or local connection of the computer (InteliConfig), Display, Modbus Server, etc.			

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Subgroup: Modbus Server Address

Modbus Server Address

Setpoint group	Communication Settings	**Related FW**	2.2.0
Range [units]	1 .. 247 [-]		
Default value	1	**Force value**	NO
Step	[-]		
Comm object	24188	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Always		
Description			
This setpoint is used for definition of the InteliNeo modbus address if it is used in Modus Server mode.			

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Subgroup: RS485 Settings

RS485 Modbus Speed

Setpoint group	Communication Settings	**Related FW**	2.2.0
Range [units]	9600 / 19200 / 38400 / 57600 / 115200 [bps]		
Default value	9600 bps	**Force value**	NO
Step	[-]		
Comm object	24141	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Always		
Description			
This setpoint adjusts communication speed of **Modbus-RTU, Modbus/TCP**.			

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RS485 Modbus Mode

Setpoint group	Communication Settings	**Related FW**	2.2.0
Range [units]	8N1 / 8N2 / 8E1 [-]		
Default value	8N1	**Force value**	NO
Step	[-]		
Comm object	24020	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Always		
Description			
This setpoint adjusts communication mode of **Modbus-RTU, Modbus/TCP**.			

Possible options

8N1	8 data bits, 1 stop bit, no parity
8N2	8 data bits, 2 stop bits, no parity
8E1	8 data bits, 1 stop bit, even parity

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Subgroup: History Settings

LB/UART Log

Setpoint group	Communication Settings	**Related FW**	2.2.0
Range [units]	Disabled / Enabled [-]		
Default value	Disabled	**Force value**	NO
Step	[-]		
Comm object	11327	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Always		
Description			

This setpoint enables/disables logging of connection/disconnection of each remote terminal. The record is written to the history.

Note: *The terminal is disconnected automatically after 1 min of inactivity and next communication request from the same terminal is considered as a new connection. When logging is enabled in certain conditions the history may be filled up with large number of records related to the communication and important record may be overwritten quite fast.*

Disabled	Logging is disabled.
Enabled	Logging is enabled. Connection/Disconnection over ETH1, ETH2 or USB (**Communication peripherals**) causes history log. ***Note:*** *Connection over USB is recognized after reading of/writing to a communication object.*

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Subgroup: Intercontroller Settings

CAN Intercontroller Comm Redund

Setpoint group	Communication Settings	**Related FW**	2.2.0
Range [units]	Enabled / Disabled [-]		
Default value	Disabled	**Force value**	NO
Step	[-]		
Comm object	24026	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Always		
Description			
This setpoint enables or disables **CAN Intercontroller Communication Redundancy**. ***Note:*** *In case that there is a mismatch between this setpoint and actual state of CAN2B alarm* ***ALI Wrn Redundant CAN Error*** *is activated.*			

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CAN ICC Mode

Setpoint group	Communication Settings	**Related FW**	2.2.0
Range [units]	32C / 16C / 8C / 64C CAN FD / 32C CAN FD / 8C CAN FD [-]		
Default value	8C	**Force value**	NO
Step	[-]		
Comm object	24499	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Always		
Description			

This setpoint selects the mode of intercontroller communication. Options 32C or 8C are necessary to use in order to ensure the communication between InteliNeo6000 and older controllers such as IGS-NT, IG2GSC, IG200, IG500. Options 64C CAN FD, 32C CAN FD and 8C CAN FD are compatible only with controllers which support the CAN FD communication.

Note: *It is strongly recommended to use CAN FD modes if all controllers on-site support the CAN FD communication.*

Mode	Arbitration Bit-Rate	Data Bit-Rate	Maximal Bus Length	Max Bus Length With Repeater
32C	250 kbit	250 kbit	200 m	800 m
16C	125 kbit	125 kbit	400 m	1600 m
8C	50 kbit	50 kbit	900 m	3600 m
64C CAN FD	250 kb	2 Mbit	200 m	Not tested
32C CAN FD	125 kb	1 Mbit	400 m	Not tested
8C CAN FD	50 kb	400 kbit	900 m	Not tested

IMPORTANT: All controllers communicating on common CAN have to use the same mode of this setpoint.

IMPORTANT: All changes made to the setpoint takes effect after the restart of the controller.

Note: *In case that there is a mismatch between this setpoint and value **CAN Intercontroller Comm Mode**, alarm **ALI CAN Mode Inconsistency** is activated.*

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CAN Intercontroller Empty Check

Setpoint group	Communication Settings	**Related FW**	2.2.0
Range [units]	Enabled / Disabled [-]		
Default value	Disabled	**Force value**	YES
Step	[-]		
Comm object	9921	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Always		
Description			

This setpoint enable or disable CAN2 Intercontroller Empty Check.

Disabled	Detection of CAN Intercontroller Empty Check is disabled.
Enabled	Detection of CAN Intercontroller Empty Check is enabled. If controller does not see any other controller on theCAN2A orCAN2B the **Wrn CAN2 Empty** will be activated.

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Subgroup: Access Settings

Access Lock Mode

Setpoint group	Communication Settings	**Related FW**	2.2.0
Range [units]	Optional/ Required[-]		
Default value	Optional	**Force value**	NO
Step	[-]		
Comm object	23842	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Always		
Description			

Switching the Access Lock mode of operation so that the lock can be forced to be used to control the controller.

Option **Optional** = Locking the lock does not condition the ability to operate the machine, it only allows you to cut off other users if necessary.

Unlocked	The controller can be controlled by anyone
Locked	The controller can only be operated by the owner of the lock

Option **Required** = The lock is required for control, i.e. I have to lock with my account to control the controller.

Unlocked	No one can control the controller
Locked	The controller can only be operated by the owner of the lock

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Automatic Access Lock Release

Setpoint group	Communication Settings	**Related FW**	2.2.0
Range [units]	Disabled/ Enabled [-]		
Default value	Disabled	**Force value**	NO
Step	[-]		
Comm object	23840	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Always		
Description			

Option to automatically unlock Access Lock if the owner of the lock is no longer logged into any active session on the controller.

ENABLED	when the controller detects that the lock is locked but its owner is no longer logged in any session, it automatically unlocks the lock
DISABLED	the lock remains locked regardless of whether the owner is logged in or not, it is only unlocked manually (by the owner or administrator)

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User sessions limit

Setpoint group	Communication Settings	**Related FW**	2.2.0
Range [units]	Disabled; 1 .. 10 [-]		
Default value	Disabled	**Force value**	NO
Step	[-]		
Comm object	23841	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Always		
Description			

The number of concurrent sessions in which the same user is allowed to log in.

In the DISABLED state the controller behaves as it does in standard version, i.e. does not limit the number of connections in which the same user is logged in. A user can log in with several connections at the same time.

In the active state, each individual user can log into as many connections as is set by this setpoint.

Note: *This feature does not apply to users in the administrator role and does not apply to the implicit user.*

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Subgroup: SD Card Settings

SD Card File System

Setpoint group	Communication Settings	**Related FW**	2.2.0
Range [units]	Unmount / Mount / Format [-]		
Default value	Unmount	**Force value**	NO
Step	[-]		
Comm object	23997	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Always		
Description			

This setpoint determines whether the SD card is mounted, unmounted, or should be formatted. After formatting, the setpoint is automatically switched to the mount option. If the setpoint is set to unmount no interaction with the SD card is allowed, the controller will only detect that the SD card is inserted.

> **IMPORTANT: This setpoint has to be set to Mount in order to allow any writing function to the SD card.**

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Long Term History

Setpoint group	Communication Settings	**Related FW**	2.2.0
Range [units]	Disabled / Enabled [-]		
Default value	Disabled	**Force value**	NO
Step	[-]		
Comm object	23995	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Always		
Description			

This setpoint enables/disables writing of long term history onto the SD card.

> ***Note:*** *Setpoint **SD Card File System** - has to be adjusted to Mount.*

Disabled	Long Term History is not written onto the SD card.
Enabled	Long Term History is written onto the SD card.

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Subgroup: CAN1 ECU/IO Modules Split

CAN1 ECU/IOModules Split

Setpoint group	Communication Settings	**Related FW**	2.2.0
Range [units]	Disabled/Enabled		
Default value	Disabled	**Force value**	NO
Step	-		
Comm object	17339	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	When setpoint **Hot Swap Redundancy** = Disabled		
Description			

This setpoint allows to change the behavior on CAN1 communication terminals.

By default, CAN1A terminal is used for communication with ECU and IO Modules, CAN1B terminal is used for **Hot Swap Redundancy**. By enabling this setpoint, the CAN1A terminal can be used only for ECU, the CAN1B can be used only for IO Modules.

> ***Note:*** *In case that **CAN1 ECU/IOModules Split** is enabled, the **Hot Swap Redundancy** is disabled (and vice versa).*

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Group: Ethernet Port Configuration

Ethernet port 1

Setpoint group	Ethernet Port Configuration	**Related FW**	2.2.0
Range [units]	Trusted Interface / Untrusted Interface / Modbus Interface / Trusted Mirroring / Untrusted Mirroring / Modbus Mirroring [-]		
Default value	Trusted Interface	**Force value**	NO
Step	[-]		
Comm object	23873	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Always		
Description			

This setpoint is used to select the interface type on ethernet slot 1.

Trusted Interface - It is expected that these interfaces are operated locally inside a closed environment / infrastructure where additional measures against misuse or attack take place (e.g. physical access limitation). Due to nature of this interface less strict cybersecurity rules apply at it and that is why Implicit account is introduced here to make working with the controller simpler.

Untrusted Interface - This interface is a general-purpose one and it is expected that it may be exposed to public networks, such as Internet, which are not under control of the entity operating the controller. Thus, strict cybersecurity rules apply for this type of interface.

Modbus Interface - This type of interface is used for Modbus communication. It is not possible to connect to the controller using this interface.

Trusted Mirroring/**Untrusted Mirroring**/**Modbus Mirroring** - If mirroring mode is selected for a socket, the switch will be configured that except sending traffic belonging normally to that socket, it will also copy to that socket all traffic from other sockets assigned to the same network.

Note: *Only one socket can be adjusted to mirroring function. If multiple sockets are adjusted to mirroring function the alarm ALI Ethernet Port Inconsistency will be still displayed after the CU restart.*

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Ethernet port 2

Setpoint group	Ethernet Port Configuration	**Related FW**	2.2.0
Range [units]	Trusted Interface / Untrusted Interface / Modbus Interface / Trusted Mirroring / Untrusted Mirroring / Modbus Mirroring [-]		
Default value	Trusted Interface	**Force value**	NO
Step	[-]		
Comm object	23872	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Always		
Description			

This setpoint is used to select the interface type on ethernet slot 2.

Trusted Interface - It is expected that these interfaces are operated locally inside a closed environment / infrastructure where additional measures against misuse or attack take place (e.g. physical access limitation). Due to nature of this interface less strict cybersecurity rules apply at it and that is why Implicit account is introduced here to make working with the controller simpler.

Untrusted Interface - This interface is a general-purpose one and it is expected that it may be exposed to public networks, such as Internet, which are not under control of the entity operating the controller. Thus, strict cybersecurity rules apply for this type of interface.

Modbus Interface - This type of interface is used for Modbus communication. It is not possible to connect to the controller using this interface.

Trusted Mirroring/**Untrusted Mirroring**/**Modbus Mirroring** - If mirroring mode is selected for a socket, the switch will be configured that except sending traffic belonging normally to that socket, it will also copy to that socket all traffic from other sockets assigned to the same network.

Note: *Only one socket can be adjusted to mirroring function. If multiple sockets are adjusted to mirroring function the alarm ALI Ethernet Port Inconsistency will be still displayed after the CU restart.*

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Ethernet port 3

Setpoint group	Ethernet Port Configuration	**Related FW**	2.2.0
Range [units]	Trusted Interface / Untrusted Interface / Modbus Interface / Trusted Mirroring / Untrusted Mirroring / Modbus Mirroring [-]		
Default value	Modbus Interface	**Force value**	NO
Step	[-]		
Comm object	23871	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Always		
Description			

This setpoint is used to select the interface type on ethernet slot 3.

Trusted Interface - It is expected that these interfaces are operated locally inside a closed environment / infrastructure where additional measures against misuse or attack take place (e.g. physical access limitation). Due to nature of this interface less strict cybersecurity rules apply at it and that is why Implicit account is introduced here to make working with the controller simpler.

Untrusted Interface - This interface is a general-purpose one and it is expected that it may be exposed to public networks, such as Internet, which are not under control of the entity operating the controller. Thus, strict cybersecurity rules apply for this type of interface.

Modbus Interface -This type of interface is used for Modbus communication. It is not possible to connect to the controller using this interface.

Trusted Mirroring/**Untrusted Mirroring**/**Modbus Mirroring** - If mirroring mode is selected for a socket, the switch will be configured that except sending traffic belonging normally to that socket, it will also copy to that socket all traffic from other sockets assigned to the same network.

Note: *Only one socket can be adjusted to mirroring function. If multiple sockets are adjusted to mirroring function the alarm ALI Ethernet Port Inconsistency will be still displayed after the CU restart.*

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Group: ETH Interface 1 - Trusted

Subgroup: TCP/IP Settings

IP Address Mode

Setpoint group	ETH Interface 1 - Trusted	**Related FW**	2.2.0
Range [units]	Manual / Automatic / Disabled [-]		
Default value	Automatic	**Force value**	YES
Step	[-]		
Comm object	24063	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Always		
Description			

This setpoint is used to select the method how the ethernet connection is adjusted on **Communication peripherals**.

Manual:	Manual: The Ethernet connection is fixed by means of the setpoints **IP Address**, **Subnet Mask**, **Gateway IP**. This method should be used for a classic Ethernet or internet connection. When this type of connection opens, the controller is specified by its IP address. This means that it would be inconvenient if the IP address were not fixed (static).
Automatic:	The Ethernet connection settings is obtained automatically from the DHCP server. The obtained settings is shown in related values. If the process of obtaining the settings from the DHCP server is not successful, the values *000.000.000.000* are shown.
Disabled:	The Ethernet terminal is disabled.

> **IMPORTANT: When the mode is switched from Automatic to Manual the TCP/IP settings will be changed to the values in the related setpoints. In case you are using Ethernet 1 to connect the CU you will be disconnected. Turn off the setpoint hiding function to manually change the TCP/IP settings to same values obtained via DHCP so you will not be disconnected when changing mode.**

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IP Address

Setpoint group	ETH Interface 1 - Trusted	**Related FW**	2.2.0
Range [units]	0 .. 15 characters [-]		
Default value	192.168.1.1	**Force value**	NO
Step	[-]		
Comm object	24061	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Only if **IP Address Mode** = Manual		
Description			

The setpoint is used to select the method how the IP Address is adjusted on **Communication peripherals**.

If **IP Address Mode** = Manual, this setpoint is used to adjust the IP address of the **Communication peripherals** interface of the controller. Ask your IT specialist for help with this setting.

If **IP Address Mode** = Automatic this setpoint is inactive. The IP address is assigned by the DHCP server.

> ***Note:*** *Only valid IP address can be inserted.*

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Subnet Mask

Setpoint group	ETH Interface 1 - Trusted	**Related FW**	2.2.0
Range [units]	0 .. 15 characters [-]		
Default value	255.255.255.0	**Force value**	NO
Step	[-]		
Comm object	24059	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Only if **IP Address Mode** = Manual		
Description			

The setpoint is used to select the method how the Subnet Mask is adjusted on **Communication peripherals**.

If **IP Address Mode** = Manual, this setpoint is used to adjust the Subnet Mask. Ask your IT specialist for help.

If **IP Address Mode** = Automatic this setpoint is inactive. The Subnet Mask is assigned by the DHCP server.

> ***Note:*** *Only valid IP address can be inserted.*

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Gateway IP

Setpoint group	ETH Interface 1 - Trusted	**Related FW**	2.2.0
Range [units]	0 .. 15 characters [-]		
Default value	192.168.1.1	**Force value**	NO
Step	[-]		
Comm object	24057	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Only if **IP Address Mode** = Manual		
Description			

This setpoint is used to select the method how the Gateway IP is adjusted on **Communication peripherals** .

If **IP Address Mode** = Manual, this setpoint is used to adjust the IP address of the gateway of the network segment where the controller is connected.

If **IP Address Mode** = Automatic this setpoint is used to display the gateway IP which has been assigned by the DHCP server.

A gateway is a device which connects the respective segment with the other segments and/or the internet.

> ***Note:*** *Only valid IP address can be inserted.*

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IP Firewall

Setpoint group	ETH Interface 1 - Trusted	**Related FW**	2.2.0
Range [units]	Enabled / Disabled [-]		
Default value	Disabled	**Force value**	NO
Step	[-]		
Comm object	24029	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Always		
Description			

This setpoints enables or disables the built-in **Firewall** functionality for **Communication peripherals**.

Disabled:	The firewall function is switched off
Enabled:	The firewall function is switched on.

> **IMPORTANT: Loss of connection can happen when enabling the firewall and using remote connection via Internet**

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Subgroup: SNMP Settings

SNMP Privacy Protocol

Setpoint group	ETH Interface 2 - Untrusted	**Related FW**	2.2.0
Range [units]	DES / 3DES / AES128 / AES256 [-]		
Default value	AES128	**Force value**	NO
Step	[-]		
Comm object	23856	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Only if **SNMP Agent** = SNMP v3		
Description			
Selects SNMP v3 Privacy Protocol.			

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SNMP Authentication Protocol

Setpoint group	ETH Interface 2 - Untrusted	**Related FW**	2.2.0
Range [units]	MD5 / SHA / SHA256[-]		
Default value	SHA	**Force value**	NO
Step	[-]		
Comm object	23857	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Only if **SNMP Agent** = SNMP v3		
Description			
Selects SNMP v3 Authentication Protocol.			

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SNMP Security Level

Setpoint group	ETH Interface 2 - Untrusted	**Related FW**	2.2.0
Range [units]	NONE/ AUTH-NOPRIV / AUTH-PRIV [-]		
Default value	NONE	**Force value**	NO
Step	[-]		
Comm object	23855	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Only if **SNMP Agent** = SNMP v3		
Description			
Selects SNMP v3 security level. If NONE the agent will work in SNMP v2c mode..			

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Subgroup: Modbus Server Settings

Modbus Server

Setpoint group	ETH Interface 1 - Trusted	**Related FW**	2.2.0
Range [units]	Disabled / Enabled [-]		
Default value	Disabled	**Force value**	NO
Step	[-]		
Comm object	24034	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Always		
Description			
This setpoint enables or disables Modbus communication via **Communication peripherals**.			

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Modbus Client Inactivity Timeout

Setpoint group	ETH Interface 1 - Trusted ETH Interface 2 - Untrusted ETH Interface 3 - Modbus	**Related FW**	2.2.0
Range [units]	0 .. 65535 [s]		
Default value	60 s	**Force value**	NO
Step	1 s		
Comm object	24097	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Always		
Description			
Modbus connection (TCP socket) is closed by controller, if a Modbus client does not communicate for this time. ***Note:*** *This setpoint is shared with other Modbus Client Inactivity Timeout setpoints.*			

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Subgroup: ComAp Client Settings

Direct Connection Port

Setpoint group	ETH Interface 1 - Trusted	**Related FW**	2.2.0
Range [units]	0 .. 65535 [-]		
Default value	23 [-]	**Force value**	YES
Step	1 [-]		
Comm object	24035	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Always		
Description			
This port is used to listen for an incoming TCP connection on **Communication peripherals**.			

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ComAp Client Inactivity Timeout

Setpoint group	ETH Interface 1 - TrustedETH Interface 2 - Untrusted	**Related FW**	2.2.0
Range [units]	0 .. 65535 [s]		
Default value	60 s	**Force value**	YES
Step	1 s		
Comm object	24098	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Always		
Description			
Connection (TCP socket) is closed by controller, if a client (e.g. InteliConfig) does not communicate for this time. This timeout applies to both direct and AirGate connection.			

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Group: ETH Interface 2 - Untrusted

Subgroup: TCP/IP Settings

IP Address Mode

Setpoint group	ETH Interface 2 - Untrusted Ethernet	**Related FW**	2.2.0
Range [units]	Manual / Automatic / Disabled [-]		
Default value	Automatic	**Force value**	NO
Step	[-]		
Comm object	24259	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Always		
Description			

This setpoint is used to select the method how the ethernet connection is adjusted on **Ethernet 2**.

Manual:	The Ethernet connection is fixed by means of the setpoints **IP Address**, **Subnet Mask**, **Gateway IP**, **DNS IP Address 1**, **DNS IP Address 2**. This method should be used for a classic Ethernet or internet connection. When this type of connection opens, the controller is specified by its IP address. This means that it would be inconvenient if the IP address were not fixed (static).
Automatic:	The Ethernet connection settings is obtained automatically from the DHCP server. The obtained settings is shown in related values. If the process of obtaining the settings from the DHCP server is not successful, the values *000.000.000.000* are shown.
Disabled:	The Ethernet terminal is disabled.

> **IMPORTANT: When the mode is switched from Automatic to Manual the TCP/IP settings will be changed to the values in the related setpoints. In case you are using Ethernet 2 to connect the CU you will be disconnected. Turn off the setpoint hiding function to manually change the TCP/IP settings to same values obtained via DHCP so you will not be disconnected when changing mode.**

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IP Address

Setpoint group	ETH Interface 2 - Untrusted	**Related FW**	2.2.0
Range [units]	0 .. 15 characters [-]		
Default value	192.168.2.254	**Force value**	NO
Step	[-]		
Comm object	24376	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Only if **IP Address Mode** = Manual		
Description			

The setpoint is used to select the method how the IP Address is adjusted on **Ethernet 2**.

If **IP Address Mode** = Manual, this setpoint is used to adjust the IP address of the **Ethernet 2** interface of the controller. Ask your IT specialist for help with this setting.

If **IP Address Mode** = Automatic this setpoint is inactive. The IP address is assigned by the DHCP server.

Note: *Only valid IP address can be inserted.*

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Subnet Mask

Setpoint group	ETH Interface 2 - Untrusted	**Related FW**	2.2.0
Range [units]	0 .. 15 characters [-]		
Default value	255.255.255.0	**Force value**	NO
Step	[-]		
Comm object	24375	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Only if **IP Address Mode** = Manual		
Description			

The setpoint is used to select the method how the Subnet Mask is adjusted on **Ethernet 2**.

If **IP Address Mode** = Manual this setpoint is used to adjust the Subnet Mask. Ask your IT specialist for help with this setting.

If **IP Address Mode** = Automatic this setpoint is inactive. The Subnet Mask is assigned by the DHCP server.

Note: *Only valid IP address can be inserted.*

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Gateway IP

Setpoint group	ETH Interface 2 - Untrusted	**Related FW**	2.2.0
Range [units]	0 .. 15 characters [-]		
Default value	192.168.2.1	**Force value**	NO
Step	[-]		
Comm object	24373	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Only if **IP Address Mode** = Manual		
Description			

This setpoint is used to select the method how the Gateway IP is adjusted.

If **IP Address Mode** = Manual, this setpoint is used to adjust the Gateway IP address of the **Ethernet 2** interface of the controller. Ask your IT specialist for help with this setting.

If **IP Address Mode** = Automatic this setpoint is inactive. The Gateway IP address is assigned by the DHCP server.

A gateway is a device which connects the respective segment with the other segments and/or Internet.

Note: *Only valid IP address can be inserted.*

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IP Firewall

Setpoint group	ETH Interface 2 - Untrusted Ethernet	**Related FW**	2.2.0
Range [units]	Disabled / Enabled [-]		
Default value	Disabled	**Force value**	NO
Step	[-]		
Comm object	24092	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Always		
Description			

This setpoints enables or disables the built-in **Firewall** functionality for **Ethernet 2**.

Disabled:	The firewall function is switched off
Enabled:	The firewall function is switched on.

IMPORTANT: Loss of connection can happen when enabling the firewall and using remote connection via Internet

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DNS Mode

Setpoint group	ETH Interface 2 - Untrusted Ethernet	**Related FW**	2.2.0
Range [units]	Manual / Automatic [-]		
Default value	Automatic	**Force value**	
Step	[-]		
Comm object	24101	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Only if **IP Address Mode** = Automatic		
Description			

This setpoint enables to enter DNS server addresses for **Ethernet 2** manually, even with the **IP Address Mode** set to Automatic.

Automatic:	DNS server addresses are automatically obtained from a DHCP server.
Manual:	**DNS IP Address 1** and **DNS IP Address 2** can be adjusted manually. Use this option to resolve e.g. internet access policy related issue, if local DNS server addresses automatically obtained from a DHCP server do not work

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DNS IP Address 1

Setpoint group	ETH Interface 2 - Untrusted	**Related FW**	2.2.0
Range [units]	0 .. 15 characters [-]		
Default value	8.8.8.8	**Force value**	NO
Step	[-]		
Comm object	24362	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Only if **IP Address Mode** = Manual OR (**IP Address Mode** = Automatic AND **DNS Mode** = Manual)		
Description			

This setpoint allows to set DNS IP Address 1 for **Ethernet 2** manually.

Note: *Only valid IP address can be inserted.*

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DNS IP Address 2

Setpoint group	ETH Interface 2 - Untrusted	**Related FW**	2.2.0
Range [units]	0 .. 15 characters [-]		
Default value	4.4.4.4	**Force value**	NO
Step	[-]		
Comm object	24331	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Only if **IP Address Mode** = Manual OR (**IP Address Mode** = Automatic AND **DNS Mode** = Manual)		
Description			
This setpoint allows to set DNS IP Address 2 for **Ethernet 2** manually. ***Note:*** *Only valid IP address can be inserted.*			

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Subgroup: AirGate Settings

AirGate Connection

Setpoint group	ETH Interface 2 - Untrusted	**Related FW**	2.2.0
Range [units]	Disabled / Enabled [-]		
Default value	Enabled	**Force value**	YES
Step	[-]		
Comm object	24365	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Always		
Description			
This setpoint enables or disables **AirGate connection** function.			

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AirGate Address

Setpoint group	ETH Interface 2 - Untrusted	**Related FW**	2.2.0
Range [units]	0 .. 31 characters [-]		
Default value	global.airgate.link	**Force value**	NO
Step	[-]		
Comm object	24364	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Always		
Description			
This setpoint is used for entering the domain name or IP address of the AirGate server. Use the free AirGate server provided by ComAp at global.airgate.link.			

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AirGate Port

Setpoint group	ETH Interface 2 - Untrusted	**Related FW**	2.2.0
Range [units]	0 .. 65535 [-]		
Default value	54440 [-]	**Force value**	NO
Step	1 [-]		
Comm object	24096	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Always		
Description			
This port is used for TCP communication with the AirGate server. ***Note:*** *Use port 54440 for standard ComAp AirGate service.*			

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Subgroup: Messages Settings

Event Message

Setpoint group	ETH Interface 2 - Untrusted	**Related FW**	2.2.0
Range [units]	Enabled / Disabled [-]		
Default value	Enabled	**Force value**	YES
Step	[-]		
Comm object	18971	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Always		
Description			
This setpoint enables or disables sending of Event Messages.			

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Wrn Message

Setpoint group	ETH Interface 2 - Untrusted	**Related FW**	2.2.0
Range [units]	Enabled / Disabled [-]		
Default value	Enabled	**Force value**	YES
Step	[-]		
Comm object	8482	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Always		
Description			
This setpoint enables or disables sending of Warning Messages.			

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AI Message

Setpoint group	ETH Interface 2 - Untrusted	**Related FW**	2.2.0
Range [units]	Enabled / Disabled [-]		
Default value	Enabled	**Force value**	YES
Step	[-]		
Comm object	10567	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Always		
Description			
This setpoint enables or disables sending of Alarm Only messages.			

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Hst Message

Setpoint group	ETH Interface 2 - Untrusted	**Related FW**	2.2.0
Range [units]	Enabled / Disabled [-]		
Default value	Enabled	**Force value**	YES
Step	[-]		
Comm object	10568	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Always		
Description			
This setpoint enables or disables sending of History Record Only messages.			

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ALI Message

Setpoint group	ETH Interface 2 - Untrusted	**Related FW**	2.2.0
Range [units]	Enabled / Disabled [-]		
Default value	Enabled	**Force value**	YES
Step	[-]		
Comm object	18993	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Always		
Description			
This setpoint enables or disables sending of Alarm List Indication messages.			

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AHI Message

Setpoint group	ETH Interface 2 - Untrusted	**Related FW**	2.2.0
Range [units]	Enabled / Disabled [-]		
Default value	Enabled	**Force value**	YES
Step	[-]		
Comm object	18994	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Always		
Description			
This setpoint enables or disables AHI Messages. This setpoint is common for CM3-Ethernet and CM2-4G-GPS modules.			

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Sd Message

Setpoint group	ETH Interface 2 - Untrusted CM-4G-GPS Ethernet	**Related FW**	2.2.0
Range [units]	Enabled / Disabled [-]		
Default value	Enabled	**Force value**	YES
Step	[-]		
Comm object	8484	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Always		
Description			
This setpoint enables or disables sending of Shutdown Messages.			

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Sd Override Message

Setpoint group	ETH Interface 2 - Untrusted CM-4G-GPS Ethernet	**Related FW**	2.2.0
Range [units]	Enabled / Disabled [-]		
Default value	Enabled	**Force value**	YES
Step	[-]		
Comm object	11413	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Always		
Description			
This setpoint enables or disables sending of Shutdown Override Messages.			

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Stp Message

Setpoint group	Ethernet	**Related FW**	2.2.0
Range [units]	Enabled/Disabled		
Default value	Enabled	**Force value**	
Step	[-]		
Comm object	8485	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Always		
Description			
This setpoint enables or disables sending of messages.			

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MP Message

Setpoint group	ETH Interface 2 - Untrusted CM-4G-GPS Ethernet	**Related FW**	2.2.0
Range [units]	Enabled / Disabled [-]		
Default value	Enabled	**Force value**	YES
Step	[-]		
Comm object	10117	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Always		
Description			
This setpoint enables or disables sending of Mains Protection messages.			

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PVBO Message

Setpoint group	ETH Interface 2 - Untrusted	**Related FW**	2.2.0
Range [units]	Enabled / Disabled [-]		
Default value	Enabled	**Force value**	YES
Step	[-]		
Comm object	10926	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Always		
Description			
This setpoint enables or disables sending of PVBO Messages.			

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E-mail Language

Setpoint group	ETH Interface 2 - Untrusted	**Related FW**	2.2.0
Range [units]	Depends on controller's supported languages. [-]		
Default value	English	**Force value**	NO
Step	[-]		
Comm object	24299	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Always		
Description			
Use this setpoint to set the language of Event, Warning, etc. e-mails.			

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Subgroup: E-mail Settings

E-mail Address 1

Setpoint group	ETH Interface 2 - Untrusted	**Related FW**	2.2.0
Range [units]	0..63 characters [-]		
Default value	[-]	**Force value**	NO
Step	[-]		
Comm object	24298	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Always		
Description			
Enter a valid e-mail address where event and alarm messages will be sent.			

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E-mail Address 2

Setpoint group	ETH Interface 2 - Untrusted	**Related FW**	2.2.0
Range [units]	0..63 characters [-]		
Default value	[-]	**Force value**	NO
Step	[-]		
Comm object	24297	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Always		
Description			
Enter a valid e-mail address where event and alarm messages will be sent.			

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E-mail Address 3

Setpoint group	ETH Interface 2 - Untrusted	**Related FW**	2.2.0
Range [units]	0..63 characters [-]		
Default value	[-]	**Force value**	NO
Step	[-]		
Comm object	24145	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Always		
Description			
Enter a valid e-mail address where event and alarm messages will be sent.			

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E-mail Address 4

Setpoint group	ETH Interface 2 - Untrusted	**Related FW**	2.2.0
Range [units]	0..63 characters [-]		
Default value	[-]	**Force value**	NO
Step	[-]		
Comm object	24144	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Always		
Description			
Enter a valid e-mail address where event and alarm messages will be sent.			

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SMTP User Name

Setpoint group	ETH Interface 2 - Untrusted	**Related FW**	2.2.0
Range [units]	0..31 characters [-]		
Default value	[-]	**Force value**	NO
Step	[-]		
Comm object	23877	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Always		
Description			
Use this setpoint to enter the username for the SMTP server. Leave the setpoint blank if the SMTP server does not require authentication.			

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SMTP User Password

Setpoint group	ETH Interface 2 - Untrusted	**Related FW**	2.2.0
Range [units]	0..15 characters [-]		
Default value	[-]	**Force value**	NO
Step	[-]		
Comm object	23876	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Always		
Description			
Use this setpoint to enter the password for the SMTP server. Leave the setpoint blank if the SMTP server does not require authentication.			

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SMTP Server Address

Setpoint group	ETH Interface 2 - Untrusted	**Related FW**	2.2.0
Range [units]	0..31 characters [-]		
Default value	global.airgate.link:9925	**Force value**	NO
Step	[-]		
Comm object	24093	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Always		
Description			

This setpoint is used for entering the domain name (e.g. smtp.yourprovider.com) or IP address (e.g. 74.125.39.109) and port number (e.g. :9925) of the SMTP server. Ask your internet provider or IT manager for this information.

> **Example:** Enter the IP address "74.125.39.109" and port number "9925" as "74.125.39.109:9925".

Note: *You may use also any public SMTP server which does not require connection over SSL/TLS channels.*

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SMTP Sender Address

Setpoint group	ETH Interface 2 - Untrusted	**Related FW**	2.2.0
Range [units]	0..31 characters [-]		
Default value	[-]	**Force value**	NO
Step	[-]		
Comm object	23878	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Always		
Description			

Enter an existing email address into this setpoint. This address will be used as sender address in active e-mails that will be sent from the controller.

> ***Note:*** *It is not needed to enter an existing email address, nevertheless valid email format needs to be followed.*

> **IMPORTANT: This item is obligatory when emails are configured.**

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SMTP Encryption Type

Setpoint group	ETH Interface 2 - Untrusted	**Related FW**	2.2.0
Range [units]	NONE / SSL/TLS / STARTTLS [-]		
Default value	NONE	**Force value**	NO
Step	[-]		
Comm object	24076	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Always		
Description			

This setpoint selects encryption type for SMTP session.

NONE	Session is without of any encryption.
SSL/TLS	Encrypted channel is created first and only after that session is created.
STARTTLS	Session is created without of encryption and after command STARTTLS it is switched to encrypted session.

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Subgroup: SNMP Settings

SNMP Agent

Setpoint group	ETH Interface 2 - Untrusted	**Related FW**	2.2.0
Range [units]	Disabled / SNMP v1/v2c / SNMP v3 [-]		
Default value	Disabled	**Force value**	NO
Step	[-]		
Comm object	24336	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Always		
Description			

This setpoints Enables or disables Simple Network Management Protocol (SNMP) Agent.

Note: *SNMP v3 has upgraded encryption, remote configuration, and security (extra setpoints are available).*

Note: *It is supported only User-Based security model (USM, RFC-3414). View-based Access Control Model (VACM, RFC-3415) is not supported.*

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SNMP Trap Format

Setpoint group	ETH Interface 2 - Untrusted	**Related FW**	2.2.0
Range [units]	v1 Trap / v2 Notific / v2 Inform [-]		
Default value	v2 Inform	**Force value**	NO
Step	[-]		
Comm object	24136	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Only if **SNMP Agent** != Disabled		
Description			

This setpoint selects format of the SNMP trap messages.

v1 Trap	SNMPv1 trap format is used
v2 Notific	SNMPv2c Notification format is used
v2 Inform	SNMPv2c Inform format is used

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SNMP RD Community String

Setpoint group	ETH Interface 2 - Untrusted	**Related FW**	2.2.0
Range [units]	0..31 characters [-]		
Default value	public	**Force value**	NO
Step	[-]		
Comm object	24335	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Only if **SNMP Agent** != Disabled		
Description			
SNMP Community String only for reading.			

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SNMP WR Community String

Setpoint group	ETH Interface 2 - Untrusted	**Related FW**	2.2.0
Range [units]	0..31 characters [-]		
Default value	private	**Force value**	NO
Step	[-]		
Comm object	24334	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Only if **SNMP Agent** = SNMP v1/v2c		
Description			
SNMP Community String for writing and reading.			

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SNMP Traps IP Address 1

Setpoint group	ETH Interface 2 - Untrusted	**Related FW**	2.2.0
Range [units]	0 .. 63 characters [-]		
Default value	-	**Force value**	NO
Step	[-]		
Comm object	24095	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Only if **SNMP Agent** != Disabled		
Description			
IP address 1 for receiving SNMP Traps. Leave this setpoint blank if SNMP traps should not be send.			

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SNMP Traps IP Address 2

Setpoint group	ETH Interface 2 - Untrusted	**Related FW**	2.2.0
Range [units]	Valid IP address [-]		
Default value	-	**Force value**	NO
Step	[-]		
Comm object	24094	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Only if **SNMP Agent** != Disabled		
Description			
IP address 2 for receiving SNMP Traps. Leave this setpoint blank if SNMP traps should not be send.			

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SNMP Engine User Name

Setpoint group	ETH Interface 2 - Untrusted	**Related FW**	2.2.0
Range [units]	0 .. 31 characters [-]		
Default value	-	**Force value**	NO
Step	[-]		
Comm object	23851	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Only if **SNMP Agent** = SNMP v3		
Description			
Defines SNMP v3 Engine User Name.			

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Subgroup: Modbus Server Settings

Modbus Server

Setpoint group	ETH Interface 2 - Untrusted	**Related FW**	2.2.0
Range [units]	Disabled / Enabled [-]		
Default value	Disabled	**Force value**	NO
Step	[-]		
Comm object	24337	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Always		
Description			
Enables or disables Modbus communication via **Ethernet 2**.			

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Modbus Client Inactivity Timeout

Setpoint group	ETH Interface 1 - Trusted ETH Interface 2 - Untrusted ETH Interface 3 - Modbus	**Related FW**	2.2.0
Range [units]	0 .. 65535 [s]		
Default value	60 s	**Force value**	NO
Step	1 s		
Comm object	24097	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Always		
Description			
Modbus connection (TCP socket) is closed by controller, if a Modbus client does not communicate for this time. ***Note:*** *This setpoint is shared with other Modbus Client Inactivity Timeout setpoints.*			

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Subgroup: ComAp Client Settings

Direct Connection

Setpoint group	ETH Interface 2 - Untrusted	**Related FW**	2.2.0
Range [units]	Disabled / Enabled [-]		
Default value	Enabled	**Force value**	NO
Step	[-]		
Comm object	24099	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Always		
Description			
Use this setpoint to enable/disable direct connection of a ComAp client (e.g. InteliConfig) to the IP address of the controller. ***Note:*** *For Direct connection the controller IP address must be reachable from the client IP address.*			

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Direct Connection Port

Setpoint group	ETH Interface 2 - Untrusted	**Related FW**	2.2.0
Range [units]	0 .. 65535 [-]		
Default value	23 [-]	**Force value**	NO
Step	1 [-]		
Comm object	24374	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Always		
Description			
This port is used to listen for an incoming TCP connection on **Ethernet 2**.			

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ComAp Client Inactivity Timeout

Setpoint group	ETH Interface 1 - TrustedETH Interface 2 - Untrusted	**Related FW**	2.2.0
Range [units]	0 .. 65535 [s]		
Default value	60 s	**Force value**	YES
Step	1 s		
Comm object	24098	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Always		
Description			
Connection (TCP socket) is closed by controller, if a client (e.g. InteliConfig) does not communicate for this time. This timeout applies to both direct and AirGate connection.			

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Subgroup: NTP Settings

NTP Clock Synchronization

Setpoint group	ETH Interface 2 - Untrusted	**Related FW**	2.2.0
Range [units]	Disabled / Enabled [-]		
Default value	Disabled	**Force value**	NO
Step	[-]		
Comm object	24075	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Always		
Description			
This setpoint is used to enable/disable synchronization of the controller's time with the exact time from a NTP server.			

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NTP Server

Setpoint group	ETH Interface 2 - Untrusted	**Related FW**	2.2.0
Range [units]	0 .. 63 characters [-]		
Default value	pool.ntp.org	**Force value**	NO
Step	[-]		
Comm object	24074	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Always		
Description			
NTP server address for time synchronization. ***Note:*** *Only valid IP address or domain can be inserted.*			

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Group: ETH Interface 3 - Modbus

Subgroup: TCP/IP Settings

IP Address Mode

Setpoint group	ETH Interface 3 - Modbus	**Related FW**	2.2.0
Range [units]	Manual / Automatic / Disabled [-]		
Default value	Automatic	**Force value**	NO
Step	[-]		
Comm object	24049	**Related applications**	MINT, MPTM

Config level	Standard
Setpoint visibility	Only if relevant module is installed
Description	

This setpoint is used to select the method how the ethernet connection is adjusted on **Communication peripherals**.

Manual:	The Ethernet connection is fixed by means of the setpoints **IP Address**, **Subnet Mask** and **Gateway IP**. This method should be used for a classic Ethernet or internet connection. When this type of connection opens, the controller is specified by its IP address. This means that it would be inconvenient if the IP address were not fixed (static).
Automatic:	The Ethernet connection settings is obtained automatically from the DHCP server. The obtained settings is shown in related values. If the process of obtaining the settings from the DHCP server is not successful, the values *000.000.000.000* are shown.
Disabled:	The Ethernet terminal is disabled.

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IP Address

Setpoint group	ETH Interface 3 - Modbus	**Related FW**	2.2.0
Range [units]	0 .. 15 characters [-]		
Default value	192.168.3.254	**Force value**	NO
Step	[-]		
Comm object	24047	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Only if **IP Address Mode** = Manual		
Description			

The setpoint is used to select the method how the IP Address is adjusted on **Communication peripherals**.

If **IP Address Mode** = Manual, this setpoint is used to adjust the IP address of the **Communication peripherals** interface of the controller. Ask your IT specialist for help with this setting.

If **IP Address Mode** = Automatic this setpoint is inactive. The IP address is assigned by the DHCP server.

Note: *Only valid IP address can be inserted.*

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Subnet Mask

Setpoint group	ETH Interface 3 - Modbus	**Related FW**	2.2.0
Range [units]	0 .. 15 characters [-]		
Default value	255.255.255.0	**Force value**	NO

Step	[-]		
Comm object	24045	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Only if **IP Address Mode** = Manual		
Description			
The setpoint is used to select the method how the Subnet Mask is adjusted on **Communication peripherals**. If **IP Address Mode** = Manual this setpoint is used to adjust the Subnet Mask. Ask your IT specialist for help with this setting. If **IP Address Mode** = Automatic this setpoint is inactive. The Subnet Mask is assigned by the DHCP server. ***Note:*** *Only valid IP address can be inserted.*			

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Gateway IP

Setpoint group	ETH Interface 3 - Modbus	**Related FW**	2.2.0
Range [units]	0 .. 15 characters [-]		
Default value	192.168.3.1	**Force value**	NO
Step	[-]		
Comm object	24043	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Only if **IP Address Mode** = Manual		
Description			
This setpoint is used to select the method how the Gateway IP is adjusted. If **IP Address Mode** = Manual, this setpoint is used to adjust the Gateway IP address of the **Communication peripherals** interface of the controller. Ask your IT specialist for help with this setting. If **IP Address Mode** = Automatic this setpoint is inactive. The Gateway IP address is assigned by the DHCP server. A gateway is a device which connects the respective segment with the other segments and/or Internet. ***Note:*** *Only valid IP address can be inserted.*			

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Subgroup: Modbus Settings

Modbus Type

Setpoint group	ETH Interface 3 - Modbus	**Related FW**	2.2.0
Range [units]	Modbus Client / Modbus Server / Disabled [-]		
Default value	Disabled	**Force value**	NO
Step	[-]		
Comm object	23868	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Always		
Description			
This setpoint enables the Modbus Client or Server on the Modbus Interface.			

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Modbus Client Inactivity Timeout

Setpoint group	ETH Interface 1 - Trusted ETH Interface 2 - Untrusted ETH Interface 3 - Modbus	**Related FW**	2.2.0
Range [units]	0 .. 65535 [s]		
Default value	60 s	**Force value**	NO
Step	1 s		
Comm object	24097	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Always		
Description			
Modbus connection (TCP socket) is closed by controller, if a Modbus client does not communicate for this time. ***Note:*** *This setpoint is shared with other Modbus Client Inactivity Timeout setpoints.*			

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Group: BESS settings

Subgroup: BESS Precharge Settings

Starting Sequence BCB Control

Setpoint group	BESS Settings	**Related FW**	2.2.0
Range [units]	Start with Opened BCB / Start with Closed BCB [-]		
Default value	Start with Opened BCB	**Force value**	NO
Step	-		
Comm object	16428	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Always		
Description			

This setpoint adjust Controller's behavior during BESS Starting Sequence.

Starting with BCB Closed	With Starting with BCB Closed, this does not mean the breaker is already closed when a start command is activated. What we mean by starting with BCB closed is the first action the **Bess State** does is evaluating the state of the AC BUS and after wards attempting to close the BCB Breaker. We provide the option to setup the **BCB Type** to be either a Breaker or Fuse/Disc. For having either one of the options set the main thing for the system is to get a confirmation that the LBI **BCB Feedback** is closed when it is supposed to thus indicating the inverter is connected. The "Start With Closed BCB" and "Start To Dead Bus = Disabled" settings must be used for BESS that only supports active power P-Q control mode, meaning it does not allow Grid Forming mode and cannot independently generate AC voltage at its output. This BESS always connects to an energized bus. This process is further influenced by the "Start To Dead Bus" setpoint, which must be set to "Disabled". Thus, the startup sequence only begins if a healthy AC voltage is detected on the bus. If not, the BESS remains in the "Ready" state. Note: This scenario corresponds to the original BESS "Precharge Type = AC" setting found in previous versions. The "Start With Closed BCB" setting combined with the "Start To Dead Bus = Enabled" option can be used if the BESS supports Grid Forming mode and requires starting with the BCB closed. This setting is used when a soft bus energize is needed.
Starting with BCB Opened	With Starting with BCB Opened first action of the controller is set up the DC part of the system and after wards once the DC system is active an attempt to close the BCB breaker to either a **deadbus** or via attempt for forward **Synchronization.** This setting corresponds to a BESS with the ability to act as a grid-forming source, meaning a BESS that can generate AC voltage at its output. Through the BCB, it then synchronizes to a live bus or switches to a dead bus. Note: The setpoint "Start To Dead Bus" is not applied for these settings.

Note: *It is important for the setting with Starting with BCB Closed that the setup of the system around the controller allows safely connection to a deadbus. For the setting with Starting with BCB Opened the controller can always start the system not depending on the actual state of the ac bus.*

Note: *The controller will not start the BESS if healthy voltage is on the ac bus and the controller does not receive information from where this voltage is generated. More information can be given in value* ***Breaker state***

Note: ***SD Wrong BCB Control Setting*** *appears when setting of the setpoint Starting Sequence BCB Control= Starting BCB Opened and the* ***BCB Type*** *is set to FUSE/Disc. User is not able to start with this setting since the controller system is the one controlling the closing of the BCB.*

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Precharge TO

Setpoint group	BESS settings	**Related FW**	2.2.0
Range [units]	1 .. 600 [s]		
Default value	30 s	**Force value**	YES
Step	1 s		
Comm object	20246	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Always		
Description			
This setpoint defines the duration of the precharge process of the BESS inverter. After the delay elapsed, the BESS inverter is considered as precharged and it can react to regulator request.			

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Start To Dead Bus

Setpoint group	BESS settings	**Related FW**	2.2.0
Range [units]	Enabled/Disabled		
Default value	Disabled	**Force value**	YES
Step	[-]		
Comm object	17661	**Related applications**	MINT, MPTM
Config level	Advanced		
Setpoint visibility	Always		

Description

This setpoint adjust Controller's behavior during starting the system based on the actual situation of the AC Bus.

Note: *The setting of this setpoint corresponds to the setting of setpoint* ***Starting Sequence BCB Control****=Start with BCB Closed since it is important to provide more necessary information.*

Enabled	Having the setpoint Enabled allows the user to start the system while having a dead ac bus or a healthy ac bus. However it is important to note that **Starting Sequence BCB Control** changes the way how the starting of the BESS occurs. In the case of Start BCB Opened the behavior of the start sequence allows to close the BCB breaker when dead bus is present or to synchronize if healthy voltage is present on the AC BUS already after when the DC setup is up and running For Start with BCB Closed the first action is ensuring that the connection of the AC Bus is with the PCS and after wards the DC setup is occurring. This means the setting up of the dead bus needs the PCS to form grid. The BESS is configured to initiate its start-up sequence even when connected to a dead bus. This means the BESS can act as a grid-forming source, generating AC voltage at its output to energize the bus. This setting is particularly useful in scenarios where the bus does not have any existing AC voltage and needs to be energized by the BESS. In this configuration, the BESS performs a soft bus energize. This process involves gradually increasing the voltage to the bus, ensuring a smooth and controlled energizing. Soft bus energize helps prevent sudden inrush currents.
Disabled	The Disabled setting requires that there is a healthy voltage on the AC BUS before start and at the same time a setting chosen **Starting Sequence BCB Control**=Start with BCB Closed. For correct setting if a start command is activated while there is no healthy voltage on the AC BUS, the BESS remains in the **BESS State** = Ready State and waits until a healthy voltage appears on the AC bus. Start with BCB Opened the BESS state changes and activates an alarm SD **Wrong Precharge Settings**. This setting is essential for BESS units that do not have grid-forming capabilities and only support active power P-Q control mode. These

	BESS units rely on the existing grid voltage for synchronization and cannot independently generate AC voltage at their output. Therefore, they must connect to an energized bus to operate correctly.

Note: *A group of BESS starts to the dead bus, they all have the same settings, one of them starts the bus, the others connect to the live bus (or are already connected).*

Note: *Having the AC Bus unhealthy will not allow the closing of the BCB or starting up of the BESS system. During the starting sequence with setting Start Sequence BCB Control = Start with BCB Closed if the voltage on bus/bess line changes from healthy to unhealthy values, a stop command occurs.*

Note: *In order to not allow starting to dead bus with Start BCB Opened the BESS setting that is recommended to utilize are LBI* ***BCB DISABLE*** *or LBI* ***BESS START BLOCKINGBESS START BLOCKING***

> **IMPORTANT: Connecting BESS to a dead bus can potentially cause damage if any unexpected changes occur on the ac bus. In order to negate any other grid forming device to connect to the starting of the BESS there are certain functions to utilize such as LBO Stop Bus Energize.**

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BESS Ready to Load TO

Setpoint group	BESS settings	**Related FW**	2.2.0
Range [units]	0 .. 3600 [s]		
Default value	30 s	**Force value**	YES
Step	1 s		
Comm object	16478	**Related applications**	MINT, MPTM
Config level	Advanced		
Setpoint visibility	Always		
Description			
This setpoint adjusts maximal waiting time for LBI **BESS 01 READY TO LOAD**. If the LBI **BESS 01 READY TO LOAD** is not configured the BCB is closed after this timer elapsed.			

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Subgroup: BESS P Control

BESS P Control

Setpoint group	BESS settings	**Related FW**	2.2.0
Range [units]	Analog/Setpoint/Balance		
Default value	Setpoint	**Force value**	YES
Step			
Comm object	20269	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Always		
Description			

This setpoints defines the source for the BESS power output request.

Analog	The controller receives a **BESS P REQUEST BESS P Request %**from the LAI **BESS P REQUEST**which is used as direct BESS Power Request.
Setpoint	The value of **BESS P REQUEST** is given by setpoints **BESS Charge Power** or **BESS Discharge Power**.
Balance	**Balance mode** is a dynamic control strategy where Battery Energy Storage Systems (BESS) automatically adjust their power output to support overall system performance. The control logic adapts based on the system configuration — whether islanded, grid-connected, or operating with gensets — to maintain power balance and meet operational targets.

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BESS Charge Power

Setpoint group	BESS settings	**Related FW**	2.2.0
Range [units]	0 .. **Nominal power** [kW]		
Default value	100 kW	**Force value**	YES
Step	1 kW		
Comm object	13930	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Always		
Description			

This setpoint defines the required charge power during the charging process. Charging process is displayed as negative power.

Note: *The setpoint is inactive when LBI **BESS DISCHARGE ENABLE** is not active.*

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BESS Discharge Power

Setpoint group	BESS settings	**Related FW**	2.2.0
Range [units]	0 .. **Nominal power** [kW]		
Default value	100 kW	**Force value**	YES
Step	1 kW		
Comm object	13931	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Alwaysl		
Description			
This setpoint defines the required discharge power during the discharging process. Discharging process is displayed as positive power. ***Note:*** *Note: The setpoint is inactive when LBI* ***BESS DISCHARGE ENABLE*** *is not active.*			

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#Gen P Min

Setpoint group	BESS settings	**Related FW**	2.2.0
Range [units]	0 .. 100 [%] of nominal power of Gen-sets running in PM		
Default value	20 % of nominal power of Gen-sets running in PM	**Force value**	YES
Step	1 % of nominal power of Gen-sets running in PM		
Comm object	14384	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Always		
Description			

Setpoint **#Gen P Min** defines the threshold for the power of the genset below which **PV curtailment** begins to take effect. .

Together with setpoint **Gen P Optimal** create a power band within which the genset output can vary if other sources (Mains, BESS) are unable - due to their configuration or limitations - to maintain the genset at the **Gen P Optimal** level.

Example Use Case:

- In an islanded system with **BESS**, **Genset**, and **PV**
- When the load reserve is fulfilled by BESS, the genset remains off.
- The load is covered by BESS and PV.
- Once BESS reaches its **SOC Low Target**, it is no longer allowed to discharge further.
- This drop in reserve capacity triggers the **start of the genset**.
- The genset then operates at **Gen P Optimal**, covering the load together with PV, while any excess power is used to **charge the BESS**.
- If PV production increases, BESS charges at its maximum charging rate.
- The genset output begins to decrease as PV production rises or load decreases.
- **PV curtailment** only occurs when the genset output reaches the **#Gen P Min** level to keep it on this level.

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Gen P Optimal

Setpoint group	BESS settings	**Related FW**	2.2.0
Range [units]	**#Gen P Min** .. 100 [%]		
Default value	20 % of nominal power of Gen-sets running in PM	**Force value**	YES
Step	1 % of nominal power of Gen-sets running in PM		
Comm object	17589	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Depends on **#System Load Control PTM** settings		

Description

Gen P Optimal defines the power level at which all gensets operating in load sharing mode should be maintained. Other sources in the system - specifically **BESS** and **grid** adjust their output to ensure that gensets operate precisely at this target level. This behavior applies in control modes such as *Mains Preference*, *BESS Max Charging*, and *BESS Max Discharging*.

The setpoint is bounded from below by the value of **#Gen P Min**.

Setpoint **#Gen P Min** defines the threshold below which **PV curtailment** begins to take effect.

Together, **Gen P Optimal** and **#Gen P Min** create a power band within which the genset output can vary if other sources (Mains, BESS) are unable - due to their configuration or limitations - to maintain the genset at the **Gen P Optimal** level.

Example Use Case:

In an islanded system with **BESS**, **Genset**, and **PV**:

- When the load reserve is fulfilled by BESS, the genset remains off.
- The load is covered by BESS and PV.
- Once BESS reaches its **SOC Low Target**, it is no longer allowed to discharge further.
- This drop in reserve capacity triggers the **start of the genset**.
- The genset then operates at **Gen P Optimal**, covering the load together with PV, while any excess power is used to **charge the BESS**.
- If PV production increases, BESS charges at its maximum charging rate.
- The genset output begins to decrease as PV production rises or load decreases.
- **PV curtailment** only occurs when the genset output reaches the **#Gen P Min** level to keep it on this level.

> **IMPORTANT: This setpoint is temporarily introduced as a non-shared setpoint. Its value is therefore not automatically propagated to all controllers on the intercontroller CAN network. To ensure correct functionality, it is necessary to manually configure the same value for this setpoint in all controllers.**

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PVCB Pre-close

Setpoint group	BESS settings	**Related FW**	2.2.0
Range [units]	#Gen P Min		
Default value	Disabled	**Force value**	YES
Step	1 % of nominal power of Gen-sets running in PM		
Comm object	17587	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	PVCB Installed		
Description			

Some PV inverters are characterized by requiring a connection to the AC bus before they can be commissioned and establish communication. Such an inverter is clearly unable to provide a **PV OPERABLE** signal if the PVCB is open. Using the **PVCB Pre-close** setpoint, it is possible to reverse the PV startup sequence.

- **Disabled**: This is the classic PV startup sequence. The **PV OPERABLE** signal is a necessary condition for the controller to close the PVCB.
- **Enabled**: The PVCB can be closed without an active **PV OPERABLE**signal. The only condition for closing the PVCB is a healthy AC bus voltage. In this case, the PVCB can be closed manually (MAN) or automatically (AUT).

Note: *Setting PVCB Pre-close to* ***Disabled*** *does not mean that the controller ignores the* ***PV OPERABLE*** *status. On the contrary, it continues to work with it according to the described rules.*

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Subgroup: BESS Q Control

#BESS Q Control

Setpoint group	BESS settings	**Related FW**	2.2.0
Range [units]	Analog/Balance		
Default value	Balance	**Force value**	YES
Step			
Comm object	20174	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Always		
Description			

This setpoints defines the source which will be used for PF/Q regulations.

Analog	The reactive power is regulated according to the the LAI **BESS Q REQUEST** which is used as direct BESS Power Request.
Balance	The PF of the BESS is regulated so the Gen-sets (system) has the constant PF which is defined by the setpoint **#Genset PF Required**.
VAr Sharing	The reactive power of the system (determined by the load in off-grid applications or the InteliMains requirement in on-grid applications) is evenly distributed among all sources, i.e., gensets and BESS. Thus, the BESS actively participates in the VAr Sharing function.

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#Genset PF Required

Setpoint group	BESS settings	**Related FW**	2.2.0
Range [units]	0.001 .. 1.999		
Default value	1.000	**Force value**	YES
Step	0.001		
Comm object	20173	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Always		
Description			

This setpoints defines the PF which is required from Gen-sets (system). The BESS will regulate its PF so it covers peaks and the Gen-sets has constant PF.

Note: *This setpoint applies only if the **#BESS Q Control** = Balance.*

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Subgroup: SOC Control

SOC High Target

Setpoint group	BESS settings	**Related FW**	2.2.0
Range [units]	50 .. 100 [%] of **BESS Nominal Capacity**		
Default value	80 % of **BESS Nominal Capacity**	**Force value**	YES
Step	1 % of **BESS Nominal Capacity**		
Comm object	20266	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Always		
Description			
This setpoint defines the relative maximal state of charge of the BESS. The value **BESS SOC** cannot exceed this limit. See the chapter **BESS SOC Control** for more information.			

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SOC High Hysteresis

Setpoint group	BESS settings	**Related FW**	2.2.0
Range [units]	50 .. 80 [%] of **BESS Nominal Capacity**		
Default value	70 % of **BESS Nominal Capacity**	**Force value**	YES
Step	1 % of **BESS Nominal Capacity**		
Comm object	20268	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Always		
Description			
This setpoint defines the relative level under which the value **BESS SOC** must drop so the charging process can be activated again . See the chapter **BESS SOC Control** for more information.			

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SOC Low Target

Setpoint group	BESS settings	**Related FW**	2.2.0
Range [units]	0 .. 50 [%] of **BESS Nominal Capacity**		
Default value	20 % of **BESS Nominal Capacity**	**Force value**	YES
Step	1 % of **BESS Nominal Capacity**		
Comm object	20265	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Always		
Description			
This setpoint defines the relative minimal state of charge of the BESS. The value **BESS SOC** cannot drop under this limit. See the chapter **BESS SOC Control** for more information.			

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SOC Low Hysteresis

Setpoint group	BESS settings	**Related FW**	2.2.0
Range [units]	20 .. 50 [%] of **BESS Nominal Capacity**		
Default value	30 % of **BESS Nominal Capacity**	**Force value**	YES
Step	1 % of **BESS Nominal Capacity**		
Comm object	20267	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Always		
Description			
This setpoint defines the relative level under which the value **BESS SOC** must exceed so the discharging process can be activated again . See the chapter **BESS SOC Control** for more information.			

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Subgroup: Battery Cycles

Max Battery Cycles Per Day

Setpoint group	BESS settings	**Related FW**	2.2.0
Range [units]	OFF; 1 .. 250 [-]		
Default value	2	**Force value**	YES
Step	1		
Comm object	20225	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Always		
Description			
This setpoint is used to define the maximal daily number of battery cycles. See the chapter **Daily battery cycles control** for more information.			

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Subgroup: Starting Timers

Minimal Stabilization Time

Setpoint group	BESS settings	**Related FW**	2.2.0
Range [units]	1 .. **Maximal Stabilization Time** [s]		
Default value	2 s	**Force value**	YES
Step	1 s		
Comm object	8259	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Always		
Description			
After the BESS has been started. The controller will wait for a period adjusted by this setpoint before closing BCB, even if the BESS voltage and frequency are already in limits. ***Note:*** *This setpoint is relevant only if* ***Starting Sequence BCB Control*** *= Start with Opened BCB.*			

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Maximal Stabilization Time

Setpoint group	BESS settings	**Related FW**	2.2.0
Range [units]	**Minimal Stabilization Time** .. 3600 [s]		
Default value	10 s	**Force value**	YES
Step	1 s		
Comm object	8313	**Related applications**	MINT, MPTM
Config level	Advanced		
Setpoint visibility	Always		
Description			
After the BESS has been started. The BESS voltage and frequency must get within limits within this period of time, otherwise an appropriate shutdown alarm (BESS voltage and/or frequency) is issued. ***Note:*** *This setpoint is relevant only if* ***Starting Sequence BCB Control*** *= Start with Opened BCB.*			

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Run Only Block Delay 1

Setpoint group	BESS settings	**Related FW**	2.2.0
Range [units]	0.0 .. 600.0 [s]		
Default value	5.0	**Force value**	YES
Step	0.1		
Comm object	10023	**Related applications**	MINT, MPTM
Config level	Advanced		
Setpoint visibility	Always		
Description			

This setpoint influences the blocking condition if any protection is configured with blocking condition "Run Only Block Delay 1". The protection blocking is based on the operating state of the BESS state machine. Once the BESS state machine reaches the "Running" state, the protection with this blocking is unblocked after this delay elapses.

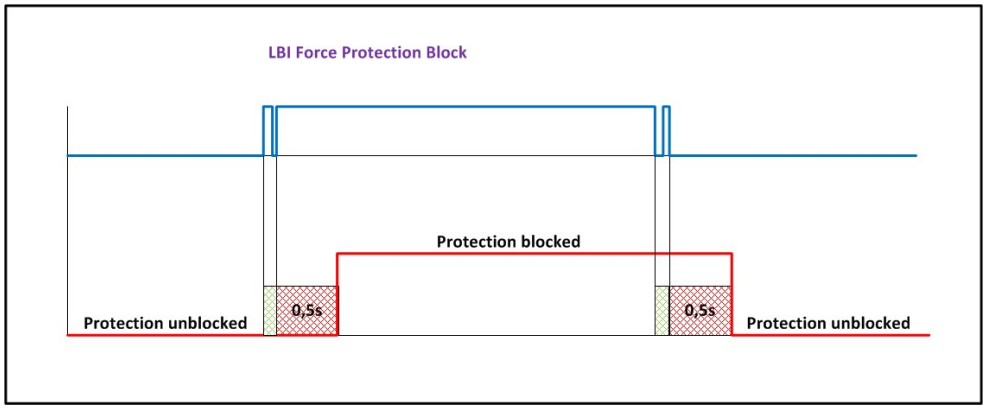

Image 22.3 Run Only Block Delay 1

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Run Only Block Delay 2

Setpoint group	BESS settings	**Related FW**	2.2.0
Range [units]	0.0 .. 600.0 [s]		
Default value	5.0	**Force value**	YES
Step	0.1		
Comm object	10024	**Related applications**	MINT, MPTM
Config level	Advanced		
Setpoint visibility	Always		
Description			

This setpoint influences the blocking condition if any protection is configured with blocking condition "Run Only Block Delay 2". The protection blocking is based on the operating state of the BESS state machine. Once the BESS state machine reaches the "Running" state, the protection with this blocking is unblocked after this delay elapses.

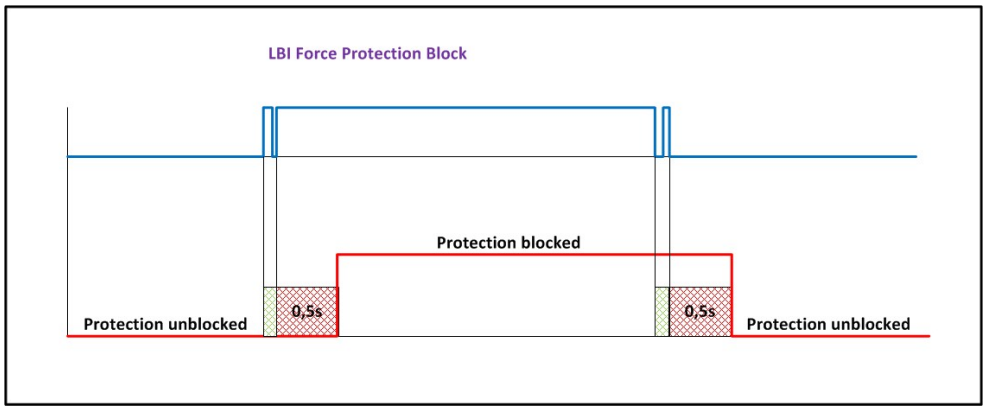

Image 22.4 Run Only Block Delay 2

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Run Only Block Delay 3

Setpoint group	BESS settings	**Related FW**	2.2.0
Range [units]	0.0 .. 600.0		
Default value	5.0	**Force value**	YES
Step	0.1		
Comm object	10025	**Related applications**	MINT, MPTM
Config level	Advanced		
Setpoint visibility	Always		
Description			

This setpoint influences the blocking condition if any protection is configured with blocking condition "Run Only Block Delay 3". The protection blocking is based on the operating state of the BESS state machine. Once the BESS state machine reaches the "Running" state, the protection with this blocking is unblocked after this delay elapses.

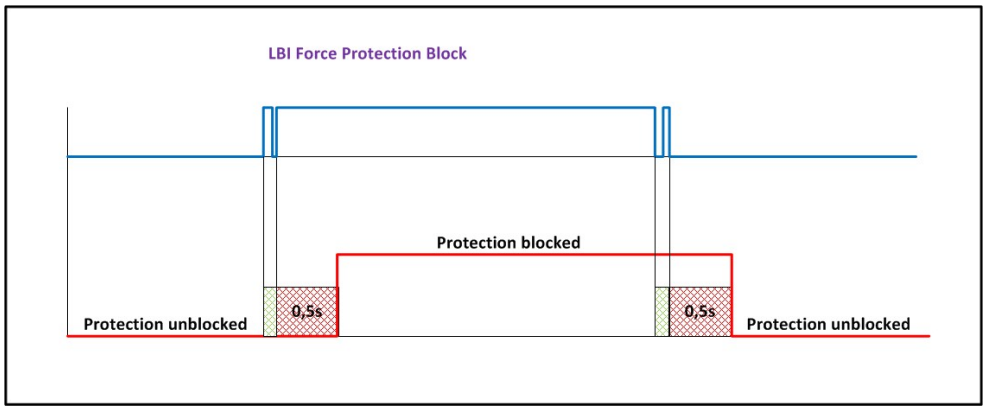

Image 22.5 Run Only Block Delay 3

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Subgroup: Stopping Timers

Stop Time

Setpoint group	BESS settings	**Related FW**	2.2.0
Range [units]	0 .. 1200 [s]		
Default value	60 s	**Force value**	YES
Step	1 s		
Comm object	9815	**Related applications**	MINT, MPTM
Config level	Advanced		
Setpoint visibility	Always		
Description			

Under normal conditions the BESS must certainly stop within this period otherwise **Wrn Stop Fail** will appear.

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Subgroup: Power Switch

Power Switch On

Setpoint group	BESS settings	**Related FW**	2.2.0
Range [units]	0 .. 32 000 [kW] (depends on the selected **Power Formats And Units**)		
Default value	100 kW (depends on the selected **Power Formats And Units**)	**Force value**	YES
Step	1 kW (depends on the selected **Power Formats And Units**)		
Comm object	11658	**Related applications**	MINT, MPTM
Config level	Advanced		
Setpoint visibility	Only if LBO **Power Switch 1** is configured		
Description			
Threshold level for switching the LBO **Power Switch 1** on.			

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Power Switch Off

Setpoint group	BESS settings	**Related FW**	2.2.0
Range [units]	0 .. 32 000 [kW] (depends on the selected **Power Formats And Units**)		
Default value	50 kW (depends on the selected **Power Formats And Units**)	**Force value**	YES
Step	1 kW (depends on the selected **Power Formats And Units**)		
Comm object	11659	**Related applications**	MINT, MPTM
Config level	Advanced		
Setpoint visibility	Only if LBO **Power Switch 1** is configured		
Description			
Threshold level for switching the LBO **Power Switch 1** off.			

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Group: BESS Protections

Subgroup: Overload Protection

2POverload Start Evaluation Level

Setpoint group	BESS Protections	**Related FW**	2.2.0
Range [units]	100 .. 200 [%] of **Nominal power**		
Default value	150 % of **Nominal power**	**Force value**	YES
Step	1 % of **Nominal power**		
Comm object	8280	**Related applications**	MINT, MPTM

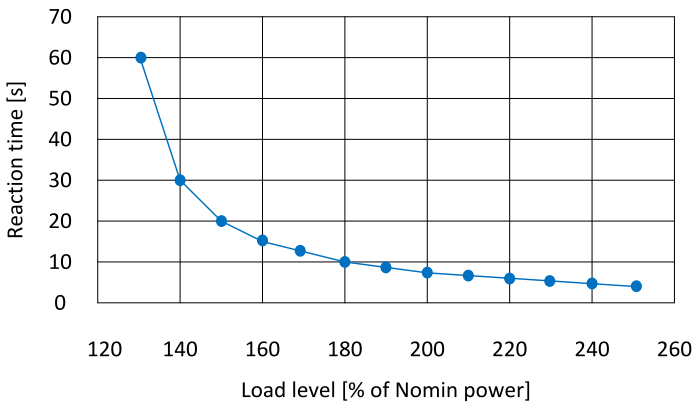
Config level	Standard
Setpoint visibility	Always
Description	

This setpoint adjusts the relative power level, where the thermal overload protection starts to be evaluated. See setpoint **IDMT Overload Protection**for complete explanation of the protection.

Load level	Reaction time [s]
100	no reaction
110	no reaction
120	600
130	60
140	30
150	20
160	15
170	12
180	10
190	8.6
200	7.5
210	6.7
220	6
230	5.5
240	5
250	4.6

2POvrldStEvDel	5 s
OverldStrtEval	150 %

$$\text{Reaction time [s]} = \frac{\text{2POvrldStEvDel*OverldStrtEval}}{\text{GeneratorActivePower [\%] - OverldStrtEval}}$$



The reaction time of the thermal overload protection is not fixed and is specified by the parameter **2POverload Start Evaluation Delay**.

Note: *Maximum reaction time is 3600 s after this time the protection is tripped.*

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2POverload Start Evaluation Delay

Setpoint group	BESS Protections	**Related FW**	2.2.0
Range [units]	0.1 .. 600.0 [s]		
Default value	5.0 s	**Force value**	YES
Step	0.1 s		
Comm object	8281	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Always		
Description			

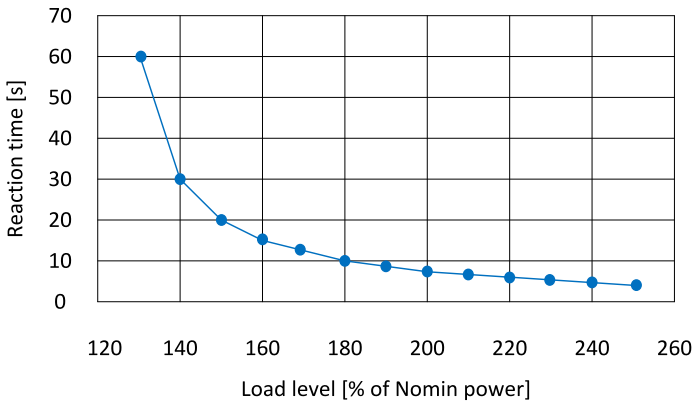
This setpoint adjusts the default delay for the thermal overload protection. See setpoint**IDMT Overload Protection**IDMT Overload Protection**for complete explanation of the protection.

Load level	Reaction time [s]
100	no reaction
110	no reaction
120	3600 (max. value)
130	60
140	30
150	20
160	15
170	12
180	10
190	8.6
200	7.5
210	6.7
220	6
230	5.5
240	5
250	4.6

2POvrldStEvDel 5 s

OverldStrtEval 150 %

$$\text{Reaction time [s]} = \frac{\text{2POvrldStEvDel*OverldStrtEval}}{\text{GeneratorActivePower [\%] - OverldStrtEval}}$$



The reaction time of the thermal overload protection is not fixed; it depends on how much is the load above the limit of **2POverload Start Evaluation Level**. The higher is the load the shorter the reaction time will be.

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Subgroup: Current Protection

Short Circuit

Setpoint group	BESS Protections	**Related FW**	2.2.0
Range [units]	100 .. 500 [%] of **Nominal Current**		
Default value	150 % of **Nominal Current**	**Force value**	NO
Step	1 % of **Nominal Current**		
Comm object	8282	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Always		
Description			
This setpoint specifies the relative current threshold level for **Short Circuit Protection**.			

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Short Circuit Delay

Setpoint group	BESS Protections	**Related FW**	2.2.0
Range [units]	0.00 .. 10.00 [s]		
Default value	0 s	**Force value**	NO
Step	0.01 s		
Comm object	9991	**Related applications**	MINT, MPTM
Config level	Advanced		
Setpoint visibility	Always		
Description			
This setpoint specifies the delay for **Short Circuit Protection**.			

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IDMT BESS >A Delay

Setpoint group	BESS Protections	**Related FW**	2.2.0
Range [units]	1.0 .. 600.0 [s]		
Default value	4.0 s	**Force value**	NO
Step	0.1 s		
Comm object	8283	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Always		
Description			

This setpoint adjusts the delay for **IDMT BESS >A Protection**.

IDMT curve shape selection. IDMT Overcurrent Delay is a reaction time of IDMT protection for 200% overcurrent I_{BESS} =2***Nominal Current**

IDMT is “very inverse” over current protection. Reaction time is not constant but depends on over current level according to the following formula:

$$\text{Reaction time} = \frac{IDMT\ \text{Generator} > A\ \text{Delay} \times \text{Nominal Current}}{I_{gen} - \text{Nominal Current}}$$

> ***Note:*** *Reaction time is limited to 3600 s = 60 minutes. IDMT protection is not active for Reaction time values longer than 60 minutes.*

I_{BESS} is maximal value of all measured phases of BESS current.

Table 22.1 EXAMPLE of Reaction time for different over current levels

	Overcurrent IDMT Delay	Overcurrent		
		≤ 100 %	101 %	110 %
Reaction time	0,2 s	No action	20 s	2 s
	2 s	No action	200 s	20 s
	20 s	No action	2000 s	200 s

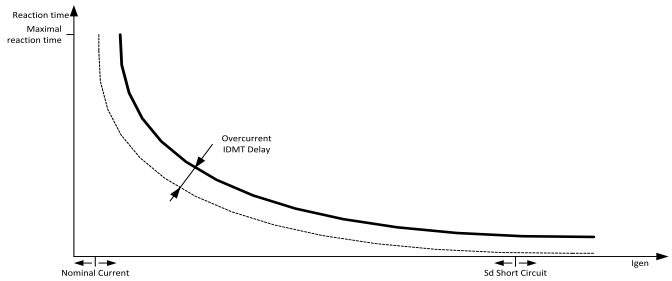

Image 22.6 IDMT Overcurrent Delay

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BESS Current Unbalance

Setpoint group	BESS Protections	**Related FW**	2.2.0
Range [units]	1 .. 200 [%] of **Nominal power**		
Default value	50 % of **Nominal power**	**Force value**	NO
Step	1 % of **Nominal power**		
Comm object	8284	**Related applications**	MINT, MPTM
Config level	Advanced		
Setpoint visibility	Only if **Connection type** != MonoPhase		
Description			
This setpoint specifies the relative current threshold level for **BESS Current Unbalance Protection**.			

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BESS Current Unbalance Delay

Setpoint group	BESS Protections	**Related FW**	2.2.0
Range [units]	0.0 .. 600.0 [s]		
Default value	5.0 s	**Force value**	NO
Step	0.1 s		
Comm object	8285	**Related applications**	MINT, MPTM
Config level	Advanced		
Setpoint visibility	Only if **Connection type** != MonoPhase		
Description			
This setpoint specifies the delay for **BESS Current Unbalance Protection**.			

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Subgroup: Voltage Protection

BESS >V

Setpoint group	BESS Protections	**Related FW**	2.2.0
Range [units]	Enabled / Blocked / Protection Force Blocked 1 / Protection Force Blocked 2 / Protection Force Blocked 3 [-]		
Default value	Enabled	**Force value**	YES
Step	[-]		
Comm object	20818	**Related applications**	MINT, MPTM
Config level	Advanced		
Setpoint visibility	Always		
Description			

This setpoint enables or disables BESS >V Protection.

Protection is enabled. Behavior of protection is adjusted via setpoints **BESS >V** and **BESS >V Delay**. When BESS voltage exceeds limit set by **BESS >V** for time longer than **BESS >V Delay** appropriate alarm is activated.

Value	Alarm
BESS Voltage L1-N	**Sd BESS >V L1-N**
BESS Voltage L2-N	**Sd BESS >V L2-N**
BESS Voltage L3-N	**Sd BESS >V L3-N**
BESS Voltage L1-L2	**SdBESS >V L1-L2**
BESS Voltage L2-L3	**Sd BESS >V L2-L3**
BESS Voltage L3-L1	**Sd BESS >V L3-L1**

Setpoint options:

- Enabled / Blocked : Protection is enabled / blocked .
- Protection Force Block 1 / 2 / 3: Protection is enabled or disabled by the state of LBI **PROTECTION FORCE DISABLE BLOCK 1** / **PROTECTION FORCE DISABLE BLOCK 2** / **PROTECTION FORCE DISABLE BLOCK 3**.

IMPORTANT: If this protection is disabled, the BCB cannot be closed.

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BESS >V Delay

Setpoint group	BESS Protections	**Related FW**	2.2.0
Range [units]	0.01 .. 600 [s]		
Default value	5.00 s	**Force value**	YES
Step	0.01 s		
Comm object	8292	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Always		
Description			
This setpoint specifies the delay for **BESS >V**.			

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BESS >>V

Setpoint group	BESS Protections	**Related FW**	2.2.0
Range [units]	**BESS >V** .. 150 [%] of **BESS Nominal Voltage Ph-N** and **BESS Nominal Voltage Ph-Ph**		
Default value	150 % of **BESS Nominal Voltage Ph-N** and **BESS Nominal Voltage Ph-Ph**	**Force value**	YES
Step	1 % of **BESS Nominal Voltage Ph-N** and **BESS Nominal Voltage Ph-Ph**		
Comm object	10013	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Always		
Description			
This setpoint specifies the relative voltage threshold level for **BESS >>V Protection**.			

Note: *BESS Voltage L1-N, BESS Voltage L2-N, BESS Voltage L3-N, BESS Voltage L1-L2, BESSBESS Voltage L2-L3 and BESS Voltage L3-L1 are used for this protection.*

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BESS >>V Delay

Setpoint group	BESS Protections	**Related FW**	2.2.0
Range [units]	0.01 .. 600 [s]		
Default value	0.10 s	**Force value**	YES
Step	0.01 s		
Comm object	16416	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Always		
Description			
This setpoint specifies the delay for **BESS >>V Protection**.			

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BESS <V

Setpoint group	BESS Protections	**Related FW**	2.2.0
Range [units]	20 .. 99 [%] of **BESS Nominal Voltage Ph-N** and **BESS Nominal Voltage Ph-Ph**		
Default value	90 % of **BESS Nominal Voltage Ph-N** and **BESS Nominal Voltage Ph-Ph**	**Force value**	YES
Step	1 % of **BESS Nominal Voltage Ph-N** and **BESS Nominal Voltage Ph-Ph**		
Comm object	8293	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Always		
Description			
This setpoint specifies the relative voltage threshold level for **BESS <V Protection**. ***Note:*** *BESS Voltage L1-N, BESS Voltage L2-N, BESS Voltage L3-N, BESS Voltage L1-L2, BESS**BESS Voltage L2-L3** and **BESS Voltage L3-L1** are used for this protection.*			

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BESS <V Delay

Setpoint group	BESS Protections	**Related FW**	2.2.0
Range [units]	0.01 .. 600.00 [s]		
Default value	5.00 s	**Force value**	YES
Step	0.01 s		
Comm object	16417	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Always		
Description			
This setpoint specifies the delay for **BESS <V Protection**.			

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BESS V Unbalance

Setpoint group	BESS Protections	**Related FW**	2.2.0
Range [units]	1 .. 200 [%]		
Default value	10 %	**Force value**	YES
Step	1 %		
Comm object	8288	**Related applications**	MINT, MPTM
Config level	Advanced		
Setpoint visibility	Only if **Connection type** != MonoPhase		
Description			
This setpoint specifies the relative voltage threshold level for**BESS <V Protection**BESS V Unbalance Protection**.**			

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BESS V Unbalance Delay

Setpoint group	BESS Protections	**Related FW**	2.2.0
Range [units]	0.01 .. 600.00 [s]		
Default value	3.00 s	**Force value**	YES
Step	0.01 s		
Comm object	8289	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Only if **Connection type** != MonoPhase		
Description			
This setpoint specifies the delay for **BESS V Unbalance Protection**.			

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BESS >V

Setpoint group	BESS Protections	**Related FW**	2.2.0
Range [units]	100 .. **BESS >>V** of **BESS Nominal Voltage Ph-N** and **BESS Nominal Voltage Ph-Ph** [%]		
Default value	120 % of **BESS Nominal Voltage Ph-N** and **BESS Nominal Voltage Ph-Ph**	**Force value**	YES
Step	1 % of **BESS Nominal Voltage Ph-N** and **BESS Nominal Voltage Ph-Ph**		
Comm object	8291	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Always		
Description			
This setpoint specifies the relative voltage threshold level for **BESS >V**. ***Note:*** *BESS Voltage L1-N, BESS Voltage L2-N, BESS Voltage L3-N, BESS Voltage L1-L2, BESSBESS Voltage L2-L3 and BESS Voltage L3-L1 are used for this protection.*			

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Subgroup: Frequency Protection

BESS >f

Setpoint group	BESS Protections	**Related FW**	2.2.0
Range [units]	0.00 .. 50.00 [Hz]		
Default value	1.50 Hz	**Force value**	YES
Step	0.01 Hz		
Comm object	8296	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Always		
Description			

This setpoint adjusts maximal accepted frequency for **BESS >f Protection**.

> **IMPORTANT: When Application Mode = MINT this setpoint also specifies the maximal accepted frequency for Bus >f Protection.**

Note: f_{max} = ***Nominal Frequency*** + *BESS >f*

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BESS >f Delay

Setpoint group	BESS Protections	**Related FW**	2.2.0
Range [units]	0.01 .. 600.0 [s]		
Default value	5.00 s	**Force value**	YES
Step	0.01 s		
Comm object	8297	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Always		
Description			

This setpoint specifies the delay for **BESS >f Protection**.

> **IMPORTANT: When Application Mode = MINT this setpoint also specifies the maximal accepted frequency for Bus >f Protection.**

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BESS <f

Setpoint group	BESS Protections	**Related FW**	2.2.0
Range [units]	0.00 .. 50.00 [Hz]		
Default value	1.50 Hz	**Force value**	YES
Step	0.01 Hz		
Comm object	14588	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Always		
Description			

This setpoint adjusts maximal accepted frequency for **BESS <f Protection**.

> **IMPORTANT: When Application Mode = MINT this setpoint also specifies the maximal accepted frequency for Bus <f Protection.**

Note: f_{min} *= **Nominal Frequency** - BESS <f*

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BESS <f Delay

Setpoint group	BESS Protections	**Related FW**	2.2.0
Range [units]	0.01 .. 600.0 [s]		
Default value	5.00 s	**Force value**	YES
Step	0.01 s		
Comm object	16423	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Always		
Description			

This setpoint specifies the delay for **BESS <f Protection**.

> **IMPORTANT: When Application Mode = MINT this setpoint also specifies the maximal accepted frequency for Bus <f Protection.**

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Subgroup: Earth Fault Current Protection

IDMT Earth Fault Current Sd

Setpoint group	BESS Protections	**Related FW**	2.2.0
Range [units]	0 .. 1000 [A]		
Default value	10 A	**Force value**	YES
Step	1 [A]		
Comm object	11632	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Always		
Description			
This setpoint specifies the current threshold level for **Earth Fault Current Protection**.			

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IDMT Earth Fault Current Delay

Setpoint group	BESS Protections	**Related FW**	2.2.0
Range [units]	0.1 .. 600.0 [s]		
Default value	0.1 s	**Force value**	YES
Step	0.1 s		
Comm object	11633	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Always		
Description			
This setpoint specifies the delay for **Earth Fault Current Protection**.			

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Subgroup: SOC Protection

BESS <SOC

Setpoint group	BESS Protections	**Related FW**	2.2.0
Range [units]	**BESS <<SOC** .. 50 [%] of **BESS Nominal Capacity**		
Default value	10 % of **BESS Nominal Capacity**	**Force value**	YES
Step	1 % of **BESS Nominal Capacity**		
Comm object	20263	**Related applications**	MINT, MPTM
Config level	Advanced		
Setpoint visibility	Always		
Description			
This setpoint specifies the relative state of charge threshold level for **BESS <SOC Protection**. Having the SOC below the threshold of the setting of the setpoint it will activate alarm **Wrn SOC Low Alarm**.			

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BESS >SOC

Setpoint group	BESS Protections	**Related FW**	2.2.0
Range [units]	50 .. **BESS >>SOC** [%] of **BESS Nominal Capacity**		
Default value	90 % of **BESS Nominal Capacity**	**Force value**	YES
Step	1 % of **BESS Nominal Capacity**		
Comm object	20264	**Related applications**	MINT, MPTM
Config level	Advanced		
Setpoint visibility	Always		
Description			
This setpoint specifies the relative state of charge threshold level for **BESS >SOC Protection**.Having the SOC above the threshold of the setting of the setpoint it will activate alarm **Wrn SOC High Alarm**..			

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BESS <<SOC

Setpoint group	BESS Protections	**Related FW**	2.2.0
Range [units]	0 .. **BESS <SOC** [%] of **BESS Nominal Capacity**		
Default value	5 % of **BESS Nominal Capacity**	**Force value**	YES
Step	1 % of **BESS Nominal Capacity**		
Comm object	20261	**Related applications**	MINT, MPTM
Config level	Advanced		
Setpoint visibility	Always		
Description			
This setpoint specifies the relative state of charge threshold level for **BESS <<SOC Protection**. Having the SOC below the threshold of the setting of the setpoint it will activate alarm **Sd SOC Critical Low**.			

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BESS >>SOC

Setpoint group	BESS Protections	**Related FW**	2.2.0
Range [units]	**BESS >SOC** .. 120 [%] of **BESS Nominal Capacity**		
Default value	100 % of **BESS Nominal Capacity**	**Force value**	YES
Step	1 % of **BESS Nominal Capacity**		
Comm object	20262	**Related applications**	MINT, MPTM
Config level	Advanced		
Setpoint visibility	Always		
Description			
This setpoint specifies the relative state of charge threshold level for **BESS >>SOC Protection**.Having the SOC above the threshold of the setting of the setpoint it will activate alarm **Sd SOC Critical High**.			

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Group: PV Settings

Subgroup: Curtailment

Curtailment

Setpoint group	Curtailment	**Related FW**	2.2.0
Range [units]	Disabled / Automatic / Manual Control / Manual Limit [-]		
Default value	Automatic	**Force value**	YES
Step	[-]		
Comm object	20243	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Always		
Description			

This setpoint defines the operating mode of the **PV P Control / Curtailment** function. It determines how the system manages photovoltaic (PV) power output in relation to system requirements and constraints

Disabled	The PV curtailment function is turned off. No limitation is applied to PV production, regardless of system conditions.
Automatic	The system automatically regulates PV output to maintain system balance. It ensures that other power sources (e.g., gensets or grid import) operate within predefined limits. This mode is ideal for normal operation where dynamic adjustment is required.
Manual Control	Enables direct manual control of PV curtailment. The output is set explicitly by the user through the **Manual Curtailment** setpoint. This mode is typically used during commissioning or testing.
Manual Limit	The system operates in automatic mode but with an upper limit on curtailment output defined by the **Manual Curtailment** setpoint. This allows for automatic regulation within a user-defined boundary.

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Manual Curtailment

Setpoint group	Curtailment	**Related FW**	2.2.0
Range [units]	0.00 .. 100.00 [%]		
Default value	5 %	**Force value**	YES
Step	0.01		
Comm object	17600	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Always		
Description			
The Manual Curtailment setpoint defines the value used to manually influence the PV curtailment output, depending on the mode selected in the **Curtailment** setpoint. When the Manual Control mode is in use, the value of Manual Curtailment is applied directly as the **Curtailment Output**, allowing full manual control over PV production reduction – typically useful during commissioning or testing. When the Manual Limit mode is in use, the system operates like in automatic mode, but the curtailment output is restricted so that it does not exceed the value defined by Manual Curtailment. This allows the system to maintain automatic regulation while respecting a user-defined upper limit.			

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#Gen P Min

Setpoint group	Curtailment	**Related FW**	2.2.0
Range [units]	0 .. 100 [%] of nominal power of Gen-sets running in PM		
Default value	20 % of nominal power of Gen-sets running in PM	**Force value**	YES
Step	1 % of nominal power of Gen-sets running in PM		
Comm object	18038	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Always		
Description			
This setpoint determinates the level of minimal partial load of Gen-sets working in power management. This is the gen-set power target value for functions Balance (**BESS P and Q control strategies** - Balance Mode) and Curtailment (**PV Output control** - PV P Control/Curtaiment").			

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Subgroup: PW Ramp

PV Ramp Up

Setpoint group	Curtailment	**Related FW**	2.2.0
Range [units]	OFF; 1 .. 1800 [s]		
Default value	20	**Force value**	YES
Step	1		
Comm object	19603	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Always		
Description			
Defines the maximal rate of rise of the value Curtailment Output.			

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PV Ramp Down

Setpoint group	Curtailment	**Related FW**	2.2.0
Range [units]	OFF; 1 .. 1800 [s]		
Default value	OFF	**Force value**	YES
Step	1		
Comm object	19604	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Always		
Description			
Defines the maximal rate of fall of the value Curtailment Output.			

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Subgroup: PV Saturation

Max difference P

Setpoint group	PV	**Related FW**	2.2.0
Range [units]	0.1 .. 20 [%]		
Default value	5	**Force value**	YES
Step	0.1		
Comm object	14084	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Always		
Description			

This setpoint is related to the **PV Output Saturation Function**.

PV as a non-dispatchable source is not able to follow the power demand of PV in every situation. The power is naturally limited by PV array irradiation. Therefore, there are situations where the current PV output is below the maximum allowed PV production level. In this case, the PV saturation detection function is applied. If the relative value of the current PV production, i.e., the current power **PV Actual P** relative to the value of the nominal PV power **PV Nominal P** does not follow the **Curtailment Output** demand and deviates by the **Max difference P** for longer than the **PV Saturated Delay**, the PV integrated within one InteliNeo as a whole is declared saturated. PV in saturation is perceived within the system as a constant source and thus does not participate in curtailment. The saturation information is further shared with other PV controllers across the system. Based on this information, their maximum production can be higher by the power that was not delivered by the PV system that is currently saturated.

During saturation, the **Curtailment Output** is maintained at the value of the current power **PV Actual P** (%) increased by the **Max difference P**.

The PV system returns from saturation to the curtailment function if the relative value of PV rises to 1/2 of the interval between **PV Actual P** (%) and **Max difference P**.

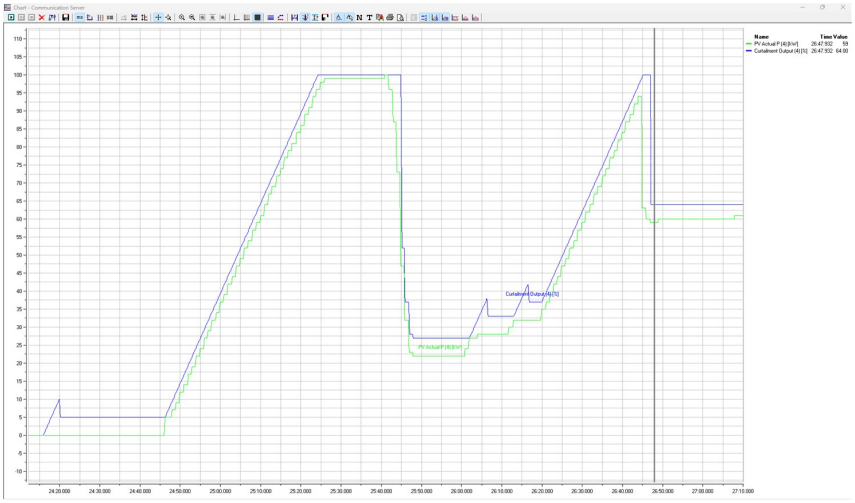

Image 22.7 Start-up of the PV system. The Curtailment outputs waits for PV contribution, then the PV output is ramped up. The Curtailment Output follows the actual PV production anytime it drops due to the low irradiation.

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PV Saturated Delay

Setpoint group	PV	**Related FW**	2.2.0
Range [units]	0.1 .. 20 [s]		
Default value	2	**Force value**	YES
Step	0.1		
Comm object	14085	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Always		
Description			

This setpoint is related to the **PV Output Saturation Function**.

PV as a non-dispatchable source is not able to follow the power demand of PV in every situation. The power is naturally limited by PV array irradiation. Therefore, there are situations where the current PV output is below the maximum allowed PV production level. In this case, the PV saturation detection function is applied. If the relative value of the current PV production, i.e., the current power **PV Actual P** relative to the value of the nominal PV power **PV Nominal P** does not follow the **Curtailment Output** demand and deviates by the **Max difference P** for longer than the **PV Saturated Delay**, the PV integrated within one InteliNeo as a whole is declared saturated. PV in saturation is perceived within the system as a constant source and thus does not participate in curtailment. The saturation information is further shared with other PV controllers across the system. Based on this information, their maximum production can be higher by the power that was not delivered by the PV system that is currently saturated.

During saturation, the **Curtailment Output** is maintained at the value of the current power **PV Actual P** (%) increased by the **Max difference P**.

The PV system returns from saturation to the curtailment function if the relative value of PV rises to 1/2 of the interval between **PV Actual P** (%) and **Max difference P**.

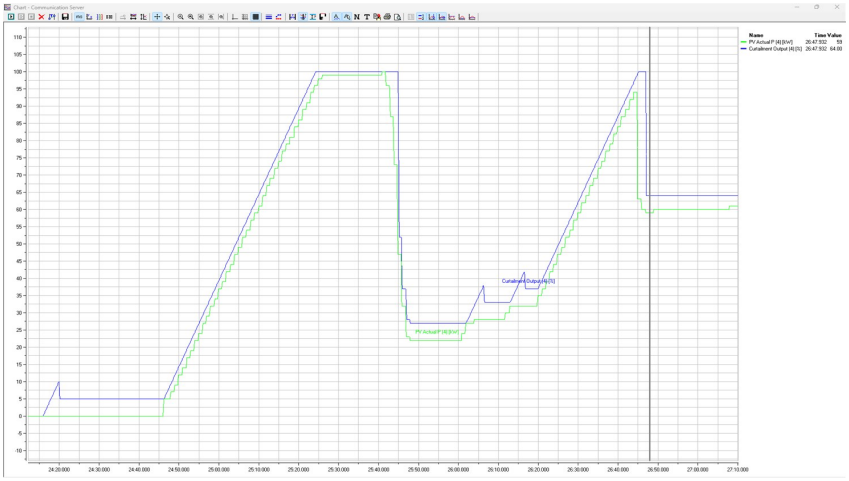

Image 22.8 Start-up of the PV system. The Curtailment outputs waits for PV contribution, then the PV output is ramped up. The Curtailment Output follows the actual PV production anytime it drops due to the low irradiation.

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Subgroup: PF Control

PV Power Factor Request

Setpoint group	PV	**Related FW**	2.2.0
Range [units]	0.001 .. 1.999		
Default value	1.000	**Force value**	YES
Step	0.001		
Comm object	20185	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Always		
Description			
The PF requirement is set by the setpoint **PV Power Factor Request** in the ComAp1 format (see chapter **Formats of Power Factor**) and transformed into the value **PV Power Factor Request** in the EEI format. This value issued as the source of the request sent to the PV inverters. Within a single system (one PV integration by one InteliNeo controller), this request is common to all PV inverters included in this system. For other PV systems integrated by another InteliNeo controller, the PF requirement can be set independently.			

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Subgroup: PV Areas

PV Array Area 1

Setpoint group	PV	**Related FW**	2.2.0
Range [units]	0 .. 32000 [m^2]		
Default value	0	**Force value**	YES
Step	1		
Comm object	19557	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Always		
Description			
Defines the area and target energy output for the PV array 1 and is associated with the LAI: **IRRADIATION OF PV ARRAY 1**.			

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PV Array Area 2

Setpoint group	PV	**Related FW**	2.2.0
Range [units]	0 .. 32000 [m^2]		
Default value	0	**Force value**	YES
Step	1		
Comm object	19558	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Always		
Description			
Defines the area and target energy output for the PV array 2 and is associated with the LAI: **IRRADIATION OF PV ARRAY 2**.			

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PV Array Area 3

Setpoint group	PV	**Related FW**	2.2.0
Range [units]	0 .. 32000 [m^2]		
Default value	0	**Force value**	YES
Step	1		
Comm object	19559	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Always		
Description			
Defines the area and target energy output for the PV array 3 and is associated with the LAI: **IRRADIATION OF PV ARRAY 3**.			

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PV Array Area 4

Setpoint group	PV	**Related FW**	2.2.0
Range [units]	0 .. 32000 [m^2]		
Default value	0	**Force value**	YES
Step	1		
Comm object	19560	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Always		
Description			
Defines the area and target energy output for the PV array 4 and is associated with the LAI: **IRRADIATION OF PV ARRAY 4**.			

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Subgroup: PV Calibration Offset

PV Calib. Offset 1

Setpoint group	PV	**Related FW**	2.2.0
Range [units]	-32000 .. 32000 [kW]		
Default value	0	**Force value**	YES
Step	1		
Comm object	19561	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Always		
Description			
This parameter represents the correction offset for PV Array 1 in kilowatts (kW). The value of this correction can be either positive or negative and is used to correct the output of PV Array 1.			

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PV Calib. Offset 2

Setpoint group	PV	**Related FW**	2.2.0
Range [units]	-32000 .. 32000 [kW]		
Default value	0	**Force value**	YES
Step	1		
Comm object	19562	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Always		
Description			
This parameter represents the correction offset for PV Array 2 in kilowatts (kW). The value of this correction can be either positive or negative and is used to correct the output of PV Array 2.			

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PV Calib. Offset 3

Setpoint group	PV	**Related FW**	2.2.0
Range [units]	-32000 .. 32000 [kW]		
Default value	0	**Force value**	YES
Step	1		
Comm object	19563	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Always		
Description			
This parameter represents the correction offset for PV Array 3 in kilowatts (kW). The value of this correction can be either positive or negative and is used to correct the output of PV Array 3.			

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PV Calib. Offset 4

Setpoint group	PV	**Related FW**	2.2.0
Range [units]	-32000 .. 32000 [kW]		
Default value	0	**Force value**	YES
Step	1		
Comm object	19564	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Always		
Description			
This parameter represents the correction offset for PV Array 4 in kilowatts (kW). The value of this correction can be either positive or negative and is used to correct the output of PV Array 4.			

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Group: WT Settings

Subgroup: PF Control

WT Power Factor Request

Setpoint group	WT Settings	**Related FW**	2.2.0
Range [units]	0.001 .. 1.999		
Default value	1.000	**Force value**	YES
Step	0.001		
Comm object	19174	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Always		
Description			
Required power factor of the WT in parallel to mains operation.			

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Group: Frequency/Load Control

Subgroup: Frequency Control

Frequency Regulator Character

Setpoint group	Frequency/Load Control	**Related FW**	2.2.0
Range [units]	Positive / Negative [-]		
Default value	Positive	**Force value**	YES
Step	[-]		
Comm object	9054	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Always		
Description			

This setpoint selects the characteristic of the **Frequency Regulator Output**. Adjust it according to the behavior of the BESS inverter.

Positive	Raising the voltage on the BESS inverter regulator causes BESS frequency to rise.
Negative	Raising the voltage on the BESS inverter regulator causes BESS frequency to go down.

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Frequency Governor Bias

Setpoint group	Frequency/Load Control	**Related FW**	2.2.0
Range [units]	**Frequency Governor Low Limit** .. **Frequency Governor High Limit** [-]		
Default value	0,00 V	**Force value**	YES
Step	0,01 V		
Comm object	8656	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Always		
Description			

This setpoint adjusts the initial voltage level for the **Frequency Regulator Output**. This level is present on the output, if no speed or power regulation loop is active.

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Frequency Governor Low Limit

Setpoint group	Frequency/Load Control	**Related FW**	2.2.0
Range [units]	-10,00 .. **Frequency Governor High Limit** [V]		
Default value	-10,00 V	**Force value**	YES
Step	0,01 V		
Comm object	10115	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Always		
Description			
The low limit of the **Frequency Regulator Output**. Use this setpoint to adjust the regulator output range according to your BESS inverter regulator.			

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Frequency Governor High Limit

Setpoint group	Frequency/Load Control	**Related FW**	2.2.0
Range [units]	**Frequency Governor Low Limit** .. 10,00 [V]		
Default value	10,00 V	**Force value**	YES
Step	0,01 V		
Comm object	10559	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Always		
Description			
Upper limit of the speed **Frequency Regulator Output**. Use this setpoint to adjust the regulator output range according to your BESS inverter regulator.			

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Frequency Governor PWM Rate

Setpoint group	Frequency/Load Control	**Related FW**	2.2.0
Range [units]	500..2900 [Hz]		
Default value	500 Hz	**Force value**	NO
Step	1 Hz		
Comm object	10911	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Always		
Description			
This setpoint adjusts the frequency of the speed governor PWM output.			

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Tau Frequency Governor Actuator

Setpoint group	Frequency/Load Control	**Related FW**	2.2.0
Range [units]	1,0 .. 300,0 [s]		
Default value	10,0 s	**Force value**	YES
Step	0,1 s		
Comm object	10784	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Always		
Description			
This setpoint is used to adjust the transformation ratio of the **Frequency Regulator Output** to the pulses at the binary outputs **Frequency Up** and **FrequencyFrequency Down**. Adjust the setpoint to the pulse duration which is needed for the regulator of BESS inverter to regulate from minimal position to the maximal position.			

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BESS Frequency Droop Slope

Setpoint group	Frequency/Load Control	**Related FW**	2.2.0
Range [units]	0 .. 20 [%]		
Default value	2	**Force value**	NO
Step	0.01		
Comm object	19450	**Related applications**	MINT, MPTM
Config level	Advanced		
Setpoint visibility	Always		
Description			
This setpoint defines the slope of the load droop correlation. The slope is set as a droop of frequency in percentages of the requested system frequency (**Nominal Frequency**) on the range of the requested power from 0 to 100% of **Nominal power**.			

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Subgroup: Regulation Loops

Dynamic f-U Balance Weight

Setpoint group	Frequency/Load Control	**Related FW**	2.2.0
Range [units]	Disable / Enable [-]		
Default value	Disable	**Force value**	NO
Step	-		
Comm object	17609	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Always		
Description			
Enables or Disables Dynamic f/U Balance Weight. If disabled, the dynamic weight is not applied. For more information **see Dynamic Isochronous Frequency and Voltage Control on page 283**.			

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Frequency Regulation Loop

Setpoint group	Frequency/Load Control	**Related FW**	2.2.0
Range [units]	Sync Only / All The Time [-]		
Default value	Sync Only	**Force value**	YES
Step	[-]		
Comm object	9891	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Always		
Description			

This setpoint selects when the frequency regulation loop is active.

- **SYNC ONLY**: The frequency regulation loop is active only during synchronizing to match the BESS, Mains, or Bus frequencies together. It is assumed that in all other situations where the frequency is to be regulated the BESS governor maintains itself.
- **ALL THE TIME**: This option activates the frequency regulation loop also while the BESS is running without load and during the island operation. The controller maintains frequency at its nominal value adjusted by setpoint **Nominal Frequency**.

Note: *See the chapter **Regulation Loops** for more information.*

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Frequency Gain

Setpoint group	Frequency/Load Control	**Related FW**	2.2.0
Range [units]	0,00 .. 200,00 [-]		
Default value	10,00 [-]	**Force value**	YES
Step	0,01 [-]		
Comm object	8715	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Always		
Description			

This setpoint adjusts the gain factor (P-factor) of the frequency control PI loop.

Note: *See the chapter **Regulation Loops** for more information.*

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Frequency Int

Setpoint group	Frequency/Load Control	**Related FW**	2.2.0
Range [units]	0,10 .. 60,00 [s]		
Default value	2,00 [s]	**Force value**	YES
Step	0,01 [s]		
Comm object	8716	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Always		
Description			
This setpoint adjusts the integration factor (I-factor) of the frequency control PI loop. ***Note:*** *See the chapter* ***Regulation Loops*** *for more information.*			

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Angle Gain

Setpoint group	Frequency/Load Control	**Related FW**	2.2.0
Range [units]	0,00 .. 200,00 [-]		
Default value	10,00 [-]	**Force value**	YES
Step	0,01 [-]		
Comm object	8718	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Always		
Description			
This setpoint is used for adjusting of the gain factor (P-factor) of the phase angle P-control loop. ***Note:*** *During synchronization, first the frequency loop is started to match the BESS frequency with the Mains or bus and after that the phase angle loop is started to match the phase angle.* ***Note:*** *See the chapter* ***Regulation Loops*** *for more information.*			

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Load Gain

Setpoint group	Frequency/Load Control	**Related FW**	2.2.0
Range [units]	0,00 .. 200,00 [-]		
Default value	10,00 [-]	**Force value**	YES
Step	0,01 [-]		
Comm object	8659	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Always		
Description			
This setpoint adjusts the gain factor (P-factor) of the load control PI loop. ***Note:*** *See the chapter* ***Regulation Loops*** *for more information.*			

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Load Int

Setpoint group	Frequency/Load Control	**Related FW**	2.2.0
Range [units]	0,10 .. 60,00 [s]		
Default value	2,00 [s]	**Force value**	YES
Step	0,01 [s]		
Comm object	8713	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Always		
Description			
This setpoint adjusts the integration factor (I-factor) of the load control PI loop. ***Note:*** *See the chapter* ***Regulation Loops*** *for more information.*			

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Load Sharing Gain

Setpoint group	Frequency/Load Control	**Related FW**	2.2.0
Range [units]	0,00 .. 200,00 [-]		
Default value	10,00 [-]	**Force value**	YES
Step	0,01 [-]		
Comm object	8725	**Related applications**	MINT
Config level	Standard		
Setpoint visibility	Only if **Application Mode** = MINT		
Description			
This setpoint adjusts the gain factor (P-factor) of the load sharing control PI loop. ***Note:*** *See the chapter **Regulation Loops** for more information.*			

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Load Sharing Int

Setpoint group	Frequency/Load Control	**Related FW**	2.2.0
Range [units]	0,10 .. 60,00 [s]		
Default value	2,00 [s]	**Force value**	YES
Step	0,01 [s]		
Comm object	9035	**Related applications**	MINT
Config level	Standard		
Setpoint visibility	Only if **Application Mode** = MINT		
Description			
This setpoint adjusts the integration factor (I-factor) of the load sharing control PI loop. ***Note:*** *See the chapter **Regulation Loops** for more information.*			

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Frequency Balancing Weight

Setpoint group	Frequency/Load Control	**Related FW**	2.2.0
Range [units]	0.000 .. 10.000 [-]		
Default value	1.000	**Force value**	YES
Step	0.001		
Comm object	18574	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Always		
Description			
The parameters of Load Sharing control loop influence the regulation process of Load Sharing itself after that it influence the Isochronous control of the frequency in island operation. The frequency iscoc control participates on the control process as feed forward component. The default weight of this component related to the Load Sharing control is set internally and can be influenced by the setpoint **Frequency Balancing Weight**. Default value 1,000 should ensure the good stability and balance between both components. However iscoc control of the frequency can be accelerated or decelerated using settings of this parameter in range 0,000 .. 10,000. The value has the meaning of multiplication of the default iscoc control loop response.			

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Subgroup: Load Transfer

Close Transfer Max Duration

Setpoint group	Frequency/Load Control	**Related FW**	2.2.0
Range [units]	< 0,1 = 0,0; 0,1 .. 600,0 [s]		
Default value	5,0 s	**Force value**	YES
Step	0,1 s		
Comm object	8661	**Related applications**	MPTM
Config level	Standard		
Setpoint visibility	Only if **Application Mode** = MPTM		
Description			
The time of parallel work of BESS and Mains in close transition. Physical time of close transfer is always longer than this setpoint (it takes time to detect the closing of the breaker, etc.).			

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Open Transfer Min Break

Setpoint group	Frequency/Load Control	**Related FW**	2.2.0
Range [units]	< 0,1 = 0,0; 0,1 .. 600,0 [s]		
Default value	1,0 s	**Force value**	YES
Step	0,1 s		
Comm object	8303	**Related applications**	MPTM
Config level	Standard		
Setpoint visibility	Only if **Application Mode** = MPTM		
Description			
Minimal duration of break in open transition when **Transfer BESS To Mains** or **Transfer Mains To BESS** is chosen as open transfer.			

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Transfer Mains To BESS

Setpoint group	Frequency/Load Control	**Related FW**	2.2.0
Range [units]	Open / Close Only / Close Prim / SoftTransf [-]		
Default value	SoftTransf	**Force value**	YES
Step	[-]		
Comm object	12969	**Related applications**	MPTM
Config level	Standard		
Setpoint visibility	Only if **Application Mode** = MPTM		

Description

This setpoint defines the type of transfer of load from Mains to BESS.

Open	Transfer of the load from Mains to BESS without parallel work and synchronization (one breaker opens and second is closed - checking feedbacks). The setpoint **Open Transfer Min Break** sets the minimal duration of break.
Close Only	Transfer of the load from Mains to BESS with synchronization and parallel work. The time of parallel work is given by setpoint **Close Transfer Max Duration**. In case of synchronization fail, MCB stays close and BESS is stopped.
Close Prim	Transfer of the load from Mains to BESS with synchronization and parallel work. The time of parallel work is given by setpoint **Close Transfer Max Duration**. In case of synchronization fail, open transfer is done.
SoftTransf	Transfer of the load from Mains to BESS with parallel work and soft loading of the BESS. This function is proceeded like the closed transfer, but there is time limitation of loading of theBESS adjusted via setpoint **Load Ramp Island**. The transfer is succeed only when theBESS is fully loaded – Mains is fully unloaded (level of load when Mains is considered as unloaded is adjusted via setpoint **Mains Unload MCB Open Window**).

Note: *Close transfer of load is also affected by setpoint **Mains Measurement P**.*

Note: *The behavior of transition of load in MAN mode is adjusted via setpoint **CB Control In MAN Mode**.*

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Transfer BESS To Mains

Setpoint group	Frequency/Load Control	**Related FW**	2.2.0
Range [units]	Open / Close Only / Close Prim / SoftTransf [-]		
Default value	SoftTransf	**Force value**	YES
Step	[-]		
Comm object	14688	**Related applications**	MPTM
Config level	Standard		
Setpoint visibility	Only if **Application Mode** = MPTM		
Description			

This setpoint defines the type of transfer of load from BESS to Mains.

Open	Transfer of the load from BESS to Mains without parallel work and synchronization (one breaker opens and second is closed - checking feedbacks). The setpoint **Open Transfer Min Break** sets the minimal duration of break.
Close Only	Transfer of the load from BESS to Mains with synchronization and parallel work. The time of parallel work is given by setpoint **Close Transfer Max Duration**. In case of synchronization fail, BCB stays closed and BESS keeps running.
Close Prim	Transfer of the load from BESS to Mains with synchronization and parallel work. The time of parallel work is given by setpoint **Close Transfer Max Duration**. In case of synchronization fail, open transfer is done.
SoftTransf	Transfer of the load from BESS to Mains with parallel work and soft unloading of the BESS. This function is proceeded like the closed transfer, but there is time limitation of unloading of the BESS adjusted via setpoint **Soft Unload Ramp**. The transfer is succeed only when the BESS is fully unloaded (level of load when BESS is considered as unloaded is adjusted via setpoint **BESS Unload BCB Open Level**).

Note: *The behavior of transition of load in SEM mode is adjusted via setpoint **CB Control In MAN Mode**.*

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BESS Unload BCB Open Level

Setpoint group	Frequency/Load Control	**Related FW**	2.2.0
Range [units]	0 .. 100 [%] of **Nominal power** or **Installed Power**		
Default value	10 % of **Nominal power** or **Installed Power**	**Force value**	YES
Step	1 % of **Nominal power** or **Installed Power**		
Comm object	8547	**Related applications**	MPTM
Config level	Standard		
Setpoint visibility	Always		
Description			

This setpoint adjusts the required value of the **BESS P** related to **Nominal power**/**Installed Power** for opening the BCB breaker during unloading of the BESS.

Note: *This setpoint is usually higher than 0 to prevent the BESS going to reverse power.*

Note: The value of this setpoint relates to Installed Power only if Installed Power != OFF, otherwise it relates to Nominal power.

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Mains Unload MCB Open Window

Setpoint group	Frequency/Load Control	**Related FW**	2.2.0
Range [units]	0 .. 100 [%] of **Nominal power**		
Default value	1 % of **Nominal power**	**Force value**	YES
Step	1 % of **Nominal power**		
Comm object	14694	**Related applications**	MPTM
Config level	Standard		
Setpoint visibility	Only if **Application Mode** = MPTM		
Description			

This setpoint adjusts the value which defines the level where the Mains is considered as unloaded. When this window is reached and it is required to open MCB, the MCB will be opened and remaining load in the window will be transfer to BESS.

> **IMPORTANT: If the window is set too high the Mains can be considered as unloaded and MCB will be opened while there is not enough reserve power on BESS. This can cause overload of BESS and blackout.**

Note: *This setpoint is window. It means that when you adjust this setpoint to 10%, there is window from -10% to +10%. The reason is Import/Export function.*

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Soft Load Ramp

Setpoint group	Frequency/Load Control	**Related FW**	2.2.0
Range [units]	0 .. 1800 [s]		
Default value	60 s	**Force value**	YES
Step	1 s		
Comm object	17603	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Always		
Description			
Description = This load ramp is applied during the soft loading process immediately after BESS is connected to the common bus and steps in the Soft Load state. The power request - Value **BESS Required P** is always ramped to the value **BESS Required P Target**. **Example: Installed Power** = 20 kW, Soft Load Ramp = 10 seconds. The ramp is changing with speed 20 kW per 10 seconds (2 kW/s) to the zero value.			

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Load Ramp PTM

Setpoint group	Frequency/Load Control	**Related FW**	2.2.0
Range [units]	0 .. 1800 [s]		
Default value	30 s	**Force value**	YES
Step	1 s		
Comm object	17602	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Always		
Description			
This load ramp is applied for any change of active power of the BESS in Loaded state when operating in parallel to mains. The power request - Value **BESS Required P** is always ramped to the value **BESS Required P Target**. **Example: Installed Power** = 20 kW, Load Ramp PTM = 10 seconds. The ramp is changing with speed 20 kW per 10 seconds (2 kW/s) to the zero value.			

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Load Ramp Island

Setpoint group	Frequency/Load Control	**Related FW**	2.2.0
Range [units]	0 .. 600 [s]		
Default value	200 s	**Force value**	YES
Step	1 s		
Comm object	8658	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Always		
Description			

This load ramp is applied for any change of active power of the BESS in Loaded state when operating in island. The power request - Value **BESS Required P** is always ramped to the value **BESS Required P Target**.

> **Example: Installed Power** = 20 kW, Load Ramp Island = 10 seconds. The ramp is changing with speed 20 kW per 10 seconds (2 kW/s) to the zero value.

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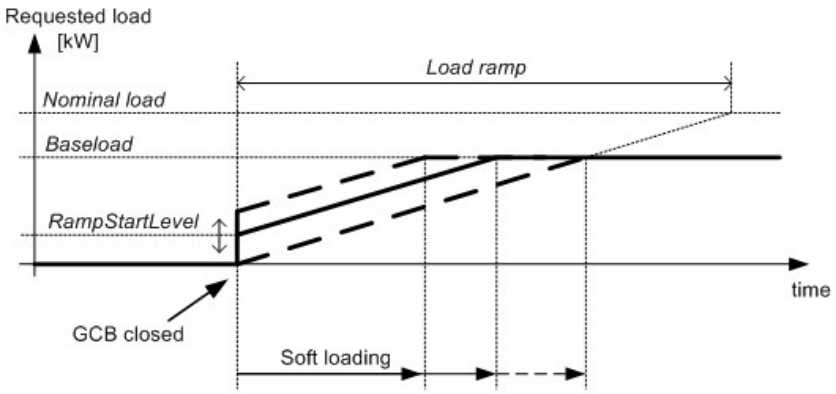
Ramp Start Level

Setpoint group	Frequency/Load Control	**Related FW**	2.2.0
Range [units]	0 .. 100 [%] of **Nominal power** or **Installed Power**		
Default value	0 % of **Nominal power** or **Installed Power**	**Force value**	YES
Step	1 % of **Nominal power** or **Installed Power**		
Comm object	10912	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Always		
Description			

This setpoint adjusts the load level at which the **Load Ramp Island** starts after the BCB has been closed.

> ***Note:*** *The value of this setpoint relates to **Installed Power** only if **Installed Power** != OFF, otherwise it relates to **Nominal power**.*



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Soft Unload Ramp

Setpoint group	Frequency/Load ControlGrid Codes	**Related FW**	2.2.0
Range [units]	0 .. 1800 [s]		
Default value	60 s	**Force value**	YES
Step	1 s		
Comm object	16489	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Only if **Application Mode** = MPTM		
Description			

This setpoint adjusts the ramping time of the **BESS Required P** to the **BESS Required P Target** while soft unloading when BCB is requested to be opened.

The Required P reach the zero value at the end of the timer. The ramping time is set for ΔP which is given by the setpoint **Installed Power** or by the setpoint **Nominal power** if the Installed Power is OFF.

> **Example: Installed Power** = 20 kW, Soft Unload Ramp = 10 seconds. The ramp is changing with speed 20 kW per 10 seconds (2 kW/s) to the zero value.

Note: *This setpoint is shared with the other Soft Unload Ramp setpoint.*

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Group: Voltage/PF Control

Subgroup: Voltage Control

Voltage Regulator Character

Setpoint group	Voltage/PF Control	**Related FW**	2.2.0
Range [units]	Positive / Negative [-]		
Default value	Positive	**Force value**	YES
Step	[-]		
Comm object	9055	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Always		
Description			

This setpoint selects the characteristic of the **Voltage Regulator Output**. Adjust it according to the behavior of the remote voltage input of the governor.

Positive	Raising the voltage on the remote voltage adjustment input causes the BESS voltage to raise.
Negative	Raising the voltage on the remote voltage adjustment input causes the BESS voltage to go down.

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Voltage Regulator Bias

Setpoint group	Voltage/PF Control	**Related FW**	2.2.0
Range [units]	**Voltage Regulator Low Limit** .. **Voltage Regulator High Limit** [V]		
Default value	0,00 V	**Force value**	YES
Step	0,01 V		
Comm object	8500	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Always		
Description			
This setpoint adjusts the initial level for the **Voltage Regulator Output**. This level is present on the output if no regulation loop is active.			

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Voltage Regulator Low Limit

Setpoint group	Voltage/PF Control	**Related FW**	2.2.0
Range [units]	-10,00 .. **Voltage Regulator High Limit** [V]		
Default value	-10,00 V	**Force value**	YES
Step	0,01 V		
Comm object	14792	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Always		
Description			
Lower limit of the **Voltage Regulator Output**. Use this setpoint to adjust the governor output range according to your governor type.			

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Voltage Regulator High Limit

Setpoint group	Synchronization	**Related FW**	2.2.0
Range [units]	**Voltage Regulator Low Limit** .. 10,00 [V]		
Default value	10,00 V	**Force value**	YES
Step	0,01 V		
Comm object	14793	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Always		
Description			
Upper limit of the **Voltage Regulator Output**. Use this setpoint to adjust the governor output range according to your governor type.			

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Tau Voltage Regulator Actuator

Setpoint group	Voltage/PF Control	**Related FW**	2.2.0
Range [units]	1,0 .. 300,0 [s]		
Default value	10,0 s	**Force value**	YES
Step	0,1 s		
Comm object	10785	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Always		
Description			
This setpoint is used to adjust the transformation ratio of the **Voltage Regulator Output** to the pulsesat the binary outputs **VOLTAGE UP** and **VOLTAGE DOWN**. Adjust the setpoint to the pulse duration which is needed for the regulator of BESS inverter to regulatefrom minimal position to the maximal position.			

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BESS Voltage Droop Slope

Setpoint group	Voltage/PF Control	**Related FW**	2.2.0
Range [units]	0 .. 20 [%]		
Default value	1	**Force value**	NO
Step	0.001		
Comm object	19449	**Related applications**	MINT, MPTM
Config level	Advanced		
Setpoint visibility	Always		
Description			
This setpoint defines the slope of the droop correlation. The slope is set as a droop of voltage in percentages of the generator nominal voltage (**BESS Nominal Voltage Ph-N**) on the range of the requested reactive power from 0 to 100% of nominal reactive power (value of nominal reactive power is not given by setpoint but it is calculated from setpoint **Nominal power** whilst the PF=0,8).			

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Subgroup: Regulation Loops

Dynamic f-U Balance Weight

Setpoint group	Frequency/Load Control	**Related FW**	2.2.0
Range [units]	Disable / Enable [-]		
Default value	Disable	**Force value**	NO
Step	-		
Comm object	17609	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Always		
Description			
Enables or Disables Dynamic f/U Balance Weight. If disabled, the dynamic weight is not applied. For more information **see Dynamic Isochronous Frequency and Voltage Control on page 283**.			

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Voltage Gain

Setpoint group	Voltage/PF Control	**Related FW**	2.2.0
Range [units]	0.00 .. 200.00 [-]		
Default value	10.00 [-]	**Force value**	YES
Step	0.01 [-]		
Comm object	8501	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Always		
Description			
This setpoint adjusts the gain factor (P-factor) of the voltage control PI loop. ***Note:*** *See the chapter **Regulation Loops** for more information.*			

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Voltage Int

Setpoint group	Voltage/PF Control	**Related FW**	2.2.0
Range [units]	0.10 .. 60.00 [s]		
Default value	2.00 [s]	**Force value**	YES
Step	0.01 [s]		
Comm object	8720	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Always		
Description			
This setpoint adjusts the integration factor (I-factor) of the voltage control PI loop. ***Note:*** *See the chapter* ***Regulation Loops*** *for more information.*			

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PF Gain

Setpoint group	Voltage/PF Control	**Related FW**	2.2.0
Range [units]	0.00 .. 200.00 [-]		
Default value	10.00 [-]	**Force value**	YES
Step	0.01 [-]		
Comm object	8503	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Always		
Description			
This setpoint adjusts the gain factor (P-factor) of the PF control PI loop. ***Note:*** *See the chapter* ***Regulation Loops*** *for more information.*			

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PF Int

Setpoint group	Voltage/PF Control	**Related FW**	2.2.0
Range [units]	0.10 .. 60.00 [s]		
Default value	2.00 [s]	**Force value**	YES
Step	0.01 [s]		
Comm object	8721	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Always		
Description			
This setpoint adjusts the integration factor (I-factor) of the PF control PI loop. ***Note:*** *See the chapter* ***Regulation Loops*** *for more information.*			

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VAr Sharing Gain

Setpoint group	Voltage/PF Control	**Related FW**	2.2.0
Range [units]	0.00 .. 200.00 [-]		
Default value	10.00 [-]	**Force value**	YES
Step	0.01 [-]		
Comm object	8777	**Related applications**	MINT
Config level	Standard		
Setpoint visibility	Only if **Application Mode** = MINT		
Description			
This setpoint adjusts the gain factor (P-factor) of the VAr sharing control PI loop. ***Note:*** *See the chapter* ***Regulation Loops*** *for more information.*			

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VAr Sharing Int

Setpoint group	Voltage/PF Control	**Related FW**	2.2.0
Range [units]	0.10 .. 60.00 [s]		
Default value	2.00 [s]	**Force value**	YES
Step	0.01 [s]		
Comm object	9036	**Related applications**	MINT
Config level	Standard		
Setpoint visibility	Only if **Application Mode** = MINT		
Description			
This setpoint adjusts the integration factor (I-factor) of the VAr sharing control PI loop. ***Note:*** *See the chapter **Regulation Loops** for more information.*			

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Voltage Balancing Weight

Setpoint group	Voltage/PF Control	**Related FW**	2.2.0
Range [units]	0.000 .. 10.000 [-]		
Default value	1.000	**Force value**	YES
Step	0.001		
Comm object	18573	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Always		
Description			
The parameters of VAr Sharing control loop influence the regulation process of VAr Sharing itself after that it influence the isochronous control of the voltage in island operation. The voltage iscoc control participates on the control process as feed forward component. The default weight of this component related to the VAr Sharing control is set internally and can be influenced by the setpoint "**Voltage Balancing Weight**". Default value 1,000 should ensure the good stability and balance between both components. However iscoc control of the voltage can be accelerated or decelerated using settings of this parameter in range 0,000 .. 10,000. The value has the meaning of multiplication of the default iscoc control loop response.			

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Group: Synchronization

Subgroup: Synchronization

Synchronization Type

Setpoint group	Synchronization	**Related FW**	2.2.0
Range [units]	PhaseMatch / SlipSynchr [-]		
Default value	PhaseMatch	**Force value**	YES
Step	[-]		
Comm object	14802	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Always		
Description			

This setpoint adjusts the type of **Synchronization**.

- PhaseMatch

  This type of synchronization is based on voltage and phase shift match. Limits are adjusted via setpoints **Voltage Window** and **Phase Window**. When voltage and phase shift match the breaker close command is sent after **Dwell Time** is elapsed.

- SlipSynchr

  This type of synchronization regulates the voltage to match **Voltage Window** and **BESS Frequency** to match the**Mains/Bus Frequency +Slip Frequency**. When this frequency is reached, **Dwell Time** starts to be counted down and when elapses, breaker close command is sent.

> **IMPORTANT: The breaker close command is sent in advance due to breaker latency which is set via setpoint BCB Latency / MCB Latency.**

Note: *Synchronization is not allowed if there is any already synchronized Mains Controller in the control group.*

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Synchronization Timeout

Setpoint group	Synchronization	**Related FW**	2.2.0
Range [units]	1 .. 1800 [s] / No Timeout		
Default value	60 s	**Force value**	YES
Step	1 s		
Comm object	8657	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Always		
Description			
This setpoint adjusts the maximum duration of **Synchronization**. ***Note:*** *If this setpoint is adjusted to No Timeout then automatic restart of synchronization occurs every 180s. This method helps to synchronize successfully even in difficult conditions.*			

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Voltage Window

Setpoint group	Synchronization	**Related FW**	2.2.0
Range [units]	0.0 .. 100.0 [%]		
Default value	10.0 %	**Force value**	YES
Step	0.1 %		
Comm object	8650	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Always		
Description			
This setpoint adjusts the maximal AC Voltage difference between respective phases of Mains/Bus and BESS for **Synchronization**. (**BESS Voltage L1-N**, **Mains/Bus Voltage L1-N**, **BESS Voltage L2-N**,**Mains/Bus Voltage L2-N**, …)			

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BESS to Mains/Bus Phase Shift

Setpoint group	Synchronization	**Related FW**	2.2.0
Range [units]	-120 .. 120 [°]		
Default value	0 [°]	**Force value**	YES
Step	1 [°]		
Comm object	9578	**Related applications**	MPTM
Config level	Standard		
Setpoint visibility	Always		
Description			
This setpoint is used to compensate phase shift which is caused by transformer.			

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Phase Window

Setpoint group	Synchronization	**Related FW**	2.2.0
Range [units]	0 .. 90 [°]		
Default value	10 °	**Force value**	YES
Step	1 °		
Comm object	8652	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Only if **Synchronization Type** = PhaseMatch		
Description			
This setpoint adjusts the maximal **Slip Angle** for **Synchronization**. In order to disable breaker close command, adjust this setpoint to 0. Synchronization procedure will be active for **Synchronization Timeout** or until breaker is closed from an external device.			

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Dwell Time

Setpoint group	Synchronization	**Related FW**	2.2.0
Range [units]	0,0 .. 25,0 [s]		
Default value	0,3 s	**Force value**	YES
Step	0,1 s		
Comm object	8653	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Always		
Description			
The period of time that the phase angle difference must be within **Phase Window** and voltage difference within **Voltage Window** before the breaker is closed.			

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Slip Frequency

Setpoint group	Synchronization	**Related FW**	2.2.0
Range [units]	-0,50 .. 0,50 [Hz]		
Default value	-0,25 Hz	**Force value**	YES
Step	0,01 Hz		
Comm object	14798	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Only if **Synchronization Type** = SlipSynchr		
Description			
This setpoint adjusts the required **BESS Frequency** during synchronization while **Synchronization Type** = SlipSynchr. ***Note:*** *Required **BESS Frequency** = **Mains/Bus Frequency** + Slip Frequency.*			

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Slip Frequency Window

Setpoint group	Synchronization	**Related FW**	2.2.0
Range [units]	0,01 .. 0,50 [Hz]		
Default value	0,15 Hz	**Force value**	YES
Step	0,01 Hz		
Comm object	14799	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Only if **Synchronization Type** = SlipSynchr		
Description			
Window of slip frequency for slip synchronization (**Synchronization Type** = SlipSynchr).			

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BCB Latency

Setpoint group	Synchronization	**Related FW**	2.2.0
Range [units]	20 .. 1 000 [ms]		
Default value	80 ms	**Force value**	YES
Step	1 ms		
Comm object	14800	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Only if **Synchronization Type** = SlipSynchr		
Description			
Latency of BCB. This setpoint is enable, when **Synchronization Type** has SlipSynchro value.			

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MCB Latency

Setpoint group	Synchronization	**Related FW**	2.2.0
Range [units]	20 .. 1 000 [ms]		
Default value	80 ms	**Force value**	YES
Step	1 ms		
Comm object	14801	**Related applications**	MPTM
Config level	Standard		
Setpoint visibility	Only if **Synchronization Type** = SlipSynchr		
Description			

Latency of MCB.

> **IMPORTANT: This setpoint is enable, when Synchronization Type has Split Synchro value**

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Group: Power Management

Subgroup: Power Management Control

Power Management

Setpoint group	Power Management	**Related FW**	2.2.0
Range [units]	Disabled / Enabled [-]		
Default value	Enabled	**Force value**	YES
Step	[-]		
Comm object	8551	**Related applications**	MINT
Config level	Standard		
Setpoint visibility	Only if **Application Mode** = MINT		
Description			

This setpoint is used to enable or disable the **Power Management** function in this particular controller.

- **Disabled** - Function is disabled. Universal Genset is Started/Stopped only via LBI **UNIVERSAL GENSET START/STOP**.
- **Enabled** - Function is enabled. Starting/Stopping of Universal Genset is affected by **Power Management** requirements.

> **IMPORTANT: Controller Mode =** AUTO, otherwise BESS is not controlled with **Power Management** function.

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Power Management Delay

Setpoint group	Power Management	**Related FW**	2.2.0
Range [units]	0 .. 3600 [s]		
Default value	0 s	**Force value**	YES
Step	1 s		
Comm object	12488	**Related applications**	MINT
Config level	Standard		
Setpoint visibility	Only if **Application Mode** = MINT		
Description			

Setpoint defines delay of the **Power Management**. When **UNIVERSAL GENSET START/STOP** signal is activated the BESS are started. All BESS (where **Power Management** is enabled) are started and stay running for time period specified by this parameter.

After this period elapses, only the unit(s) needed according to the Power Management calculation stay running and the rest is stopped.

> **Example:** This delay is useful, when you need to start BESS to an unknown load. Setting for example 360s (6 minutes) and activating **UNIVERSAL GENSET START/STOP** will force all gen-sets to start and run for 6 minutes despite of the power management setting.

Note: *By setting "0" the Power Management function is enabled immediately.*

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#Power Management Mode

Setpoint group	Power Management	**Related FW**	2.2.0
Range [units]	ABS [kW] / ABS (kVA) / REL [%]		
Default value	ABS [kW]	**Force value**	NO
Step	[-]		
Comm object	9874	**Related applications**	MINT
Config level	Standard		
Setpoint visibility	Only if **Application Mode** = MINT		
Description			

This setpoint selects the **Power Management** function mode.

ABS [kW]	The **Power Management** is based on **Total Running P** and **Nominal power** or **Installed Power** of each unit.
ABS (kVA)	The **Power Management** is based on total running apparent power in PM and nominal apparent power.
REL [%]	The **Power Management** is based on relative load, i.e. ratio of **Total Running P** to **Nominal power** or **Installed Power**.

> **IMPORTANT:** This setpoint is shared via **CAN2A** and/or **CAN2B .** Change of this setpoint will be reflected in all controllers.

Note: *Setpoint shared throughout the system, is not applicable in InteliNeo.*

Note: *The value of this setpoint relates to **Installed Power** only if **Installed Power** != OFF, otherwise it relates to **Nominal power**.*

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Priority

Setpoint group	Power Management	**Related FW**	2.2.0
Range [units]	1 .. 64 [-]		
Default value	1 [-]	**Force value**	YES
Step	1 [-]		
Comm object	8488	**Related applications**	MINT
Config level	Standard		
Setpoint visibility	Only if **Application Mode** = MINT		
Description			

This setpoint adjusts the priority of the unit within the control group. A lower number represents a “higher” priority, i.e. a Gen-set (Universal Genset) with lower number will start before another one with higher number.

Note: *If the binary input **Top Priority** is active, the unit gets the highest priority (0) independent of the setpoint setting.*

Note: *If more than one unit have the same priority they will act as “one big” unit.*

Note: *The main idea of renewables is to run with the maximal priority. So it is expect the Microgrid site will not be influenced by the power management because BESS and renewables shloud always run.*

Note: *The setpoint is relevant with function Universal Genset in InteliNeo and does not affects the BESS.*

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#Priority Auto Swap

Setpoint group	Power Management	**Related FW**	2.2.0
Range [units]	Disabled / RunHourEq / N/A Mode / Efficient [-]		
Default value	Disabled	**Force value**	NO
Step	[-]		
Comm object	10593	**Related applications**	MINT
Config level	Standard		
Setpoint visibility	Only if **Application Mode** = MINT		
Description			

This setpoint selects the optimization of **Power Management** function.

Disabled	Optimization is disabled. Priorities are given directly by the values adjusted in the setpoint **Priority**.
Run Hours Equal	This method changes the **Engine Priority** (not the setpoint **Priority**) to equalize running hours of the units or to keep maximal difference of running hours set by **#Run Hours Max Difference**.
N/A Mode	Power Management mode, which has been set via **CAN2A** (**Communication peripherals**), is not supported in this controller.
Efficient	This method changes the **Engine Priority** (not the setpoint **Priority**) to optimize which units are running according to their **Nominal power**/**Installed Power**, requested Load reserve and Run Hours. For units with the same nominal power also run hour equalization is being performed.

IMPORTANT: LBI Top Priority can be used only if #Priority Auto Swap = Disabled.

IMPORTANT: This setpoint is shared via **CAN2A** and/or **CAN2B** . Change of this setpoint will be reflected in all controllers.

Note: *The value of this setpoint relates to **Installed Power** only if **Installed Power** != OFF, otherwise it relates to **Nominal power**.*

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#System Start Delay

Setpoint group	Power Management	**Related FW**	2.2.0
Range [units]	0 .. 600 [s]		
Default value	5 s	**Force value**	NO
Step	1 s		
Comm object	8549	**Related applications**	MINT
Config level	Standard		
Setpoint visibility	Only if **Application Mode** = MINT		
Description			

This setpoint adjusts the delay of the system activation after the LBI **Universal Genset Start/Stop** has been activated.

Note: *System Start Delay countdown is changed to 1 second for parallel operation (Bus is in parallel with Mains).*

> **IMPORTANT:** This setpoint is shared via **CAN2A** and/or **CAN2B** . Change of this setpoint will be reflected in all controllers.

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#System Stop Delay

Setpoint group	Power Management	**Related FW**	2.2.0
Range [units]	0 .. 600 [s]		
Default value	30 s	**Force value**	NO
Step	1 s		
Comm object	8550	**Related applications**	MINT
Config level	Standard		
Setpoint visibility	Only if **Application Mode** = MINT		
Description			

This setpoint adjusts the delay of the system deactivation after the LBI **Universal Genset Start/Stop** has been deactivated.

Note: *System Stop Delay countdown is changed to 1 second for parallel operation (Bus is in parallel with Mains).*

> **IMPORTANT:** This setpoint is shared via **CAN2A** and/or **CAN2B** . Change of this setpoint will be reflected in all controllers.

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Subgroup: Dynamic Spinning Reserve

Dynamic Spinning Reserve

Setpoint group	Power Management	**Related FW**	2.2.0
Range [units]	Enabled / Disabled [-]		
Default value	Disabled	**Force value**	NO
Step	[-]		
Comm object	14126	**Related applications**	MINT
Config level	Standard		
Setpoint visibility	Only if **Application Mode** = MINT		
Description			
This setpoint is used to enable/disable use of the **Dynamic Spinning Reserve** functionality in power management. ***Note:*** *If enabled option is selected the InteliNeo 6000 controller also participate on DSR in the same way as Gen-set controllers setpoint should be used only to have the same calculation of Load Reserve and DSR as rest of controllers in group.*			

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PV Coverage Ratio

Setpoint group	Power Management	**Related FW**	2.2.0
Range [units]	0 .. 100 [%] of **PV Actual P**		
Default value	100 % of **PV Actual P**	**Force value**	YES
Step	1 % of **PV Actual P**		
Comm object	20247	**Related applications**	MINT
Config level	Standard		
Setpoint visibility	Always		
Description			
This setpoint defines how much percent from actual power of the PV should be covered by (counted in) **Dynamic Spinning Reserve**.			

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WT Coverage Ratio

Setpoint group	Power Management	**Related FW**	2.2.0
Range [units]	0 .. 100 [%] of **WT Actual P**		
Default value	100 % of **WT Actual P**	**Force value**	YES
Step	1 % of **WT Actual P**		
Comm object	19715	**Related applications**	MINT
Config level	Standard		
Setpoint visibility	Always		
Description			
This setpoint defines how much percent from actual power of the WT should be covered by (counted in) **Dynamic Spinning Reserve**.			

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Subgroup: Load Reserve Set 1

#Starting Load Reserve 1

Setpoint group	Power Management	**Related FW**	2.2.0
Range [units]	0 .. **#Stopping Load Reserve 1** [kW] (depends on the selected **Power Formats And Units**)		
Default value	60 kW (depends on the selected **Power Formats And Units**)	**Force value**	NO
Step	1 kW (depends on the selected **Power Formats And Units**)		
Comm object	8489	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Only if **#Power Management Mode** = ABS [kW]		
Description			

This setpoint adjusts required minimal **Actual Reserve** for **Power Management** function.

If Load Reserve Set 1 is activated and **Actual Reserve** drops below this limit, next Source will be started.

The currently active reserve set is selected by binary inputs **Load Res 2 Active**, **Load Res 3 Active** and **Load Res 4 Active**. If none of these inputs is active the Load Reserve Set 1 is selected.

> ***Note:*** *If the absolute power management is selected, this setpoint (or the setpoints **#Starting Load Reserve 2**, **#Starting Load Reserve 3** or **#Starting Load Reserve 4** depending on which load reserve set is selected) determines also the number of Controllers (that are part of the power management) which will start (according to their priority and nominal power).*

> **IMPORTANT:** This setpoint is shared via **CAN2A** and/or **CAN2B** . Change of this setpoint will be reflected in all controllers.

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#Stopping Load Reserve 1

Setpoint group	Power Management	**Related FW**	2.2.0
Range [units]	**#Starting Load Reserve 1** .. 32000 [kW] (depends on the selected **Power Formats And Units**)		
Default value	110 kW (depends on the selected **Power Formats And Units**)	**Force value**	NO
Step	1 kW (depends on the selected **Power Formats And Units**)		
Comm object	8491	**Related applications**	MINT
Config level	Standard		
Setpoint visibility	Only if **#Power Management Mode** = ABS [kW]		
Description			

This setpoint adjusts required maximal **Actual Reserve** for **Power Management** function.

If Load Reserve Set 1 is activated and **Actual Reserve** rises over this limit, next Source will be stopped.

The currently active reserve set is selected by binary inputs **Load Res 2 Active**, **Load Res 3 Active** and **Load Res 4 Active**. If none of these inputs is active the Load Reserve Set 1 is selected.

Note: *The reserve for stop must be always adjusted higher than the reserve for start.*

> **IMPORTANT:** This setpoint is shared via **CAN2A** and/or **CAN2B** . Change of this setpoint will be reflected in all controllers.

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#Starting Rel Load Reserve 1

Setpoint group	Power Management	**Related FW**	2.2.0
Range [units]	0 .. **#Stopping Load Reserve 1** [%]		
Default value	60 %	**Force value**	NO
Step	1 %		
Comm object	10648	**Related applications**	MINT
Config level	Standard		
Setpoint visibility	Only if **#Power Management Mode** = REL [%]		
Description			

This setpoint adjusts required minimal **Actual Relative Reserve** for **Power Management** function.

If Load Reserve Set 1 is activated and **Actual Relative Reserve** drops below this limit, next Source will be started.

The currently active reserve set is selected by binary inputs **Load Res 2 Active**, **Load Res 3 Active** and **Load Res 4 Active**. If none of these inputs is active the Load Reserve Set 1 is selected.

> **IMPORTANT:** This setpoint is shared via **CAN2A** and/or **CAN2B** . Change of this setpoint will be reflected in all controllers.

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#Stopping Rel Load Reserve 1

Setpoint group	Power Management	**Related FW**	2.2.0
Range [units]	**#Starting Rel Load Reserve 1** .. 110 [%]		
Default value	80 %	**Force value**	NO
Step	1 %		
Comm object	10652	**Related applications**	MINT
Config level	Standard		
Setpoint visibility	Only if **#Power Management Mode** = REL [%]		
Description			

This setpoint adjusts required maximal **Actual Relative Reserve** for **Power Management** function.

If Load Reserve Set 1 is activated and **Actual Relative Reserve** rises over this limit, next Source will be stopped.

The currently active reserve set is selected by binary inputs **LOAD RES 2 ACTIVE**, **LOAD RES 3 ACTIVE** and **LOAD RES 4 ACTIVE**. If none of these inputs is active the Load Reserve Set 1 is selected.

> **IMPORTANT:** This setpoint is shared via **CAN2A** and/or **CAN2B** . Change of this setpoint will be reflected in all controllers.

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Subgroup: Load Reserve Set 2

#Starting Load Reserve 2

Setpoint group	Power Management	**Related FW**	2.2.0
Range [units]	0 .. **#Stopping Load Reserve 2** [kW] (depends on the selected **Power Formats And Units**)		
Default value	410 kW (depends on the selected **Power Formats And Units**)	**Force value**	NO
Step	1 kW (depends on the selected **Power Formats And Units**)		
Comm object	8490	**Related applications**	MINT
Config level	Standard		
Setpoint visibility	Only if **#Power Management Mode** = ABS [kW]		
Description			

This setpoint adjusts required minimal **Actual Reserve** for **Power Management** function.

If Load Reserve Set 2 is activated and **Actual Reserve** drops below this limit, next Source will be started.

The currently active reserve set is selected by binary inputs **Load Res 2 Active**, **Load Res 3 Active** and **Load Res 4 Active**. If none of these inputs is active the Load Reserve Set 1 is selected.

> ***Note:*** *If the absolute power management is selected, this setpoint (or the setpoints **#Starting Load Reserve 2**, **#Starting Load Reserve 3** or **#Starting Load Reserve 4** depending on which load reserve set is selected) determines also the number of Controllers (that are part of the power management) which will start (according to their priority and nominal power).*

> **IMPORTANT:** This setpoint is shared via **CAN2A** and/or **CAN2B** . Change of this setpoint will be reflected in all controllers.

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#Stopping Load Reserve 2

Setpoint group	Power Management	**Related FW**	2.2.0
Range [units]	**#Starting Load Reserve 2** .. 32000 [kW] (depends on the selected **Power Formats And Units**)		
Default value	460 kW (depends on the selected **Power Formats And Units**)	**Force value**	NO
Step	1 kW (depends on the selected **Power Formats And Units**)		
Comm object	8633	**Related applications**	MINT
Config level	Standard		
Setpoint visibility	Only if **#Power Management Mode** = ABS [kW]		
Description			

This setpoint adjusts required maximal **Actual Reserve** for **Power Management** function.

If Load Reserve Set 2 is activated and **Actual Reserve** rises over this limit, next Source will be stopped.

The currently active reserve set is selected by binary inputs **Load Res 2 Active**, **Load Res 3 Active** and **Load Res 4 Active**. If none of these inputs is active the Load Reserve Set 1 is selected.

Note: *The reserve for stop must be always adjusted higher than the reserve for start.*

> **IMPORTANT:** This setpoint is shared via **CAN2A** and/or **CAN2B** . Change of this setpoint will be reflected in all controllers.

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#Starting Rel Load Reserve 2

Setpoint group	Power Management	**Related FW**	2.2.0
Range [units]	0 .. **#Stopping Rel Load Reserve 2** [%]		
Default value	60 %	**Force value**	NO
Step	1 %		
Comm object	10649	**Related applications**	MINT
Config level	Standard		
Setpoint visibility	Only if **#Power Management Mode** = REL [%]		
Description			

This setpoint adjusts required minimal **Actual Relative Reserve** for **Power Management** function.

If Load Reserve Set 2 is activated and **Actual Relative Reserve** drops below this limit, next Source will be started.

The currently active reserve set is selected by binary inputs **Load Res 2 Active**, **Load Res 3 Active** and **Load Res 4 Active**. If none of these inputs is active the Load Reserve Set 1 is selected.

> **IMPORTANT:** This setpoint is shared via **CAN2A** and/or **CAN2B** . Change of this setpoint will be reflected in all controllers.

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#Stopping Rel Load Reserve 2

Setpoint group	Power Management	**Related FW**	2.2.0
Range [units]	**#Starting Rel Load Reserve 2** .. 110 [%]		
Default value	80 %	**Force value**	NO
Step	1 %		
Comm object	10653	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Only if **#Power Management Mode** = REL [%]		
Description			

This setpoint adjusts required maximal **Actual Relative Reserve** for **Power Management** function.

If Load Reserve Set 2 is activated and **Actual Relative Reserve** rises over this limit, next Source will be stopped.

The currently active reserve set is selected by binary inputs **Load Res 2 Active**, **Load Res 3 Active** and **Load Res 4 Active**. If none of these inputs is active the Load Reserve Set 1 is selected.

> **IMPORTANT:** This setpoint is shared via **CAN2A** and/or **CAN2B** . Change of this setpoint will be reflected in all controllers.

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Subgroup: Load Reserve Set 3

#Starting Load Reserve 3

Setpoint group	Power Management	**Related FW**	2.2.0
Range [units]	0 .. **#Stopping Load Reserve 3** [kW] (depends on the selected **Power Formats And Units**)		
Default value	410 kW (depends on the selected **Power Formats And Units**)	**Force value**	NO
Step	1 kW (depends on the selected **Power Formats And Units**)		
Comm object	8831	**Related applications**	MINT
Config level	Standard		
Setpoint visibility	Only if **#Power Management Mode** = ABS [kW]		
Description			

This setpoint adjusts required minimal **Actual Reserve** for **Power Management** function.

If Load Reserve Set 3 is activated and **Actual Reserve** drops below this limit, next Source will be started.

The currently active reserve set is selected by binary inputs **Load Res 2 Active**, **Load Res 3 Active** and **Load Res 4 Active**. If none of these inputs is active the Load Reserve Set 1 is selected.

> **IMPORTANT:** This setpoint is shared via **CAN2A** and/or **CAN2B** . Change of this setpoint will be reflected in all controllers.

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#Stopping Load Reserve 3

Setpoint group	Power Management	**Related FW**	2.2.0
Range [units]	**#Starting Load Reserve 3** .. 32000 [kW] (depends on the selected **Power Formats And Units**)		
Default value	460 kW (depends on the selected **Power Formats And Units**)	**Force value**	NO
Step	1 kW (depends on the selected **Power Formats And Units**)		
Comm object	8833	**Related applications**	MINT
Config level	Standard		
Setpoint visibility	Only if **#Power Management Mode** = ABS [kW]		
Description			

This setpoint adjusts required maximal **Actual Reserve** for **Power Management** function.

If Load Reserve Set 3 is activated and **Actual Reserve** rises over this limit, next Source will be stopped.

The currently active reserve set is selected by binary inputs **Load Res 2 Active**, **Load Res 3 Active** and **Load Res 4 Active**. If none of these inputs is active the Load Reserve Set 1 is selected.

Note: *The reserve for stop must be always adjusted higher than the reserve for start.*

> **IMPORTANT:** This setpoint is shared via **CAN2A** and/or **CAN2B** . Change of this setpoint will be reflected in all controllers.

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#Starting Rel Load Reserve 3

Setpoint group	Power Management	**Related FW**	2.2.0
Range [units]	0 .. **#Stopping Rel Load Reserve 3** [%]		
Default value	60 %	**Force value**	NO
Step	1 %		
Comm object	10650	**Related applications**	MINT
Config level	Standard		
Setpoint visibility	Only if **#Power Management Mode** = REL [%]		
Description			

This setpoint adjusts required minimal **Actual Relative Reserve** for **Power Management** function.

If Load Reserve Set 3 is activated and **Actual Relative Reserve** drops below this limit, next Source will be started.

The currently active reserve set is selected by binary inputs **Load Res 2 Active**, **Load Res 3 Active** and **Load Res 4 Active**. If none of these inputs is active the Load Reserve Set 1 is selected.

> **IMPORTANT:** This setpoint is shared via **CAN2A** and/or **CAN2B** . Change of this setpoint will be reflected in all controllers.

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#Stopping Rel Load Reserve 3

Setpoint group	Power Management	**Related FW**	2.2.0
Range [units]	**#Starting Rel Load Reserve 3** .. 110 [%]		
Default value	80 %	**Force value**	NO
Step	1 %		
Comm object	10654	**Related applications**	MINT
Config level	Standard		
Setpoint visibility	Only if **#Power Management Mode** = REL [%]		
Description			

This setpoint adjusts required maximal **Actual Relative Reserve** for **Power Management** function.

If Load Reserve Set 3 is activated and **Actual Relative Reserve** rises over this limit, next Source will be stopped.

The currently active reserve set is selected by binary inputs **Load Res 2 Active**, **Load Res 3 Active** and **Load Res 4 Active**. If none of these inputs is active the Load Reserve Set 1 is selected.

> **IMPORTANT:** This setpoint is shared via **CAN2A** and/or **CAN2B** . Change of this setpoint will be reflected in all controllers.

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Subgroup: Load Reserve Set 4

#Starting Load Reserve 4

Setpoint group	Power Management	**Related FW**	2.2.0
Range [units]	0 .. **#Stopping Load Reserve 4** [kW] (depends on the selected **Power Formats And Units**)		
Default value	410 kW (depends on the selected **Power Formats And Units**)	**Force value**	NO
Step	1 kW (depends on the selected **Power Formats And Units**)		
Comm object	8832	**Related applications**	MINT
Config level	Standard		
Setpoint visibility	Only if **#Power Management Mode** = ABS [kW]		
Description			

This setpoint adjusts required minimal **Actual Reserve** for **Power Management** function.

If Load Reserve Set 4 is activated and **Actual Reserve** drops below this limit, next Source will be started.

The currently active reserve set is selected by binary inputs **Load Res 2 Active**, **Load Res 3 Active** and **Load Res 4 Active**. If none of these inputs is active the Load Reserve Set 1 is selected.

> **IMPORTANT:** This setpoint is shared via **CAN2A** and/or **CAN2B** . Change of this setpoint will be reflected in all controllers.

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#Stopping Load Reserve 4

Setpoint group	Power Management	**Related FW**	2.2.0
Range [units]	**#Starting Load Reserve 4** .. 32000 [kW] (depends on the selected **Power Formats And Units**)		
Default value	460 kW (depends on the selected **Power Formats And Units**)	**Force value**	NO
Step	1 kW (depends on the selected **Power Formats And Units**)		
Comm object	8834	**Related applications**	MINT
Config level	Standard		
Setpoint visibility	Only if **#Power Management Mode** = ABS [kW]		
Description			

This setpoint adjusts required maximal **Actual Reserve** for **Power Management** function.

If Load Reserve Set 4 is activated and **Actual Reserve** rises over this limit, next Source will be stopped.

The currently active reserve set is selected by binary inputs **Load Res 2 Active**, **Load Res 3 Active** and **Load Res 4 Active**. If none of these inputs is active the Load Reserve Set 1 is selected.

Note: *The reserve for stop must be always adjusted higher than the reserve for start.*

> **IMPORTANT:** This setpoint is shared via **CAN2A** and/or **CAN2B** . Change of this setpoint will be reflected in all controllers.

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#Starting Rel Load Reserve 4

Setpoint group	Power Management	**Related FW**	2.2.0
Range [units]	0 .. **#Stopping Rel Load Reserve 4** [%]		
Default value	60 %	**Force value**	NO
Step	1 %		
Comm object	10651	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Only if **#Power Management Mode** = REL [%]		
Description			

This setpoint adjusts required minimal **Actual Relative Reserve** for **Power Management** function.

If Load Reserve Set 4 is activated and **Actual Relative Reserve** drops below this limit, next Source will be started.

The currently active reserve set is selected by binary inputs **Load Res 2 Active**, **Load Res 3 Active** and **Load Res 4 Active**. If none of these inputs is active the Load Reserve Set 1 is selected.

> **IMPORTANT:** This setpoint is shared via **CAN2A** and/or **CAN2B** . Change of this setpoint will be reflected in all controllers.

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#Stopping Rel Load Reserve 4

Setpoint group	Power Management	**Related FW**	2.2.0
Range [units]	**#Starting Rel Load Reserve 4** .. 110 [%]		
Default value	80 %	**Force value**	NO
Step	1 %		
Comm object	10655	**Related applications**	MINT
Config level	Standard		
Setpoint visibility	Only if **#Power Management Mode** = REL [%]		
Description			

This setpoint adjusts required maximal **Actual Relative Reserve** for **Power Management** function.

If Load Reserve Set 4 is activated and **Actual Relative Reserve** rises over this limit, next Source will be stopped.

The currently active reserve set is selected by binary inputs **Load Res 2 Active**, **Load Res 3 Active** and **Load Res 4 Active**. If none of these inputs is active the Load Reserve Set 1 is selected.

> **IMPORTANT:** This setpoint is shared via **CAN2A** and/or **CAN2B** . Change of this setpoint will be reflected in all controllers.

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Subgroup: Minimal Running Power

#Min Run Power 1

Setpoint group	Power Management	**Related FW**	2.2.0
Range [units]	0 .. 65000 [kW] (depends on the selected **Power Formats And Units**)		
Default value	210 kW (depends on the selected **Power Formats And Units**)	**Force value**	NO
Step	1 kW (depends on the selected **Power Formats And Units**)		
Comm object	9584	**Related applications**	MINT
Config level	Standard		
Setpoint visibility	Only if **Application Mode** = MINT		
Description			

This setpoint adjusts required **Minimal Running Nominal Power** of all sources and BESS if Minimal Running Power 1 is chosen.

There are 3 Minimal Running Power options. This one is activated by LBI **Min Run Power Act 1**.

> **IMPORTANT:** This setpoint is shared via **CAN2A** and/or **CAN2B** . Change of this setpoint will be reflected in all controllers.

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#Min Run Power 2

Setpoint group	Power Management	**Related FW**	2.2.0
Range [units]	0 .. 65000 [kW] (depends on the selected **Power Formats And Units**)		
Default value	210 kW (depends on the selected **Power Formats And Units**)	**Force value**	NO
Step	1 kW (depends on the selected **Power Formats And Units**)		
Comm object	9585	**Related applications**	MINT
Config level	Standard		
Setpoint visibility	Only if **Application Mode** = MINT		
Description			

This setpoint adjusts required **Minimal Running Nominal Power** of Controllers and BESS if Minimal Running Power 2 is chosen.

There are 3 Minimal Running Power options. This one is activated by LBI **MIN RUN POWER ACT 2**.

> **IMPORTANT:** This setpoint is shared via **CAN2A** and/or **CAN2B** . Change of this setpoint will be reflected in all controllers.

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#Min Run Power 3

Setpoint group	Power Management	**Related FW**	2.2.0
Range [units]	0 .. 65000 [kW] (depends on the selected **Power Formats And Units**)		
Default value	210 kW (depends on the selected **Power Formats And Units**)	**Force value**	NO
Step	1 kW (depends on the selected **Power Formats And Units**)		
Comm object	9586	**Related applications**	MINT
Config level	Standard		
Setpoint visibility	Only if **Application Mode** = MINT		
Description			

This setpoint adjusts required **Minimal Running Nominal Power** of Controllers and BESS if Minimal Running Power 3 is chosen.

There are 3 Minimal Running Power options. This one is activated by LBI **MIN RUN POWER ACT 3**.

> **IMPORTANT:** This setpoint is shared via **CAN2A** and/or **CAN2B** . Change of this setpoint will be reflected in all controllers.

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Subgroup: Start/Stop Timing

#Next Engine Start Delay

Setpoint group	Power Management	**Related FW**	2.2.0
Range [units]	0 .. 3 600 [s]		
Default value	5 s	**Force value**	NO
Step	1 s		
Comm object	8492	**Related applications**	MINT
Config level	Standard		
Setpoint visibility	Only if **Application Mode** = MINT		
Description			
This setpoint adjusts the delay before next Gen-set is started after **Actual Reserve** / **Actual Relative Reserve** drops below Starting Load Reserve of currently active Load Reserve Set. > **IMPORTANT:** This setpoint is shared via **CAN2A** and/or **CAN2B** . Change of this setpoint will be reflected in all controllers.			

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#Next Engine Stop Delay

Setpoint group	Power Management	**Related FW**	2.2.0
Range [units]	0 .. 3600 [s]		
Default value	20 s	**Force value**	NO
Step	1 s		
Comm object	8494	**Related applications**	MINT
Config level	Standard		
Setpoint visibility	Only if **Application Mode** = MINT		
Description			
This setpoint adjusts the delay before next Gen-set is stopped after **Actual Reserve** / **Actual Relative Reserve** rises over Stopping Load Reserve of currently active Load Reserve Set. > **IMPORTANT:** This setpoint is shared via **CAN2A** and/or **CAN2B** . Change of this setpoint will be reflected in all controllers.			

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Subgroup: Slow Stop Protection

#Slow Stop Delay

Setpoint group	Power Management	**Related FW**	2.2.0
Range [units]	0 .. 600 [s]		
Default value	60 s	**Force value**	NO
Step	1 s		
Comm object	8495	**Related applications**	MINT
Config level	Standard		
Setpoint visibility	Only if **Application Mode** = MINT		
Description			

This setpoint adjusts for how long the next Gen-set will suppress their own Slow Stop alarms to give chance to another Controller to start and replace the defective one.

Note: *If there is no Controller available to start, the Slow Stop alarms are not suppressed.*

> **IMPORTANT:** This setpoint is shared via **CAN2A** and/or **CAN2B .** Change of this setpoint will be reflected in all controllers.

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Slow Stop Stay In Load Sharing

Setpoint group	Power Management	**Related FW**	2.2.0
Range [units]	Yes / No [-]		
Default value	No	**Force value**	NO
Step	[-]		
Comm object	16648	**Related applications**	MINT
Config level	Standard		
Setpoint visibility	Only if **Application Mode** = MINT		
Description			

This setpoint defines if the Source stays in loadsharing once the slow stop is initiated. The Slow Stop protection takes an effect in Multiple Island as same as in Multiple parallel operation.

No	The Source with active Slow Stop protection regulates its power to value 20% of its Nominal Power but only in if does not lead to overloading of other gensets or running them under 20%. Then it stays in load sharing. This mode is ended once the capacity of other genset with lowest priority is available (load reserve is sufficient) or latest when Slow Stop Delay elapsed.
Yes	The Source with active Slow Stop protection stay in load sharing until another gen-set is connected to the bus or after the Slow Stop Delay is elapsed.

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Subgroup: Over Load Next Start Protection

#Overload Next Start Protection

Setpoint group	Power Management	**Related FW**	2.2.0
Range [units]	Disabled / Enabled [-]		
Default value	Enabled	**Force value**	NO
Step	[-]		
Comm object	14942	**Related applications**	MINT
Config level	Standard		
Setpoint visibility	Only if **Application Mode** = MINT		
Description			

This setpoint enables or disables Overload Next Start Protection. It makes the next Gen-set (in priority order) to start when the load excises the value given by the setpoint **#Overload Next Start Level** right after the delay **#Overload Next Start Delay**. #Overload Next Start Protection requires Starting Load Reserve condition to be fulfilled in order to be used.

Disabled	Protection is disabled.
Enabled	Protection is enabled. If **Total Running P** of PM Controllers related to **Running Nominal Power In PM** is over **#Overload Next Start Level**, another Controller is started after **#Overload Next Start Delay**.

> **IMPORTANT:** This setpoint is shared via **CAN2A** and/or **CAN2B** . Change of this setpoint will be reflected in all controllers.

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#Overload Next Start Level

Setpoint group	Power Management	**Related FW**	2.2.0
Range [units]	0 .. 100 [%] of **Running Nominal Power In PM**		
Default value	80 % of **Running Nominal Power In PM**	**Force value**	NO
Step	1 % of **Running Nominal Power In PM**		
Comm object	14941	**Related applications**	MINT
Config level	Standard		
Setpoint visibility	Only if **#Overload Next Start Protection** = Enabled		
Description			

This setpoint adjusts the minimal load for **#Overload Next Start Protection**.

> **IMPORTANT:** This setpoint is shared via **CAN2A** and/or **CAN2B** . Change of this setpoint will be reflected in all controllers.

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#Overload Next Start Delay

Setpoint group	Power Management	**Related FW**	2.2.0
Range [units]	0 .. 5 [s]		
Default value	1 s	**Force value**	NO
Step	1 s		
Comm object	8493	**Related applications**	MINT
Config level	Standard		
Setpoint visibility	Only if **#Overload Next Start Protection** = Enabled		
Description			
This setpoint adjusts the delay for **#Overload Next Start Protection**. **IMPORTANT:** This setpoint is shared via **CAN2A** and/or **CAN2B** . Change of this setpoint will be reflected in all controllers.			

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Subgroup: Run Hours Equalization

Run Hours Base

Setpoint group	Power Management	**Related FW**	2.2.0
Range [units]	0.0 .. 200000.0 [h]		
Default value	0.0 h	**Force value**	YES
Step	0.1 h		
Comm object	10600	**Related applications**	MINT
Config level	Standard		
Setpoint visibility	Only if **Application Mode** = MINT		
Description			
This setpoint adjusts the correction of actual **Running Hours**. RH = **Running Hours** -Run Hours Base ***Note:*** *RH can not be adjusted below 0*			

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#Run Hours Max Difference

Setpoint group	Power Management	**Related FW**	2.2.0
Range [units]	0 .. 65000 [h]		
Default value	100 h	**Force value**	NO
Step	1 h		
Comm object	9919	**Related applications**	MINT
Config level	Standard		
Setpoint visibility	Only if **Application Mode** = MINT		
Description			

This setpoint adjusts the maximal difference between **Running Hours** of Gen-sets in **Power Management** function if **#Priority Auto Swap**.

If the difference between **Running Hours** is over this limit, priorities are swapped.

> **IMPORTANT:** This setpoint is shared via **CAN2A** and/or **CAN2B** . Change of this setpoint will be reflected in all controllers.

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Subgroup: Efficient Mode Settings

#Power Band Change Up Delay

Setpoint group	Power Management	**Related FW**	2.2.0
Range [units]	0 .. 3 600 [s]		
Default value	10 s	**Force value**	NO
Step	[s]		
Comm object	8896	**Related applications**	MINT
Config level	Standard		
Setpoint visibility	Only if **Application Mode** = MINT		
Description			

This setpoint is used for adjusting the delay of changing the power band if the load demand rise above the upper limit of the current power band. Setpoint is taken into account only if **#Priority Auto Swap** = Efficient.

> **IMPORTANT:** This setpoint is shared via **CAN2A** and/or **CAN2B** . Change of this setpoint will be reflected in all controllers.

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#Power Band Change Down Delay

Setpoint group	Power Management	**Related FW**	2.2.0
Range [units]	0 .. 3 600 [s]		
Default value	10 s	**Force value**	NO
Step	[s]		
Comm object	10795	**Related applications**	MINT
Config level	Standard		
Setpoint visibility	Only if **Application Mode** = MINT		
Description			

This setpoint is used for adjusting the delay of changing the power band if the load demand drops below the lower limit of the current power band. Setpoint is taken into account only if **#Priority Auto Swap** = Efficient.

> **IMPORTANT:** This setpoint is shared via **CAN2A** and/or **CAN2B** . Change of this setpoint will be reflected in all controllers.

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Subgroup: Group Settings

Control Group

Setpoint group	Power Management	**Related FW**	2.2.0
Range [units]	1 .. 32 [-]		
Default value	1 [-]	**Force value**	YES
Step	1 [-]		
Comm object	10589	**Related applications**	MINT
Config level	Standard		
Setpoint visibility	Only if **Application Mode** = MINT		
Description			

This setpoint adjusts control group in which the particular source belongs to.
If there are no logical groups on the site, adjust this setpoint to 1. See more information in chapter **Control Groups**.

> ***Note:*** *This control group settings are applied to BESS and/or Universal Gensets integrated via InteliNeo.*

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Group Link L

Setpoint group	Power Management	**Related FW**	2.2.0
Range [units]	1 .. 32 [-]		
Default value	1 [-]	**Force value**	YES
Step	1 [-]		
Comm object	10590	**Related applications**	MINT
Config level	Standard		
Setpoint visibility	Only if **Application Mode** = MINT		
Description			
If the input **GROUP LINK** of this particular controller is used to provide the "group link" information for two Control groups (to get more information refer to the chapter **Control Groups**). This setpoint is used to select which group is located at the left side of the group link breaker. (bus tie breaker). If this particular controller is not used for the group link function, adjust this setpoint to 1.			

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Group Link R

Setpoint group	Power Management	**Related FW**	2.2.0
Range [units]	1 .. 32 [-]		
Default value	1 [-]	**Force value**	YES
Step	1 [-]		
Comm object	10591	**Related applications**	MINT
Config level	Standard		
Setpoint visibility	Only if **Application Mode** = MINT		
Description			
If the input **GROUP LINK** of this particular controller is used to provide the "group link" information for two Control groups (to get more information refer to the chapter **Control Groups**). This setpoint is used to select which group is located at the right side of the group link breaker. (bus tie breaker). If this particular controller is not used for the group link function, adjust this setpoint to 1.			

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Group: Loss of Mains Protections

Subgroup: Loss of Mains Protections

Vector Shift Limit

Setpoint group	Loss of Mains Protection	**Related FW**	2.2.0
Range [units]	1 .. 45 [°]		
Default value	10 °	**Force value**	YES
Step	1 °		
Comm object	9843	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Only if **Vector Shift Protection** is not Disabled		
Description			
This setpoint adjusts the threshold level for the **Vector Shift Protection**. ***Note:*** *To adjust this setpoint properly, check the value* ***Max Vector Shift****. The value is available in InteliConfig, contains the maximal measured vector shift value since the BESS has been synchronized to the mains and after opening of BCB or MCB it is "frozen". In normal conditions the value should not be higher than 3 ° and the most common setting of the threshold is about 7 °.*			

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ROCOF1 Windows Length

Setpoint group	Loss of Mains Protection	**Related FW**	2.2.0
Range [units]	3 .. 30 [-]		
Default value	5	**Force value**	YES
Step	1 [-]		
Comm object	9990	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Only if **ROCOF1 Protection** is not Disabled		
Description			
This setpoint adjusts the time averaging level for the **ROCOF1 Protection**. It defines the number of periods of the Mains voltage in which the ROCOF protection is evaluated. The higher length of the ROCOF window means less sensitive protection for short oscillations of the frequency to both directions from the nominal value. Also, the delay of evaluation is higher.			

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ROCOF1 df/dt

Setpoint group	Loss of Mains Protection	**Related FW**	2.2.0
Range [units]	0.01 .. 10.00 [Hz/s]		
Default value	1.00 Hz/s	**Force value**	YES
Step	0.01 Hz/s		
Comm object	9844	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Only if **ROCOF1 Protection** is not Disabled		
Description			
This setpoint adjusts the trip level for **ROCOF1 Protection**.			

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ROCOF2 Windows Length

Setpoint group	Loss of Mains Protection	**Related FW**	2.2.0
Range [units]	0.1 .. 2.5 [s]		
Default value	0.5 s	**Force value**	YES
Step	0.1 s		
Comm object	16137	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Only if **ROCOF2 Protection** is not Disabled		
Description			
This setpoint adjusts the time averaging level for the **ROCOF2 Protection**. It defines the time interval for which the ROCOF protection is evaluated. The higher length of the ROCOF window means less sensitive protection for short oscillations of the frequency to both directions from the nominal value. Also, the delay of evaluation is higher.			

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ROCOF2 df/dt

Setpoint group	Loss of Mains Protection	**Related FW**	2.2.0
Range [units]	0.01 .. 10.00 [Hz/s]		
Default value	2.00 Hz/s	**Force value**	YES
Step	0.01 Hz/s		
Comm object	16141	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Only if **ROCOF2 Protection** is not Disabled		
Description			
This setpoint adjusts the trip level for **ROCOF2 Protection**.			

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ROCOF3 Windows Length

Setpoint group	Loss of Mains Protection	**Related FW**	2.2.0
Range [units]	0.1 .. 2.5 [s]		
Default value	1.0 s	**Force value**	YES
Step	0.1 s		
Comm object	16138	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Only if **ROCOF3 Protection** is not Disabled		
Description			
This setpoint adjusts the time averaging level for the **ROCOF3 Protection**. It defines the time interval for which the ROCOF protection is evaluated. The higher length of the ROCOF window means less sensitive protection for short oscillations of the frequency to both directions from the nominal value. Also, the delay of evaluation is higher.			

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ROCOF3 df/dt

Setpoint group	Loss of Mains Protection	**Related FW**	2.2.0
Range [units]	0.01 .. 10.00 [Hz/s]		
Default value	1.50 Hz/s	**Force value**	YES
Step	0.01 Hz/s		
Comm object	16142	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Only if **ROCOF3 Protection** is not Disabled		
Description			
This setpoint adjusts the trip level for **ROCOF3 Protection**.			

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ROCOF4 Windows Length

Setpoint group	Loss of Mains Protection	**Related FW**	2.2.0
Range [units]	0.1 .. 2.5 [s]		
Default value	2.0 s	**Force value**	YES
Step	0.1 s		
Comm object	16139	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Only if **ROCOF4 Protection** is not Disabled		
Description			
This setpoint adjusts the time averaging level for the **ROCOF4 Protection**. It defines the time interval for which the ROCOF protection is evaluated. The higher length of the ROCOF window means less sensitive protection for short oscillations of the frequency to both directions from the nominal value. Also, the delay of evaluation is higher.			

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ROCOF4 df/dt

Setpoint group	Loss of Mains Protection	**Related FW**	2.2.0
Range [units]	0.01 .. 10.00 [Hz/s]		
Default value	1.25 Hz/s	**Force value**	YES
Step	0.01 Hz/s		
Comm object	16143	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Only if **ROCOF4 Protection** is not Disabled		
Description			
This setpoint adjusts the trip level for **ROCOF4 Protection**.			

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Vector Shift/ROCOF CB Selector

Setpoint group	Loss of Mains Protection	**Related FW**	2.2.0
Range [units]	MCB / BCB [-]		
Default value	MCB	**Force value**	YES
Step	[-]		
Comm object	10552	**Related applications**	MPTM
Config level	Standard		
Setpoint visibility	Only if **Application Mode** = MPTM and **Vector Shift Protection**!= Disabled or **ROCOF1 Protection**!= Disabled or **ROCOF2 Protection**!= Disabled or **ROCOF3 Protection**!= Disabled or **ROCOF4 Protection**!= Disabled .		
Description			
This setpoint adjusts which breaker will be opened when **Vector Shift Protection**, **ROCOF1 Protection**, **ROCOF2 Protection**, **ROCOF3 Protection** or **ROCOF4 Protection** is detected. ***Note:*** *If the BCB is selected and a mains failure occurs the BCB will be opened immediately when the vector shift or ROCOF is detected, however MCB will be also opened due to other mains protections such as **Mains <f Protection** or **Mains <V Protection**.*			

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Group: Mains Settings

Subgroup: Mains Voltage Protections

Mains >V

Setpoint group	Mains Settings	**Related FW**	2.2.0
Range [units]	100.0 .. **Mains >>V** of **Mains/Bus Nominal Voltage Ph-N** and **Mains/Bus Nominal Voltage Ph-Ph** [%]		
Default value	110.0 % of **Mains/Bus Nominal Voltage Ph-N** and **Mains/Bus Nominal Voltage Ph-Ph**	**Force value**	YES
Step	0.1 % of **Mains/Bus Nominal Voltage Ph-N** and **Mains/Bus Nominal Voltage Ph-Ph**		
Comm object	8305	**Related applications**	MPTM
Config level	Standard		
Setpoint visibility	Only if **Application Mode** = MPTM		
Description			
This setpoint specifies the relative voltage threshold level for **Mains >V Protection**. ***Note:*** *Mains/Bus Voltage L1-N, Mains/Bus Voltage L2-N, Mains/Bus Voltage L3-N, Mains/Bus Voltage L1-L2, Mains/Bus Voltage L2-L3 and Mains/Bus Voltage L3-L1 are used for this protection.*			

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Mains >V Delay

Setpoint group	Mains Settings	**Related FW**	2.2.0
Range [units]	0.00 .. 600.00 [s]		
Default value	5.00 s	**Force value**	YES
Step	0.01 s		
Comm object	8306	**Related applications**	MPTM
Config level	Standard		
Setpoint visibility	Only if **Application Mode** = MPTM		
Description			
This setpoint specifies the delay for **Mains >V Protection**.			

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Mains >V Hys

Setpoint group	Mains Settings	**Related FW**	2.2.0
Range [units]	0.0 .. 30.0 [%] of **Mains/Bus Nominal Voltage Ph-N** and **Mains/Bus Nominal Voltage Ph-Ph**		
Default value	0.0 [%] of **Mains/Bus Nominal Voltage Ph-N** and **Mains/Bus Nominal Voltage Ph-Ph**	**Force value**	NO
Step	0.1 % of **Mains/Bus Nominal Voltage Ph-N** and **Mains/Bus Nominal Voltage Ph-Ph**		
Comm object	14132	**Related applications**	MPTM
Config level	Standard		
Setpoint visibility	Only if **Application Mode** = MPTM		
Description			
This setpoint adjusts the hysteresis for return from **Mains >V Protection**.			

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Mains >>V

Setpoint group	Mains Settings	**Related FW**	2.2.0
Range [units]	**Mains >V** .. 130.0 [%] of **Mains/Bus Nominal Voltage Ph-N** and **Mains/Bus Nominal Voltage Ph-Ph**		
Default value	120.0 % of **Mains/Bus Nominal Voltage Ph-N** and **Mains/Bus Nominal Voltage Ph-Ph**	**Force value**	YES
Step	0.1 % of **Mains/Bus Nominal Voltage Ph-N** and **Mains/Bus Nominal Voltage Ph-Ph**		
Comm object	11345	**Related applications**	MPTM
Config level	Standard		
Setpoint visibility	Only if **Application Mode** = MPTM		
Description			
This setpoint specifies the relative voltage threshold level for **Mains >>V Protection**. ***Note:*** *Mains/Bus Voltage L1-N, Mains/Bus Voltage L2-N, Mains/Bus Voltage L3-N, Mains/Bus Voltage L1-L2, Mains/Bus Voltage L2-L3 and Mains/Bus Voltage L3-L1 are used for this protection.*			

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Mains >>V Delay

Setpoint group	Mains Settings	**Related FW**	2.2.0
Range [units]	0.00 .. 600.00 [s]		
Default value	0.10 s	**Force value**	YES
Step	0.01 s		
Comm object	11347	**Related applications**	MPTM
Config level	Standard		
Setpoint visibility	Only if **Application Mode** = MPTM		
Description			
This setpoint specifies the delay for **Mains >>V Protection**.			

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Mains >>V Hys

Setpoint group	Mains Settings	**Related FW**	2.2.0
Range [units]	0.0 .. 30.0 [%] of **Mains/Bus Nominal Voltage Ph-N** and **Mains/Bus Nominal Voltage Ph-Ph**		
Default value	0.0 % of **Mains/Bus Nominal Voltage Ph-N** and **Mains/Bus Nominal Voltage Ph-Ph**	**Force value**	YES
Step	0.1 % of **Mains/Bus Nominal Voltage Ph-N** and **Mains/Bus Nominal Voltage Ph-Ph**		
Comm object	14133	**Related applications**	MPTM
Config level	Standard		
Setpoint visibility	Only if **Application Mode** = MPTM		
Description			
This setpoint adjusts the hysteresis for return from **Mains >>V Protection**.			

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Mains 10min Avg >V

Setpoint group	Mains Settings	**Related FW**	2.2.0
Range [units]	100.0 .. 150.0 [%] of **Mains/Bus Nominal Voltage Ph-Ph**		
Default value	110.0 % of **Mains/Bus Nominal Voltage Ph-Ph**	**Force value**	YES
Step	0.1 % of **Mains/Bus Nominal Voltage Ph-Ph**		
Comm object	13795	**Related applications**	MPTM
Config level	Advanced		
Setpoint visibility	Only if **Application Mode** = MPTM		
Description			
This setpoint specifies the relative voltage threshold level for **Mains 10min Avg >V Protection**.			

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Mains 10min Avg >V Delay

Setpoint group	Mains Settings	**Related FW**	2.2.0
Range [units]	0.00 .. 600.00 [s]		
Default value	0 s	**Force value**	YES
Step	0.01 s		
Comm object	16898	**Related applications**	MPTM
Config level	Advanced		
Setpoint visibility	Only if **Application Mode** = MPTM		
Description			
This setpoints adjust delay for **Mains 10min Avg >V Protection**.			

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Mains <V

Setpoint group	Mains Settings	**Related FW**	2.2.0
Range [units]	**Mains <<V** .. 99.0 [%] of **Mains/Bus Nominal Voltage Ph-N** and **Mains/Bus Nominal Voltage Ph-Ph**		
Default value	60 % of **Mains/Bus Nominal Voltage Ph-N** and **Mains/Bus Nominal Voltage Ph-Ph**	**Force value**	YES
Step	1 % of **Mains/Bus Nominal Voltage Ph-N** and **Mains/Bus Nominal Voltage Ph-Ph**		
Comm object	8307	**Related applications**	MPTM
Config level	Standard		
Setpoint visibility	Only if **Application Mode** = MPTM		
Description			
This setpoint specifies the relative voltage threshold level for **Mains <V Protection**. ***Note:*** *Mains/Bus Voltage L1-N, Mains/Bus Voltage L2-N, Mains/Bus Voltage L3-N, Mains/Bus Voltage L1-L2, Mains/Bus Voltage L2-L3 and Mains/Bus Voltage L3-L1 are used for this protection.*			

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Mains <V Delay

Setpoint group	Mains Settings	**Related FW**	2.2.0
Range [units]	0.00 .. 600.00 [s]		
Default value	1.50 s	**Force value**	YES
Step	0.01 s		
Comm object	8308	**Related applications**	MPTM
Config level	Standard		
Setpoint visibility	Only if **Application Mode** = MPTM		
Description			
This setpoint specifies the delay for **Mains <V Protection**.			

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Mains <V Hys

Setpoint group	Mains Settings	**Related FW**	2.2.0
Range [units]	0.0 .. 50.0 [%] of **Mains/Bus Nominal Voltage Ph-N** and **Mains/Bus Nominal Voltage Ph-Ph**		
Default value	0.0 % of **Mains/Bus Nominal Voltage Ph-N** and **Mains/Bus Nominal Voltage Ph-Ph**	**Force value**	YES
Step	0.1 % of **Mains/Bus Nominal Voltage Ph-N** and **Mains/Bus Nominal Voltage Ph-Ph**		
Comm object	14130	**Related applications**	MPTM
Config level	Standard		
Setpoint visibility	Only if **Application Mode** = MPTM		
Description			
This setpoint adjusts the hysteresis for return from **Mains <V Protection**.			

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Mains <<V

Setpoint group	Mains Settings	**Related FW**	2.2.0
Range [units]	10.0 .. **Mains <V** [%] of **Mains/Bus Nominal Voltage Ph-N** and **Mains/Bus Nominal Voltage Ph-Ph**		
Default value	30.0 % of **Mains/Bus Nominal Voltage Ph-N** and **Mains/Bus Nominal Voltage Ph-Ph**	**Force value**	YES
Step	0.1 % of **Mains/Bus Nominal Voltage Ph-N** and **Mains/Bus Nominal Voltage Ph-Ph**		
Comm object	11346	**Related applications**	MPTM
Config level	Standard		
Setpoint visibility	Only if **Application Mode** = MPTM		
Description			
This setpoint specifies the relative voltage threshold level for **Mains <V Protection**. ***Note:*** *Mains/Bus Voltage L1-N, Mains/Bus Voltage L2-N, Mains/Bus Voltage L3-N, Mains/Bus Voltage L1-L2, Mains/Bus Voltage L2-L3 and Mains/Bus Voltage L3-L1 are used for this protection.*			

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Mains <<V Delay

Setpoint group	Mains Settings	**Related FW**	2.2.0
Range [units]	0.00 .. 600.00 [s]		
Default value	0.10 s	**Force value**	YES
Step	0.01 s		
Comm object	11348	**Related applications**	MPTM
Config level	Standard		
Setpoint visibility	Only if **Application Mode** = MPTM		
Description			
This setpoint specifies the delay for **Mains <V Protection**.			

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Mains <<V Hys

Setpoint group	Mains Settings	**Related FW**	2.2.0
Range [units]	0.0 .. 50.0 [%] of **Mains/Bus Nominal Voltage Ph-N** and **Mains/Bus Nominal Voltage Ph-Ph**		
Default value	0.0 % of **Mains/Bus Nominal Voltage Ph-N** and **Mains/Bus Nominal Voltage Ph-Ph**	**Force value**	YES
Step	0.1 % of **Mains/Bus Nominal Voltage Ph-N** and **Mains/Bus Nominal Voltage Ph-Ph**		
Comm object	14131	**Related applications**	MPTM
Config level	Standard		
Setpoint visibility	Only if **Application Mode** = MPTM		
Description			
This setpoint adjusts the hysteresis for return from **Mains <V Protection**.			

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Mains V Unbalance

Setpoint group	Mains Settings	**Related FW**	2.2.0
Range [units]	1 .. 200 [%] of **Mains/Bus Nominal Voltage Ph-N** and **Mains/Bus Nominal Voltage Ph-Ph**		
Default value	10 % of **Mains/Bus Nominal Voltage Ph-N** and **Mains/Bus Nominal Voltage Ph-Ph**	**Force value**	YES
Step	1 % of **Mains/Bus Nominal Voltage Ph-N** and **Mains/Bus Nominal Voltage Ph-Ph**		
Comm object	8446	**Related applications**	MPTM
Config level	Advanced		
Setpoint visibility	Only if **Application Mode** = MPTM		
Description			
This setpoint specifies the relative voltage threshold level for **Mains V Unbalance Protection**.			

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Mains V Unbalance Delay

Setpoint group	Mains Settings	**Related FW**	2.2.0
Range [units]	0.00 .. 600.00 [s]		
Default value	2.00 s	**Force value**	YES
Step	0.01 s		
Comm object	8447	**Related applications**	MPTM
Config level	Advanced		
Setpoint visibility	Only if **Application Mode** = MPTM		
Description			
This setpoint specifies the delay for **Mains V Unbalance Protection**.			

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Subgroup: Mains Frequency Protection

Mains >f

Setpoint group	Mains Settings	**Related FW**	2.2.0
Range [units]	0.00 ..**Mains >>f** [Hz]		
Default value	1.50 Hz	**Force value**	YES
Step	0.01 Hz		
Comm object	8310	**Related applications**	MPTM
Config level	Standard		
Setpoint visibility	Only if **Application Mode** = MPTM		
Description			
This setpoint adjusts maximal accepted frequency for **Mains >f Protection**.			

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Mains >f Delay

Setpoint group	Mains Settings	**Related FW**	2.2.0
Range [units]	0.00 .. 1000.00 [s]		
Default value	5.00 s	**Force value**	YES
Step	0.01 s		
Comm object	16632	**Related applications**	MPTM
Config level	Standard		
Setpoint visibility	Only if **Application Mode** = MPTM		
Description			
This setpoint specifies the delay for **Mains >f Protection**.			

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Mains >f Hys

Setpoint group	Mains Settings	**Related FW**	2.2.0
Range [units]	0.00 .. 2.50 [Hz]		
Default value	0.00 Hz	**Force value**	YES
Step	0.01 Hz		
Comm object	14134	**Related applications**	MPTM
Config level	Standard		
Setpoint visibility	Only if **Application Mode** = MPTM		
Description			
This setpoint adjusts the hysteresis for return from **Mains >f Protection**.			

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Mains >>f

Setpoint group	Mains Settings	**Related FW**	2.2.0
Range [units]	**Mains >f** .. 10.00 [Hz]		
Default value	2.50 Hz	**Force value**	YES
Step	0.01 Hz		
Comm object	11349	**Related applications**	MPTM
Config level	Standard		
Setpoint visibility	Only if **Application Mode** = MPTM		
Description			
This setpoint adjusts maximal accepted frequency for **Mains >>f Protection**.			

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Mains >>f Delay

Setpoint group	Mains Settings	**Related FW**	2.2.0
Range [units]	0.00 .. 1000.00 [s]		
Default value	0.00 s	**Force value**	YES
Step	0.01 s		
Comm object	16628	**Related applications**	MPTM
Config level	Standard		
Setpoint visibility	Only if **Application Mode** = MPTM		
Description			
This setpoint specifies the delay for **Mains >>f Protection**.			

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Mains >>f Hys

Setpoint group	Mains Settings	**Related FW**	2.2.0
Range [units]	0.00 .. 2.50 [Hz]		
Default value	0.00 Hz	**Force value**	YES
Step	0.01 Hz		
Comm object	16076	**Related applications**	MPTM
Config level	Standard		
Setpoint visibility	Only if **Application Mode** = MPTM		
Description			
This setpoint adjusts the hysteresis for return from **Mains >>f Protection**.			

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Mains <f

Setpoint group	Mains Settings	**Related FW**	2.2.0
Range [units]	**Mains <<f** .. 0.00 [Hz]		
Default value	-1.50 Hz	**Force value**	YES
Step	0.01 Hz		
Comm object	14587	**Related applications**	MPTM
Config level	Standard		
Setpoint visibility	Only if **Application Mode** = MPTM		
Description			
This setpoint adjusts minimal accepted frequency for **Mains <f Protection**.			

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Mains <f Delay

Setpoint group	Mains Settings	**Related FW**	2.2.0
Range [units]	0.00 .. 1000.00 [s]		
Default value	5.00 s	**Force value**	YES
Step	0.01 s		
Comm object	16633	**Related applications**	MPTM
Config level	Standard		
Setpoint visibility	Only if **Application Mode** = MPTM		
Description			
This setpoint specifies the delay for **Mains <f Protection**.			

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Mains <f Hys

Setpoint group	Mains Settings	**Related FW**	2.2.0
Range [units]	0.00 .. 2.50 [Hz]		
Default value	0.00 Hz	**Force value**	YES
Step	0.01 Hz		
Comm object	14135	**Related applications**	MPTM
Config level	Standard		
Setpoint visibility	Only if **Application Mode** = MPTM		
Description			
This setpoint adjusts the hysteresis for return from **Mains <f Protection**.			

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Mains <<f

Setpoint group	Mains Settings	**Related FW**	2.2.0
Range [units]	-10.00 .. **Mains <f** [Hz]		
Default value	-2.50 Hz	**Force value**	YES
Step	0.01 Hz		
Comm object	16483	**Related applications**	MPTM
Config level	Standard		
Setpoint visibility	Only if **Application Mode** = MPTM		
Description			
This setpoint adjusts maximal accepted frequency for **Mains <<f Protection**.			

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Mains <<f Delay

Setpoint group	Mains Settings	**Related FW**	2.2.0
Range [units]	0.00 .. 1000.00 [s]		
Default value	0.00 s	**Force value**	YES
Step	0.01 s		
Comm object	16630	**Related applications**	MPTM
Config level	Standard		
Setpoint visibility	Only if **Application Mode** = MPTM		
Description			
This setpoint specifies the delay for **Mains <<f Protection**.			

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Mains <<f Hys

Setpoint group	Mains Settings	**Related FW**	2.2.0
Range [units]	0.00 .. 2.50 [Hz]		
Default value	0.00 Hz	**Force value**	YES
Step	0.01 Hz		
Comm object	16555	**Related applications**	MPTM
Config level	Standard		
Setpoint visibility	Only if **Application Mode** = MPTM		
Description			
This setpoint adjusts the hysteresis for return from **Mains <<f Protection**.			

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Subgroup: Mains Fault Timers

Mains Stabilization Delay

Setpoint group	Mains Settings	**Related FW**	2.2.0
Range [units]	0.0 .. 60.0 [s]		
Default value	1.0 s	**Force value**	YES
Step	0.1 s		
Comm object	14435	**Related applications**	MPTM
Config level	Standard		
Setpoint visibility	Only if **Application Mode** = MPTM		
Description			
This setpoint adjusts the time that Mains parameters need to remain within limits of voltage and frequency protections before the return to Mains is initiated. This delay is active only when the BCB is not closed and the load is not powered from the BESS or PV. After this delay elapsed, the procedure continues by counting down the **MCB Close Delay**.			

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MCB Close Delay

Setpoint group	Mains Settings	**Related FW**	2.2.0
Range [units]	0.0 .. 60.0 [s]		
Default value	5.0 s	**Force value**	YES
Step	0.1 s		
Comm object	8389	**Related applications**	MPTM
Config level	Standard		
Setpoint visibility	Only if **Application Mode** = MPTM		
Description			
This setpoint adjusts the delay before MCB is closed after Mains returns.			

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Group: Grid Codes

Subgroup: Grid Codes Test

Grid Codes Test

Setpoint group	Grid Codes	**Related FW**	2.2.0
Range [units]	Disabled / Enabled [-]		
Default value	Disabled	**Force value**	NO
Step	[-]		
Comm object	14129	**Related applications**	MPTM
Config level	Standard		
Setpoint visibility	Only if **Application Mode** = MPTM		
Description			

This setpoint enables/disables simulation mode for some Grid Codes and Q(Um) regulation:

- **Power Regulation Based On Over/Under Frequency**
- **P For Q**

While this setpoint is Enabled, alarm **Wrn Test UPQF** is active.

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Subgroup: Mains Params/MP Synchronization

Mains Params/MP Synchronization

Setpoint group	Grid Codes	**Related FW**	2.2.0
Range [units]	Disabled / Enabled [-]		
Default value	Disabled	**Force value**	YES
Step	[-]		
Comm object	16636	**Related applications**	MPTM
Config level	Standard		
Setpoint visibility	Only if **Application Mode** = MPTM		
Description			

This setpoint enables/disables **Synchronization & Connection Conditions**.

Disabled	**Synchronization & Connection Conditions** is disabled.
Enabled	**Synchronization & Connection Conditions** is enabled.

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Mains Synchronization V Max

Setpoint group	Grid Codes	**Related FW**	2.2.0
Range [units]	**Mains Synchronization V Min** .. 130 [%] of **Mains/Bus Nominal Voltage Ph-Ph**		
Default value	110 % of **Mains/Bus Nominal Voltage Ph-Ph**	**Force value**	YES
Step	1 % of **Mains/Bus Nominal Voltage Ph-Ph**		
Comm object	13012	**Related applications**	MPTM
Config level	Standard		
Setpoint visibility	Only if **Application Mode** = MPTM and **Mains Params/MP Synchronization** = Enabled		
Description			
This setpoint adjusts maximal accepted Mains/Bus Voltage for **Network connection/reconnection conditions**.			

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Mains Synchronization V Min

Setpoint group	Grid Codes	**Related FW**	2.2.0
Range [units]	10 .. **Mains Synchronization V Max** [%] of **Mains/Bus Nominal Voltage Ph-Ph**		
Default value	90 % of **Mains/Bus Nominal Voltage Ph-Ph**	**Force value**	YES
Step	1 % of **Mains/Bus Nominal Voltage Ph-Ph**		
Comm object	13013	**Related applications**	MPTM
Config level	Standard		
Setpoint visibility	Only if **Application Mode** = MPTM and **Mains Params/MP Synchronization** = Enabled		
Description			
This setpoint adjusts minimal accepted Mains/Bus Voltage for **Network connection/reconnection conditions**.			

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Mains Synchronization f Max

Setpoint group	Grid Codes	**Related FW**	2.2.0
Range [units]	0.00 .. 2.00 [Hz]		
Default value	0.20 Hz	**Force value**	YES
Step	0.01 Hz		
Comm object	13014	**Related applications**	MPTM
Config level	Standard		
Setpoint visibility	Only if **Application Mode** = MPTM and **Mains Params/MP Synchronization** = Enabled		
Description			
This setpoint adjusts maximal accepted **Mains/Bus Frequency** for **Network connection/reconnection conditions**.			

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Mains Synchronization f Min

Setpoint group	Grid Codes	**Related FW**	2.2.0
Range [units]	-3.00 .. 0.00 [Hz]		
Default value	-3.00 Hz	**Force value**	YES
Step	0.01 Hz		
Comm object	14586	**Related applications**	MPTM
Config level	Standard		
Setpoint visibility	Only if **Application Mode** = MPTM and **Mains Params/MP Synchronization** = Enabled		
Description			
This setpoint adjusts minimal accepted **Mains/Bus Frequency** for **Network connection/reconnection conditions** .			

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Mains Synchronization Period

Setpoint group	Grid Codes	**Related FW**	2.2.0
Range [units]	0 .. 1800 [s]		
Default value	600 s	**Force value**	YES
Step	1 s		
Comm object	13017	**Related applications**	MPTM
Config level	Standard		
Setpoint visibility	Only if **Application Mode** = MPTM and **Mains Params/MP Synchronization** = Enabled		
Description			
This setpoint adjusts period for which is active **Network connection/reconnection conditions** after LBO **MAINS/BUS HEALTHYMAINS HEALTHY** gets closed again. ***Note:*** *This period resets every time LBO **MAINS/BUS HEALTHYMAINS HEALTHY** recloses.*			

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After MP Synchronization V Max

Setpoint group	Grid Codes	**Related FW**	2.2.0
Range [units]	**After MP Synchronization V Min** .. 130 [%] of **Mains/Bus Nominal Voltage Ph-Ph**		
Default value	110 % of **Mains/Bus Nominal Voltage Ph-Ph**	**Force value**	YES
Step	1 % of **Mains/Bus Nominal Voltage Ph-Ph**		
Comm object	16393	**Related applications**	MPTM
Config level	Standard		
Setpoint visibility	Only if **Application Mode** = MPTM and **Mains Params/MP Synchronization** = Enabled		
Description			
This setpoint adjusts maximal accepted Mains/Bus Voltage for **Network connection/reconnection conditions after Mains Fail**.			

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After MP Synchronization V Min

Setpoint group	Grid Codes	**Related FW**	2.2.0
Range [units]	10 .. **After MP Synchronization V Max** [%] of **Mains/Bus Nominal Voltage Ph-Ph**		
Default value	95 % of **Mains/Bus Nominal Voltage Ph-Ph**	**Force value**	YES
Step	1 % of **Mains/Bus Nominal Voltage Ph-Ph**		
Comm object	16394	**Related applications**	MPTM
Config level	Standard		
Setpoint visibility	Only if **Application Mode** = MPTM and **Mains Params/MP Synchronization** = Enabled		
Description			
This setpoint adjusts minimal accepted Mains/Bus Voltage for **Network connection/reconnection conditions after Mains Fail**.			

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After MP Synchronization f Max

Setpoint group	Grid Codes	**Related FW**	2.2.0
Range [units]	0.00 .. 2.00 [Hz]		
Default value	0.10 Hz	**Force value**	YES
Step	0.01 Hz		
Comm object	16395	**Related applications**	MPTM
Config level	Standard		
Setpoint visibility	Only if **Application Mode** = MPTM and **Mains Params/MP Synchronization** = Enabled		
Description			
This setpoint adjusts maximal accepted **Mains/Bus Frequency** for **Network connection/reconnection conditions after Mains Fail**.			

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After MP Synchronization f Min

Setpoint group	Grid Codes	**Related FW**	2.2.0
Range [units]	-3.00 .. 0.00 [Hz]		
Default value	-0.10 Hz	**Force value**	YES
Step	0.01 Hz		
Comm object	16396	**Related applications**	MPTM
Config level	Standard		
Setpoint visibility	Only if **Application Mode** = MPTM and **Mains Params/MP Synchronization** = Enabled		
Description			
This setpoint adjusts minimal accepted **Mains/Bus Frequency** for **Network connection/reconnection conditions after Mains Fail**.			

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After MP Synchronization Period

Setpoint group	Grid Codes	**Related FW**	2.2.0
Range [units]	0 .. 1800 [s]		
Default value	600 s	**Force value**	YES
Step	1 s		
Comm object	16397	**Related applications**	MPTM
Config level	Standard		
Setpoint visibility	Only if **Application Mode** = MPTM and **Mains Params/MP Synchronization** = Enabled		
Description			
This setpoint adjusts period for which is active **Network connection/reconnection conditions after Mains Fail** after LBO **Mains/Bus HealthyMains Healthy** gets closed again. ***Note:*** *This period resets every time LBO **Mains/Bus HealthyMains Healthy** recloses.*			

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Subgroup: After Mains Trip Period

After Mains Trip

Setpoint group	Grid Codes	**Related FW**	2.2.0
Range [units]	Disabled / Enabled [-]		
Default value	Disabled	**Force value**	YES
Step	[-]		
Comm object	16637	**Related applications**	MPTM
Config level	Standard		
Setpoint visibility	Only if **Application Mode** = MPTM		
Description			

This setpoint enables/disables **After Mains Trip Period**.

Disabled	**After Mains Trip Period** is disabled
Enabled	**After Mains Trip Period** is enabled

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After Mains Trip Period

Setpoint group	Grid Codes	**Related FW**	2.2.0
Range [units]	0 .. 3600 [s]		
Default value	1200 s	**Force value**	YES
Step	1 s		
Comm object	14601	**Related applications**	MPTM
Config level	Standard		
Setpoint visibility	Only if **Application Mode** = MPTM and **After Mains Trip** = Enabled		
Description			

This setpoint adjusts the period for how long is After Mains Trip Period active and LBO **Event Mains Trip** is closed. The period starts once the Mains is healthy (LBO **Mains/Bus HealthyMains Healthy** is closed) and timer **After MP Synchronization Period** is elapsed or **Mains Params/MP Synchronization** is disabled.

Note: *This period resets every time LBO **Event Mains Trip** re-closes.*

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After Mains Trip Period Priority

Setpoint group	Grid Codes	**Related FW**	2.2.0
Range [units]	0 .. 254; OFF [-]		
Default value	7 [-]	**Force value**	YES
Step	1 [-]		
Comm object	14491	**Related applications**	MPTM
Config level	Standard		
Setpoint visibility	Only if **Application Mode** = MPTM and **Power Over/Under Frequency** = Enabled		
Description			

This setpoint adjusts the priority of **After Mains Trip Period Ramp** which is used while LBO **EVENT MAINS TRIP** is closed.

> ***Note:*** *Smaller number means higher priority, i.e. 0 has the highest priority.*

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After Mains Trip Period Ramp

Setpoint group	Grid Codes	**Related FW**	2.2.0
Range [units]	0 .. 1800 [s]		
Default value	60 s	**Force value**	YES
Step	1 s		
Comm object	16487	**Related applications**	MPTM
Config level	Standard		
Setpoint visibility	Only if **Application Mode** = MPTM and **After Mains Trip** = Enabled		
Description			

This setpoint adjusts ramping time of the **BESS Required P** to the **BESS Required P Target** if the LBO **EVENT MAINS TRIP** is closed.

The ramping time is set for ΔP which is given by the setpoint **Installed Power** or by the setpoint **Nominal power** if the Installed Power is OFF.

Priority of this ramp is given by **After Mains Trip Period Priority**.

> **Example: Installed Power** = 20 kW, After Mains Trip Period Ramp = 10 seconds. The ramp is changing with speed 20 kW per 10 seconds (2 kW/s).

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Subgroup: Power Over/Under Frequency

Power Over/Under Frequency

Setpoint group	Grid Codes	**Related FW**	2.2.0
Range [units]	Disabled / Enabled [-]		
Default value	Disabled	**Force value**	YES
Step	[-]		
Comm object	16631	**Related applications**	MPTM
Config level	Standard		
Setpoint visibility	Only if **Application Mode** = MPTM		
Description			

This setpoint enables/disables **Power Regulation Based On Over/Under Frequency**.

Disabled	**Power Regulation Based On Over/Under Frequency** is disabled
Enabled	**Power Regulation Based On Over/Under Frequency** is enabled

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Over Frequency Hysteresis Mode

Setpoint group	Grid Codes	**Related FW**	2.2.0
Range [units]	Disabled / Enabled [-]		
Default value	Disabled	**Force value**	YES
Step	[-]		
Comm object	17633	**Related applications**	MINT, SPTM
Config level	Standard		
Setpoint visibility	Only if **Application Mode** = MPTM		
Description			

This setpoints enables/disables frequency hysteresis mode.

Disabled	The regulation of the power during over frequency is according adjusted over frequency curve and the positioning is fully according actual over frequency.
Enabled	When the frequency is rising the power is decreased according the curve of over frequency but in case of frequency fall the frequency remains on the last position of overfrequency and remains there until the value of Over Frequency Hysteresis is reached.

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Over Frequency Hysteresis

Setpoint group	Grid Codes	**Related FW**	2.2.0
Range [units]	0.00 .. 1.00 [Hz]		
Default value	0.01 [Hz]	**Force value**	YES
Step	0.01 [Hz]		
Comm object	17632	**Related applications**	MINT, SPTM
Config level	Standard		
Setpoint visibility	Only if **Over Frequency Hysteresis Mode** = Enabled		
Description			
If the Setpoint **Over Frequency Hysteresis Mode** is set to Enabled then when the frequency is rising the power is decreased according the curve of over frequency but in case of frequency fall the frequency remains on the last position of over frequency and remains there until the value of Over Frequency Hysteresis is reached. Over Frequency Hysteresis setpoint defines the value when the power may by increased when the frequency drops.			

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Power Over/Under Frequency Delay

Setpoint group	Grid Codes	**Related FW**	2.2.0
Range [units]	0.0 .. 2.0 [s]		
Default value	0.2 s	**Force value**	YES
Step	0.1 s		
Comm object	16186	**Related applications**	MPTM
Config level	Standard		
Setpoint visibility	Only if **Application Mode** = MPTM and **Power Over/Under Frequency** = Enabled		
Description			
This setpoint adjusts behavior of **Power Regulation Based On Over/Under Frequency** and defines minimal period for which **Mains/Bus Frequency** has to be inside of PoF/PuF range. This setpoint adjusts delay for activation of Power regulation based on over frequency/under frequency.			

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Return Over/Under Frequency Delay

Setpoint group	Grid Codes	**Related FW**	2.2.0
Range [units]	0 .. 1800 [s]		
Default value	0 s	**Force value**	YES
Step	1 s		
Comm object	16886	**Related applications**	MPTM
Config level	Standard		
Setpoint visibility	Only if **Application Mode** = MPTM and **Power Over/Under Frequency** = Enabled		
Description			
This setpoint defines the delay for Return Over/Under Frequency function. After this delay elapsed the LBO **Event Return Over/Under Frequency** is closed.			

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Return Over/Under Frequency Period

Setpoint group	Grid Codes	**Related FW**	2.2.0
Range [units]	0 .. 3600 [s]		
Default value	600 s	**Force value**	YES
Step	1 s		
Comm object	16900	**Related applications**	MPTM
Config level	Standard		
Setpoint visibility	Only if **Application Mode** = MPTM and **Power Over/Under Frequency** = Enabled		
Description			
This setpoint adjusts the period for how long is Return Over/Under Frequency active and LBO **Event Return Over/Under Frequency** is closed.			

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Return From Over/Under Frequency Priority

Setpoint group	Grid Codes	**Related FW**	2.2.0
Range [units]	0 .. 254; OFF [-]		
Default value	2 [-]	**Force value**	YES
Step	1 [-]		
Comm object	15152	**Related applications**	MPTM
Config level	Standard		
Setpoint visibility	Only if **Application Mode** = MPTM and **Power Over/Under Frequency** = Enabled		
Description			
This setpoint adjusts the priority of **Return From Over/Under Frequency Ramp** which is used while LBO **Event Return Over/Under Frequency** is closed. ***Note:*** *Smaller number means higher priority, i.e. 0 has the highest priority.*			

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Return From Over/Under Frequency Ramp

Setpoint group	Grid Codes	**Related FW**	2.2.0
Range [units]	0 .. 1800 [s]		
Default value	60 s	**Force value**	YES
Step	1 s		
Comm object	16491	**Related applications**	MPTM
Config level	Standard		
Setpoint visibility	Only if **Application Mode** = MPTM and **Power Over/Under Frequency** = Enabled		
Description			

This setpoint adjusts ramping time of **BESS Required P** to **BESS Required P Target** if LBO **EVENT RETURN OVER/UNDER FREQUENCY** is closed.

The ramping time is set for ΔP which is given by the setpoint **Installed Power** or by the setpoint **Nominal power** if the Installed Power is OFF.

Priority of this ramp is given by **Return From Over/Under Frequency Priority**

> **Example: Installed Power** = 20 kW, Return From Over/Under Frequency Ramp = 10 seconds. The ramp is changing with speed 20 kW per 10 seconds (2 kW/s).

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Mains Frequency Rise Priority

Setpoint group	Grid Codes	**Related FW**	2.2.0
Range [units]	0 .. 254; OFF [-]		
Default value	4 [-]	**Force value**	YES
Step	1 [-]		
Comm object	14488	**Related applications**	MPTM
Config level	Standard		
Setpoint visibility	Only if **Application Mode** = MPTM and **Power Over/Under Frequency** = Enabled		
Description			

This setpoint adjusts **Mains Frequency Rise Ramp** which is used while LBO **EVENT MAINS FREQUENCY RISE** is closed.

> ***Note:*** *Smaller number means higher priority, i.e. 0 has the highest priority.*

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Mains Frequency Rise Ramp

Setpoint group	Grid Codes	**Related FW**	2.2.0
Range [units]	0 .. 1800 [s]		
Default value	60 s	**Force value**	YES
Step	1 s		
Comm object	16484	**Related applications**	MPTM
Config level	Standard		
Setpoint visibility	Only if **Application Mode** = MPTM and **Power Over/Under Frequency** = Enabled		
Description			

This setpoint adjusts ramping time of **BESS Required P** to **BESS Required P Target** if LBO **EVENT MAINS FREQUENCY RISE** is closed.

The ramping time is set for ΔP which is given by the setpoint **Installed Power** or by the setpoint **Nominal power** if the Installed Power is OFF.

Priority of this ramp is given by **Mains Frequency Rise Priority**

> **Example: Installed Power** = 20 kW, Mains Frequency Rise Ramp = 10 seconds. The ramp is changing with speed 20 kW per 10 seconds (2 kW/s).

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Mains Frequency Fall Priority

Setpoint group	Grid Codes	**Related FW**	2.2.0
Range [units]	0 .. 254; OFF [-]		
Default value	5 [-]	**Force value**	YES
Step	1 [-]		
Comm object	14489	**Related applications**	MPTM
Config level	Standard		
Setpoint visibility	Only if **Application Mode** = MPTM and **Power Over/Under Frequency** = Enabled		
Description			

This setpoint adjusts the priority of **Mains Frequency Fall Ramp** which is used while LBO **EVENT MAINS FREQUENCY FALL** is closed.

> ***Note:*** *Smaller number means higher priority, i.e. 0 has the highest priority.*

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Mains Frequency Fall Ramp

Setpoint group	Grid Codes	**Related FW**	2.2.0
Range [units]	0 .. 1800 [s]		
Default value	5 s	**Force value**	YES
Step	1 s		
Comm object	16485	**Related applications**	MPTM
Config level	Standard		
Setpoint visibility	Only if **Application Mode** = MPTM and **Power Over/Under Frequency** = Enabled		
Description			

This setpoint adjusts ramping time of **BESS Required P** to **BESS Required P Target** if LBO **EVENT MAINS FREQUENCY FALL** is closed.

The ramping time is set for ΔP which is given by the setpoint **Installed Power** or by the setpoint **Nominal power** if the Installed Power is OFF.

Priority of this ramp is given by **Mains Frequency Fall Priority**.

> **Example: Installed Power** = 20 kW, Mains Frequency Fall Ramp = 10 seconds. The ramp is changing with speed 20 kW per 10 seconds (2 kW/s).

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Subgroup: Load Reduction

Load Reduction

Setpoint group	Grid Codes	**Related FW**	2.2.0
Range [units]	Disabled / Enabled [-]		
Default value	Disabled	**Force value**	YES
Step	[-]		
Comm object	16638	**Related applications**	MPTM
Config level	Standard		
Setpoint visibility	Only if **Application Mode** = MPTM		
Description			

This setpoint enables/disables **Load Reduction**.

Disabled	**Load Reduction** is disabled
Enabled	

Note: *LBI **Load Reduction Enable** has to be closed, otherwise this Setpoint has no effect.*

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Load Reduction 1

Setpoint group	Grid Codes	**Related FW**	2.2.0
Range [units]	0 .. 100 [%] of **Installed Power** or **Nominal power**		
Default value	100 % of **Installed Power** or **Nominal power**	**Force value**	YES
Step	0.1 % of **Installed Power** or **Nominal power**		
Comm object	16132	**Related applications**	MPTM
Config level	Standard		
Setpoint visibility	Only if **Application Mode** = MPTM and **Load Reduction** = Enabled		
Description			
This setpoint adjusts maximal allowed load of BESS while LBI **Load Reduction 1** is closed. Always the lowest load defined by the LAI **Load Reduction** or by LBIs, **Load Reduction 1**, **Load Reduction 2**, etc. is allowed. ***Note:*** *The value of this setpoint relates to **Installed Power** only if **Installed Power** != OFF, otherwise it relates to **Nominal power**.*			

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Load Reduction 2

Setpoint group	Grid Codes	**Related FW**	2.2.0
Range [units]	0 .. 100 [%] of **Installed Power** or **Nominal power**		
Default value	60 [%] of **Installed Power** or **Nominal power**	**Force value**	YES
Step	0.1 % of **Installed Power** or **Nominal power**		
Comm object	16133	**Related applications**	MPTM
Config level	Standard		
Setpoint visibility	Only if **Application Mode** = MPTM and **Load Reduction** = Enabled		
Description			
This setpoint adjusts maximal allowed load of BESS while LBI **Load Reduction 2** is closed. Always the lowest load defined by the LAI **Load Reduction** or by LBIs, **Load Reduction 1**, **Load Reduction 2**, etc. is allowed. ***Note:*** *The value of this setpoint relates to **Installed Power** only if **Installed Power** != OFF, otherwise it relates to **Nominal power**.*			

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Load Reduction 3

Setpoint group	Grid Codes	**Related FW**	2.2.0
Range [units]	0 .. 100 [%] of **Installed Power** or **Nominal power**		
Default value	30 % of **Installed Power** or **Nominal power**	**Force value**	YES
Step	0.1 % of **Installed Power** or **Nominal power**		
Comm object	16134	**Related applications**	MPTM
Config level	Standard		
Setpoint visibility	Only if **Application Mode** = MPTM and **Load Reduction** = Enabled		
Description			
This setpoint adjusts maximal allowed load of BESS while LBI **LOAD REDUCTION 3** is closed. Always the lowest load defined by the LAI **LOAD REDUCTION** or by LBIs, **LOAD REDUCTION 1**, **LOAD REDUCTION 2**, etc. is allowed. ***Note:*** *The value of this setpoint relates to **Installed Power** only if **Installed Power** != OFF, otherwise it relates to **Nominal power**.*			

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Load Reduction 4

Setpoint group	Grid Codes	**Related FW**	2.2.0
Range [units]	0 .. 100 [%] of **Installed Power** or **Nominal power**		
Default value	10 %of **Installed Power** or **Nominal power**	**Force value**	YES
Step	0.1 % of **Installed Power** or **Nominal power**		
Comm object	16135	**Related applications**	MPTM
Config level	Standard		
Setpoint visibility	Only if **Application Mode** = MPTM and **Load Reduction** = Enabled		
Description			
This setpoint adjusts maximal allowed load of BESS while LBI **LOAD REDUCTION 4** is closed. Always the lowest load defined by the LAI **LOAD REDUCTION** or by LBIs, **LOAD REDUCTION 1**, **LOAD REDUCTION 2**, etc. is allowed. ***Note:*** *The value of this setpoint relates to **Installed Power** only if **Installed Power** != OFF, otherwise it relates to **Nominal power**.*			

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Load Reduction Priority

Setpoint group	Grid Codes	**Related FW**	2.2.0
Range [units]	0 .. 254; OFF [-]		
Default value	3 [-]	**Force value**	YES
Step	1 [-]		
Comm object	14490	**Related applications**	MPTM
Config level	Standard		
Setpoint visibility	Only if **Application Mode** = MPTM and **Load Reduction** = Enabled		
Description			

This setpoint adjusts the priority of **Load Reduction Ramp** which is used while LBO **EVENT LOAD REDUCTION** is closed.

> ***Note:*** *Smaller number means higher priority, i.e. 0 has the highest priority.*

> ***Note:*** *If priority is set to OFF,* ***Load Reduction Ramp*** *is not applied.*

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Load Reduction Ramp

Setpoint group	Grid Codes	**Related FW**	2.2.0
Range [units]	0 .. 1800 [s]		
Default value	5 s	**Force value**	YES
Step	1 s		
Comm object	16486	**Related applications**	MPTM
Config level	Standard		
Setpoint visibility	Only if **Application Mode** = MPTM and **Load Reduction** = Enabled		
Description			

This setpoint adjusts the ramping time of the **BESS Required P** to the **BESS Required P Target** if the LBO **EVENT LOAD REDUCTION** is closed.

The ramping time is set for ΔP which is given by the setpoint **Installed Power** or by the setpoint **Nominal power** if the Installed Power is OFF.

Priority of this ramp is given by **After Mains Trip Period Priority**.

> **Example: Installed Power** = 20 kW, Load Reduction Ramp = 10 seconds. The ramp is changing with speed 20 kW per 10 seconds (2 kW/s).

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Subgroup: P(Um)

P(Um)

Setpoint group	Grid Codes	**Related FW**	2.2.0
Range [units]	Disabled / P Instal (Um) / P Actual (Um)		
Default value	Disabled	**Force value**	YES
Step	-		
Comm object	16567	**Related applications**	MPTM
Config level	Standard		
Setpoint visibility	Only if **Application Mode** = MPTM		
Description			

This setpoint enables/disables and selects mode of **Power Regulation Based On Actual Mains Voltage**.

Disabled	**Power Regulation Based On Actual Mains Voltage** is disabled.
P Instal (Um)	**Power Regulation Based On Actual Mains Voltage** is enabled. Function is evaluated according to **P(Um)** curve and the reduction is based on the setpoint **Installed Power**. Value **Pmom** is not used in this case.
P Actual (Um)	**Power Regulation Based On Actual Mains Voltage** is enabled. Function is evaluated according to **P(Um)** curve and the reduction is based on the actual value of **BESS P**.Value **Pmom** is used in this case.

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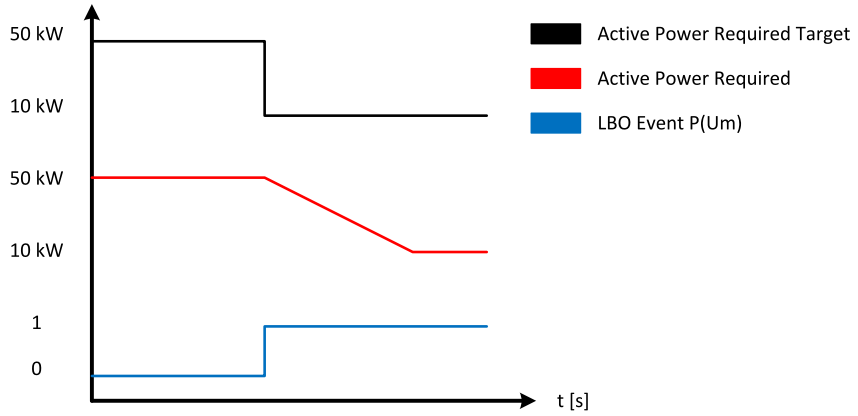
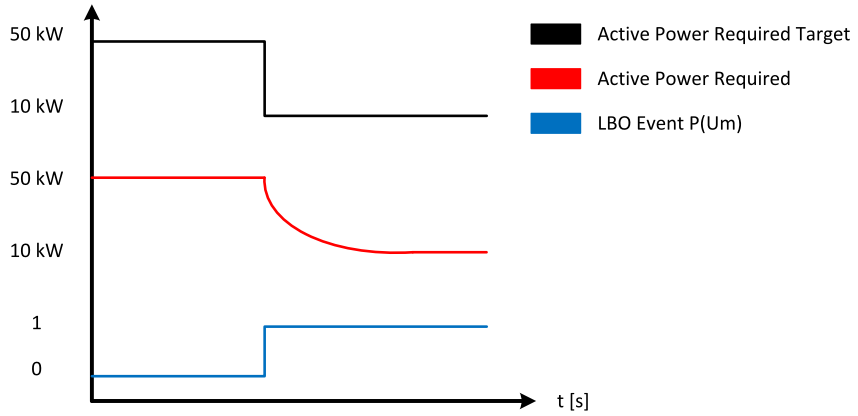
P Ramp Filter

Setpoint group	Grid Codes	**Related FW**	2.2.0
Range [units]	Disabled / Enabled		
Default value	Disabled	**Force value**	YES
Step	-		
Comm object	16634	**Related applications**	MPTM
Config level	Standard		
Setpoint visibility	Only if **Application Mode** = MPTM and **P(Um)** != Disabled		
Description			

This setpoint enables/disables PT1 filtering for **P(Um) Ramp** during ramping of **BESS Required P** to **BESS Required P Target**.

Disabled	PT1 filtering is disabled. 
Enabled	Pt1 filtering is enabled 

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P(Um) Priority

Setpoint group	Grid Codes	**Related FW**	2.2.0
Range [units]	0 .. 254 / OFF [-]		
Default value	11 [-]	**Force value**	YES
Step	1 [-]		
Comm object	15153	**Related applications**	MPTM
Config level	Standard		
Setpoint visibility	Only if **Application Mode** = MPTM and **P(Um)** != Disabled		
Description			
This setpoint adjusts priority of **P(Um) Ramp** which is used while LBO **EVENT P(UM)** is closed. ***Note:*** *Smaller number means higher priority, e.i. 0 has highest priority.*			

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P(Um) Ramp

Setpoint group	Grid Codes	**Related FW**	2.2.0
Range [units]	0 .. 1800 s		
Default value	60 s	**Force value**	YES
Step	1 s		
Comm object	16492	**Related applications**	MPTM
Config level	Standard		
Setpoint visibility	Only if **Application Mode** = MPTM and **P(Um)** != Disabled		
Description			
This setpoint adjusts ramping time of **BESS Required P** to **BESS Required P Target** if LBO **EVENT P (UM)** is closed. The ramping behavior is affected by **P Ramp Filter** which can enable the PT1 filtering. The ramping time is set for ΔP which is given by the setpoint **Installed Power** or by the setpoint **Nominal power** if the Installed Power is OFF. Priority of this ramp is given by **P(Um) Priority**. **Example: Installed Power** = 20 kW, P(Um) Ramp = 10 seconds. The ramp is changing with speed 20 kW per 10 seconds (2 kW/s).			

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Subgroup: P For Q

P For Q Limitation

Setpoint group	Grid Codes	**Related FW**	2.2.0
Range [units]	Disabled / Enabled [-]		
Default value	Disabled	**Force value**	YES
Step	[-]		
Comm object	14481	**Related applications**	MPTM
Config level	Standard		
Setpoint visibility	Only if **Application Mode** = MPTM		
Description			

This setpoint enables/disables **P For Q**.

Disabled	**P For Q** is disabled
Enabled	**P For Q** is enabled

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P For Q Deadband

Setpoint group	Grid Codes	**Related FW**	2.2.0
Range [units]	0 .. 100 [%] of **Installed Power** or **Nominal power**		
Default value	1 % of **Installed Power** or **Nominal power**	**Force value**	YES
Step	1 % of **Installed Power** or **Nominal power**		
Comm object	14486	**Related applications**	MPTM
Config level	Standard		
Setpoint visibility	Only if **Application Mode** = MPTM and **P For Q Limitation** = Enabled		
Description			

This setpoint adjusts the sensitive of **P For Q** function. Use it to prevent oscillation of **BESS P**.

Note: *The value of this setpoint relates to **Installed Power** only if **Installed Power** != OFF, otherwise it relates to **Nominal power**.*

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P For Q Priority

Setpoint group	Grid Codes	**Related FW**	2.2.0
Range [units]	0 .. 254; OFF [-]		
Default value	6 [-]	**Force value**	YES
Step	1 [-]		
Comm object	14492	**Related applications**	MPTM
Config level	Standard		
Setpoint visibility	Only if **Application Mode** = MPTM and **P For Q Limitation** = Enabled		
Description			

This setpoint adjusts the priority of **P For Q Ramp** which is used while LBO **EVENT P FOR Q** is closed.

Note: *Smaller number means higher priority, i.e. 0 has the highest priority.*

Note: *If priority is set to OFF,* ***P For Q Ramp*** *is not applied.*

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P For Q Ramp

Setpoint group	Grid Codes	**Related FW**	2.2.0
Range [units]	0 .. 1800 [s]		
Default value	60 s	**Force value**	YES
Step	1 s		
Comm object	16488	**Related applications**	MPTM
Config level	Standard		
Setpoint visibility	Only if **Application Mode** = MPTM and **P For Q Limitation** = Enabled		
Description			

This setpoint adjusts ramping time of **BESS Required P** to **BESS Required P Target** if LBO **EVENT P FOR Q** is closed.

The ramping time is set for ΔP which is given by the setpoint **Installed Power** or by the setpoint **Nominal power** if the Installed Power is OFF.

Priority of this ramp is given by **P For Q Priority**

> **Example: Installed Power** = 20 kW, P For Q Ramp = 10 seconds. The ramp is changing with speed 20 kW per 10 seconds (2 kW/s).

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Subgroup: Q&U Protection

Q&U Protection

Setpoint group	Grid Codes	**Related FW**	2.2.0
Range [units]	Enabled / Blocked / Protection Force Blocked 1 / Protection Force Blocked 2 / Protection Force Blocked 3 [-]		
Default value	Enabled	**Force value**	YES
Step	[-]		
Comm object	14519	**Related applications**	MPTM
Config level	Advanced		
Setpoint visibility	Only if **Application Mode** = MPTM		
Description			

This setpoint enables/disables **Q&U Protection**.

Enabled	Protection is enabled. Behavior of protection is adjusted via setpoints **Q&U < V**, **Q&U < Q**, **Q&U Protection Delay** and **Q&U CB Selector**. When relative value of **Mains/Bus Voltage L1-N** drops below **Q&U < V** of **Mains/Bus Nominal Voltage Ph-N** value **BESS Q** is below **Q&U < Q** for period longer than **Q&U Protection Delay**, alarm **Wrn Q&U Protection** is activated and breaker selected by **Q&U CB Selector** is opened.
Disabled	Protection is disabled.
Protection Force Disable 1	Protection is enabled or disabled by the state of LBI **Protection Force Disable Block 1**.
Protection Force Disable 2	Protection is enabled or disabled by the state of LBI **Protection Force Disable Block 2**.
Protection Force Disable 3	Protection is enabled or disabled by the state of LBI **Protection Force Disable Block 3**.

Note: *This protection is evaluated only if **Application Mode** = MPTM and **Breaker state** = ParalOper.*

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Q&U < V

Setpoint group	Grid Codes	**Related FW**	2.2.0
Range [units]	70.0 .. 100.0 [%] of **Mains/Bus Nominal Voltage Ph-N**		
Default value	85.0 % of **Mains/Bus Nominal Voltage Ph-N**	**Force value**	YES
Step	0.1 % of **Mains/Bus Nominal Voltage Ph-N**		
Comm object	14137	**Related applications**	MPTM
Config level	Standard		
Setpoint visibility	Only if **Application Mode** = MPTM and **Q&U Protection** != Disabled		
Description			
This setpoint adjusts minimal relative required **Mains/Bus Voltage L1-N** for **Q&U Protection**.			

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Q&U < Q

Setpoint group	Grid Codes	**Related FW**	2.2.0
Range [units]	-32000 .. 32000 [kVAr] (depends on the selected **Power Formats And Units**)		
Default value	0 kVAr	**Force value**	YES
Step	1 kVAr (depends on the selected **Power Formats And Units**)		
Comm object	14139	**Related applications**	MPTM
Config level	Standard		
Setpoint visibility	Only if **Application Mode** = MPTM and **Q&U Protection** != Disabled		
Description			
This setpoint adjusts minimal relative required **BESS Q** for **Q&U Protection**.			

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Q&U Protection Delay

Setpoint group	Grid Codes	**Related FW**	2.2.0
Range [units]	0.00 .. 600.00 [s]		
Default value	0.40 s	**Force value**	YES
Step	0.01 s		
Comm object	16078	**Related applications**	MPTM
Config level	Standard		
Setpoint visibility	Only if **Application Mode** = MPTM and **Q&U Protection** != Disabled		
Description			
This setpoint adjusts reaction delay for **Q&U Protection**.			

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Q&U CB Selector

Setpoint group	Grid Codes	**Related FW**	2.2.0
Range [units]	MCB / BCB [-]		
Default value	BCB	**Force value**	YES
Step	[-]		
Comm object	16079	**Related applications**	MPTM
Config level	Standard		
Setpoint visibility	Only if **Application Mode** = MPTM and **Q&U Protection** != Disabled		
Description			

This setpoint adjusts which breaker opens in case that **Q&U Protection** is activated.

MCB	When **Q&U Protection** is activated, MCB breaker opens.
BCB	When **Q&U Protection** is activated, BCB breaker opens.

Note: *Reclosing of breaker is forbidden if* ***Wrn Q&U Protection*** *is present in the alarm list.*

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Subgroup: Dynamic Support

Dynamic Support

Setpoint group	Grid Codes	**Related FW**	2.2.0
Range [units]	Enabled / Disabled / Protection Force Disable 1 / Protection Force Disable 2 / Protection Force Disable 3 [-]		
Default value	Disabled	**Force value**	YES
Step	[-]		
Comm object	14136	**Related applications**	MPTM
Config level	Standard		
Setpoint visibility	Only if **Application Mode** = MPTM		
Description			

This setpoint enables/disables **Dynamic Support - VRT** defined by >V and <V ride through curves. The standard mains protections are still active.

Enabled	Protection is enabled. Behavior of protection is adjusted via application curves **LVRT 3-phase**, **LVRT 2-phase**, **LVRT 1-phase** and **OVRT**.
Disabled	Protection is disabled.
Protection Force Disable 1	Protection is enabled or disabled by the state of LBI **Protection Force Disable Block 1**.
Protection Force Disable 2	Protection is enabled or disabled by the state of LBI **Protection Force Disable Block 2**.
Protection Force Disable 3	Protection is enabled or disabled by the state of LBI **Protection Force Disable Block 3**.

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Dynamic Support Protection Type

Setpoint group	Grid Codes	**Related FW**	2.2.0
Range [units]	No Protection / History Record / Warning / Mains Protection [-]		
Default value	Mains Protection	**Force value**	YES
Step	[-]		
Comm object	16559	**Related applications**	MPTM
Config level	Standard		
Setpoint visibility	Only if **Application Mode** = MPTM and **Dynamic Support** != Disabled		
Description			
This setpoint adjusts protection type of **Dynamic Support**.			

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Dynamic Support PF/Q Control

Setpoint group	Grid Codes	**Related FW**	2.2.0
Range [units]	Active / Stopped [-]		
Default value	Active	**Force value**	YES
Step	[-]		
Comm object	16569	**Related applications**	MPTM
Config level	Standard		
Setpoint visibility	Only if **Application Mode** = MPTM and **Dynamic Support** != Disabled		
Description			
This setpoint adjusts behavior of **Voltage Regulator Output** while **Dynamic Support - VRT** is active.			

Active	**Voltage Regulator Output** is still being regulated
Stopped	**Voltage Regulator Output** is frozen at the moment of activation the VRT function.

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LVRT Level Severe

Setpoint group	Grid Codes	**Related FW**	2.2.0
Range [units]	0,0 .. 100,0 [%] of relative Mains Voltage		
Default value	50,0 % of relative Mains Voltage	**Force value**	YES
Step	0,1 % of relative Mains Voltage		
Comm object	16564	**Related applications**	MPTM
Config level	Standard		
Setpoint visibility	Only if **Application Mode** = MPTM and **Dynamic Support** != Disabled		
Description			
This setpoint adjusts critical undervoltage. If relative Mains Voltage drops below this limit, LBO **LVRT SEVERE** is closed for at least 500 ms.			

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Post VRT Priority

Setpoint group	Grid Codes	**Related FW**	2.2.0
Range [units]	0 .. 254; OFF [-]		
Default value	2 [-]	**Force value**	YES
Step	1 [-]		
Comm object	14503	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Only if **Application Mode** = MPTM and **Dynamic Support** != Disabled		
Description			
This setpoint adjusts priority of **Post VRT Ramp** which is used while LBO **EVENT POST VRT** is closed.			

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Post VRT Ramp

Setpoint group	Grid Codes	**Related FW**	2.2.0
Range [units]	0 .. 1800 [s]		
Default value	60 s	**Force value**	YES
Step	1 s		
Comm object	16490	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Only if **Application Mode** = MPTM and **Dynamic Support** != Disabled		
Description			

This setpoint adjusts ramping time of **BESS Required P** to **BESS Required P Target** if LBO **EVENT POST VRT** is closed.

The ramping time is set for ΔP which is given by the setpoint **Installed Power** or by the setpoint **Nominal power** if the Installed Power is OFF.

Priority of this ramp is given by **Post VRT Priority**.

> **Example: Installed Power** = 20 kW, Post VRT Ramp = 10 seconds. The ramp is changing with speed 20 kW per 10 seconds (2 kW/s).

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Subgroup: Q Ramp

Q Ramp

Setpoint group	Grid Codes	**Related FW**	2.2.0
Range [units]	1 .. 60 [s]		
Default value	10 s	**Force value**	YES
Step	1 s		
Comm object	16151	**Related applications**	MPTM
Config level	Standard		
Setpoint visibility	Only if **Application Mode** = MPTM		
Description			

This setpoint adjusts ramping time of **BESS Required Q** from actual value to the new one while **PF/Q Control PTM Mode** = Q Control.This ramp is activated in case the **BESS Required Q** cross the limit defined by the setpoint **Q Deadband**.

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Q Deadband

Setpoint group	Grid Codes	**Related FW**	2.2.0
Range [units]	0,0 .. 5,0 [%] of **BESS Q**		
Default value	2,0 % of **BESS Q**	**Force value**	YES
Step	0,1 % of **BESS Q**		
Comm object	16150	**Related applications**	MPTM
Config level	Standard		
Setpoint visibility	Only if **Application Mode** = MPTM		
Description			
This setpoint prevents oscillation of **BESS P** while **PF/Q Control PTM Mode** = Q Control.In case the **BESS Required Q** cross the limit defined by this setpoint **Q Ramp** is activated.			

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Subgroup: Q(Um)

Q(Um) 0 Reference

Setpoint group	Grid Codes	**Related FW**	2.2.0
Range [units]	75 .. 125 [%] of **Q(Um)**		
Default value	100 % of **Q(Um)**	**Force value**	YES
Step	1 % of **Q(Um)**		
Comm object	16125	**Related applications**	MPTM
Config level	Standard		
Setpoint visibility	Only if **Application Mode** = MPTM		
Description			
This setpoint adjusts horizontal offset of **Q(Um)** curve.			

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Q(Um) Deadband

Setpoint group	Grid Codes	**Related FW**	2.2.0
Range [units]	0.0 .. 5,0 [%] of **BESS Q**		
Default value	0,0 % of **BESS Q**	**Force value**	YES
Step	0,1 % of **BESS Q**		
Comm object	14127	**Related applications**	MPTM
Config level	Standard		
Setpoint visibility	Only if **Application Mode** = MPTM		
Description			
This setpoint prevents oscillation of **BESS P** while **PF/Q Control PTM Mode** = Q(Um).In case the voltage cross the limit defined by this setpoint, the new value of **BESS Required Q** is calculated according to **Q(Um)** curve.			

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Subgroup: Qref/Ulim

Qref/Pnom Shift

Setpoint group	Grid Codes	**Related FW**	2.2.0
Range [units]	-33 .. 33 [%] of **Qref/Ulim**		
Default value	0 % of **Qref/Ulim**	**Force value**	YES
Step	1 % of **Qref/Ulim**		
Comm object	16128	**Related applications**	MPTM
Config level	Standard		
Setpoint visibility	Only if **Application Mode** = MPTM		
Description			
This setpoint adjusts vertical offset of **Qref/Ulim** curve.			

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Qref/Ulim Deadband

Setpoint group	Grid Codes	**Related FW**	2.2.0
Range [units]	0,0 .. 5,0 [%] of **BESS Q**		
Default value	0,0 % of **BESS Q**	**Force value**	YES
Step	0,1 % of **BESS Q**		
Comm object	16129	**Related applications**	MPTM
Config level	Standard		
Setpoint visibility	Only if **Application Mode** = MPTM		
Description			
This setpoint prevents oscillation of **BESS P** while **PF/Q Control PTM Mode** = Qref/Ulim.In case the voltage cross the limit defined by this setpoint, the new value of **BESS Required Q** is calculated according to **Qref/Ulim** curve.			

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Subgroup: Q(P)

Q(P) Deadband

Setpoint group	Grid Codes	**Related FW**	2.2.0
Range [units]	0,0 .. 5,0 [%] of **BESS Q**		
Default value	0,0 % of **BESS Q**	**Force value**	YES
Step	0,1 % of **BESS Q**		
Comm object	16126	**Related applications**	MPTM
Config level	Standard		
Setpoint visibility	Only if **Application Mode** = MPTM		
Description			
This setpoint prevents oscillation of **BESS P** while **PF/Q Control PTM Mode** = Q(P). In case the voltage cross the limit defined by this setpoint, the new value of **BESS Required Q** is calculated according to **Q (P)** curve.			

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Subgroup: Soft Unload

Soft Unload Priority

Setpoint group	Grid Codes	**Related FW**	2.2.0
Range [units]	0 .. 254; OFF [-]		
Default value	1 [-]	**Force value**	YES
Step	1 [-]		
Comm object	14493	**Related applications**	MINT, , SPTM
Config level	Standard		
Setpoint visibility	Only if **Application Mode** = MPTM		
Description			
This setpoint adjusts priority of **Soft Unload Ramp** which is used while LBO **EVENT SOFT UNLOAD** is closed. ***Note:*** *Smaller number means higher priority, e.i. 0 has highest priority.*			

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Soft Unload Ramp

Setpoint group	Frequency/Load ControlGrid Codes	**Related FW**	2.2.0
Range [units]	0 .. 1800 [s]		
Default value	60 s	**Force value**	YES
Step	1 s		
Comm object	16489	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Only if **Application Mode** = MPTM		
Description			

This setpoint adjusts the ramping time of the **BESS Required P** to the **BESS Required P Target** while soft unloading when BCB is requested to be opened.

The Required P reach the zero value at the end of the timer. The ramping time is set for ΔP which is given by the setpoint **Installed Power** or by the setpoint **Nominal power** if the Installed Power is OFF.

> **Example: Installed Power** = 20 kW, Soft Unload Ramp = 10 seconds. The ramp is changing with speed 20 kW per 10 seconds (2 kW/s) to the zero value.

Note: *This setpoint is shared with the other Soft Unload Ramp setpoint.*

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Subgroup: Pave

Pave Protection

Setpoint group	Grid Codes	**Related FW**	2.2.0
Range [units]	Enabled / Disabled / Protection Force Disable 1 / Protection Force Disable 2 / Protection Force Disable 3 [-]		
Default value	Disabled	**Force value**	YES
Step	[-]		
Comm object	16649	**Related applications**	MPTM
Config level	Standard		
Setpoint visibility	Only if **Application Mode** = MPTM		
Description			

This setpoint enables/disables **Pave** function.

Enabled	Protection is enabled. Behavior of protection is adjusted via setpoint **Pave**.
Disabled	Protection is disabled.
Protection Force Disable 1	Protection is enabled or disabled by the state of LBI **PROTECTION FORCE DISABLE BLOCK 1**.
Protection Force Disable 2	Protection is enabled or disabled by the state of LBI **PROTECTION FORCE DISABLE BLOCK 2**.
Protection Force Disable 3	Protection is enabled or disabled by the state of LBI **PROTECTION FORCE DISABLE BLOCK 3**.

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Pave

Setpoint group	Grid Codes	**Related FW**	2.2.0
Range [units]	1 .. 32000 [kW] (depends on the selected **Power Formats And Units**)		
Default value	1 kW	**Force value**	YES
Step	1 kW		
Comm object	16544	**Related applications**	MPTM
Config level	Standard		
Setpoint visibility	Only if **Application Mode** = MPTM and **Pave Protection** != Disabled		
Description			

This setpoint defines the maximum exported power agreed with the grid.

According to this setpoint and LAI **PMOM** is calculated value **Pmom/Pave** which is used in application curve **P MOM/PAVE MAX**. It is used by the **Pave** function.

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Group: Protections

Subgroup: Overload Protection

IDMT Overload Protection

Setpoint group	BESS Protections	**Related FW**	2.2.0
Range [units]	Enabled / Blocked / Protection Force Blocked 1 / Protection Force Blocked 2 / Protection Force Blocked 3 [-]		
Default value	Enabled	**Force value**	YES
Step	[-]		
Comm object	13231	**Related applications**	MINT, MPTM
Config level	Advanced		
Setpoint visibility	Always		
Description			

This setpoint enables or disables IDMT Overload Protection.

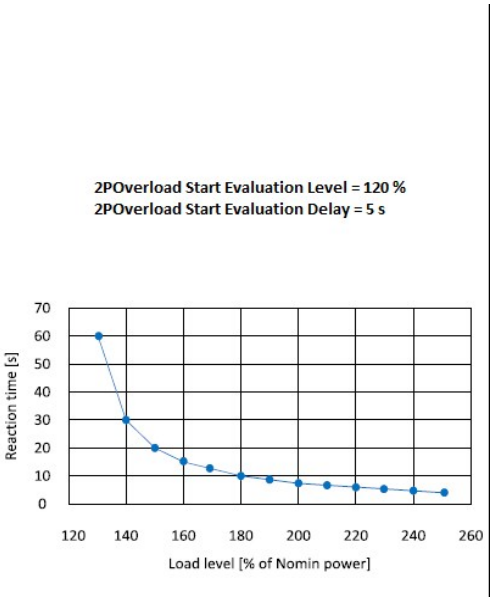
Behavior of protection is adjusted via setpoints **2POverload Start Evaluation Level** and **2POverload Start Evaluation Delay**. This protection activates alarm **Sd IDMT Overload** .

The reaction time is calculated by this formula:

$$\text{Reaction time} = \frac{\text{2POverload Start Evaluation Level} \times \text{2Poverload Start Evaluation Delay}}{\frac{\text{BESS } P}{\text{Nominal Power}} \times 100 \times \text{2Poverload Start Evaluation Level}}$$

> **IMPORTANT: If this protection is disabled, the BCB cannot be closed.**

Load level	Reaction time [s]
100	no reaction
110	no reaction
120	3600
130	60
140	30
150	20
160	15
170	12
180	10
190	8.6
200	7.5
210	6.7
220	6
230	5.5
240	5
250	4.6



Setpoint options:

- Enabled / Blocked: Protection is enabled / Blocked.
- Protection Force Disable 1 / 2 / 3: Protection is enabled or disabled by the state of LBI **Protection Force Disable Block 1** / **Protection Force Disable Block 2** / **Protection Force Disable Block 3**.

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Subgroup: Current Protection

Short Circuit Protection

Setpoint group	BESS Protections	**Related FW**	2.2.0
Range [units]	Enabled / Blocked / Protection Force Blocked 1 / Protection Force Blocked 2 / Protection Force Blocked 3 [-] [-]		
Default value	Enabled	**Force value**	YES
Step	[-]		
Comm object	15665	**Related applications**	MINT, MPTM
Config level	Advanced		
Setpoint visibility	Always		
Description			

This setpoint enables or disables Short Circuit Protection.

Behavior of protection is adjusted via setpoints **Short Circuit** and **Short Circuit Delay**. When value of **BESS Current L1**, **BESS Current L2** and **BESS Current L3** related to **Nominal Current** cross over **Short Circuit** for time longer than **Short Circuit Delay** alarm **Sd Short Circuit** is activated.

Setpoint options:

- Enabled / Blocked : Protection is Enabled / Blocked.
- Protection Force Disable 1 / 2 / 3: Protection is enabled or disabled by the state of LBI **PROTECTION FORCE DISABLE BLOCK 1** / **PROTECTION FORCE DISABLE BLOCK 2** / **PROTECTION FORCE DISABLE BLOCK 3**.

IMPORTANT: If this protection is disabled, the BCB cannot be closed.

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IDMT BESS >A Protection

Setpoint group	BESS Protections	**Related FW**	2.2.0
Range [units]	Enabled / Blocked / Protection Force Blocked 1 / Protection Force Blocked 2 / Protection Force Blocked 3 [-]		
Default value	Enabled	**Force value**	YES
Step	[-]		
Comm object	15666	**Related applications**	MINT, MPTM
Config level	Advanced		
Setpoint visibility	Always		
Description			

This setpoint enables or disables IDMT BESS >A Protection.

Behavior of protection is adjusted via setpoints **IDMT BESS >A Delay**. This protection activates alarm **Sd IDMT BESS >A**.

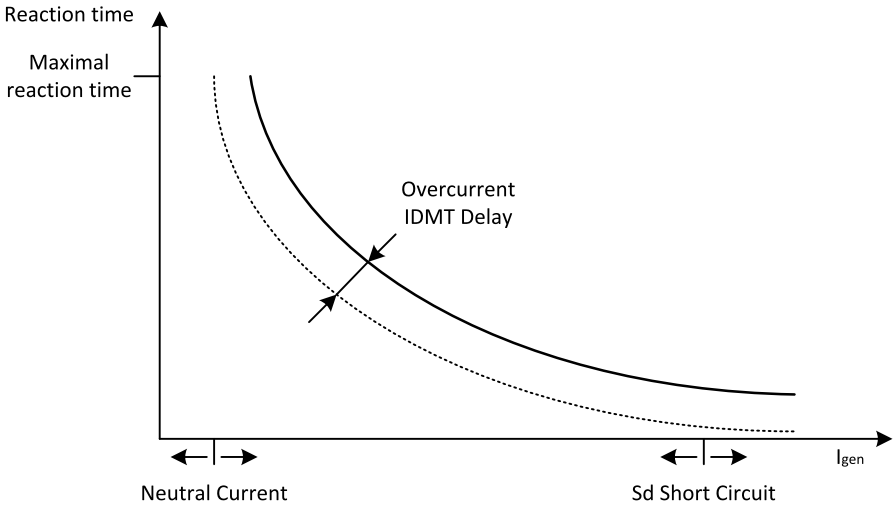
The reaction time is calculated by this formula:

$$\text{Reaction time} = \frac{IDMT\ \text{BESS} > A\ \text{Delay} \times \text{Nominal Current}}{I_{gen} - \text{Nominal Current}}$$

IBESS = Maximum (**BESS Current L1**and**BESS Current L1**

Note: *Reaction time is limited to 3600 s = 60 minutes. IDMT protection is not active for Reaction time values longer than 60 minutes.*

	Overcurrent IDMT Delay	Overcurrent		
		≤100 %	101 %	110 %
Reaction Time	0.2 s	No action	20 s	2 s
	2 s	No action	200 s	20 s
	20 s	No action	2000 s	200 s



Setpoint options:

- Enabled / Disabled: Protection is enabled / disabled.
- Protection Force Block 1 / 2 / 3: Protection is enabled or disabled by the state of LBI **PROTECTION FORCE DISABLE BLOCK 1** / **PROTECTION FORCE DISABLE BLOCK 2** / **PROTECTION FORCE DISABLE BLOCK 3**.

IMPORTANT: If this protection is disabled, the BCB cannot be closed.

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BESS Current Unbalance Protection

Setpoint group	BESS Protections	**Related FW**	2.2.0
Range [units]	Enabled / Blocked / Protection Force Blocked 1 / Protection Force Blocked 2 / Protection Force Blocked 3 [-]		
Default value	Enabled	**Force value**	YES
Step	[-]		
Comm object	15667	**Related applications**	MINT, MPTM
Config level	Advanced		
Setpoint visibility	Always		
Description			

This setpoint enables or disables BESS Current Unbalance Protection.

Protection is enabled. Behavior of protection is adjusted via setpoints **BESS Current Unbalance** and **BESS Current Unbalance Delay**. When relative difference between BESS currents is over setpoint **BESS Current Unbalance** for time longer than **BESS Current Unbalance Delay**alarm **Sd BESS Current Unbalance** is activated.

> **IMPORTANT: Behavior of this protection is influenced by setpoint Connection type**

Connection type	Compared values (maximum difference)
3Ph4Wire	(**BESS Current L1**,**BESS Current L1**
High Leg D	
3Ph3Wire	
SplitPhase	
MonoPhase	No protection is evaluated.

Setpoint options:

- Enabled / Blocked : Protection is enabled / blocked .
- Protection Force Block 1 / 2 / 3: Protection is enabled or disabled by the state of LBI **Protection Force Disable Block 1** / **Protection Force Disable Block 2** / **Protection Force Disable Block 3**.

> **IMPORTANT: If this protection is blocked, the BCB cannot be closed.**

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Subgroup: Voltage Protection

BESS >V

Setpoint group	BESS Protections	**Related FW**	2.2.0
Range [units]	Enabled / Blocked / Protection Force Blocked 1 / Protection Force Blocked 2 / Protection Force Blocked 3 [-]		
Default value	Enabled	**Force value**	YES
Step	[-]		
Comm object	20818	**Related applications**	MINT, MPTM
Config level	Advanced		
Setpoint visibility	Always		
Description			

This setpoint enables or disables BESS >V Protection.

Protection is enabled. Behavior of protection is adjusted via setpoints **BESS >V** and **BESS >V Delay**. When BESS voltage exceeds limit set by **BESS >V** for time longer than **BESS >V Delay** appropriate alarm is activated.

Value	Alarm
BESS Voltage L1-N	**Sd BESS >V L1-N**
BESS Voltage L2-N	**Sd BESS >V L2-N**
BESS Voltage L3-N	**Sd BESS >V L3-N**
BESS Voltage L1-L2	**SdBESS >V L1-L2**
BESS Voltage L2-L3	**Sd BESS >V L2-L3**
BESS Voltage L3-L1	**Sd BESS >V L3-L1**

Setpoint options:

- Enabled / Blocked : Protection is enabled / blocked .
- Protection Force Block 1 / 2 / 3: Protection is enabled or disabled by the state of LBI **PROTECTION FORCE DISABLE BLOCK 1** / **PROTECTION FORCE DISABLE BLOCK 2** / **PROTECTION FORCE DISABLE BLOCK 3**.

IMPORTANT: If this protection is disabled, the BCB cannot be closed.

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BESS >>V Protection

Setpoint group	BESS Protections	**Related FW**	2.2.0
Range [units]	Enabled / Blocked / Protection Force Blocked 1 / Protection Force Blocked 2 / Protection Force Blocked 3 [-]		
Default value	Enabled	**Force value**	YES
Step	[-]		
Comm object	20817	**Related applications**	MINT, MPTM
Config level	Advanced		
Setpoint visibility	Always		
Description			

This setpoint enables or disables BESS >>V Protection..

Behavior of protection is adjusted via setpoints **BESS >>V** and **BESS >>V Delay**. When BESS voltage exceeds limit set by **BESS >>V** for time longer than **BESS >>V Delay** appropriate alarm is activated.

Value	Alarm
BESS Voltage L1-N	**Sd BESS >>V L1-N**
BESS Voltage L2-N	**Sd BESS >>V L2-N**
BESS Voltage L3-N	**Sd BESS >>V L3-N**
BESS Voltage L1-L2	**Sd BESS >>V L1-L2**
BESS Voltage L2-L3	**Sd BESS >>V L2-L3**
BESS Voltage L3-L1	**Sd BESS >>V L3-L1**

Setpoint options:

- Enabled / Blocked : Protection is enabled / blocked .
- Protection Force Block 1 / 2 / 3: Protection is enabled or disabled by the state of LBI **PROTECTION FORCE DISABLE BLOCK 1** / **PROTECTION FORCE DISABLE BLOCK 2** / **PROTECTION FORCE DISABLE BLOCK 3**.

IMPORTANT: If this protection is disabled, the BCB cannot be closed.

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BESS <V Protection

Setpoint group	BESS Protections	**Related FW**	2.2.0
Range [units]	Enabled / Blocked / Protection Force Blocked 1 / Protection Force Blocked 2 / Protection Force Blocked 3 [-]		
Default value	Enabled	**Force value**	YES
Step	[-]		
Comm object	20819	**Related applications**	MINT, MPTM
Config level	Advanced		
Setpoint visibility	Always		
Description			

This setpoint enables or disables BESS <V Protection.

Behavior of protection is adjusted via setpoints **BESS <V** and **BESS <V Delay** When BESS voltage drops below limit set by **BESS <V** for time longer than **BESS <V Delay** appropriate alarm is activated.

Value	Alarm
BESS Voltage L1-N	**Sd BESS <V L1-N**
BESS Voltage L2-N	**Sd BESS <V L2-N**
BESS Voltage L3-N	**Sd BESS <V L3-N**
BESS Voltage L1-L2	**Sd BESSMains <V L1-L2**
BESS Voltage L2-L3	**Sd BESSMains <V L2-L3**
BESS Voltage L3-L1	**Sd BESS >V L3-L1**

Setpoint options:

- Enabled / Blocked : Protection is enabled / blocked .
- Protection Force Block 1 / 2 / 3: Protection is enabled or disabled by the state of LBI **PROTECTION FORCE DISABLE BLOCK 1** / **PROTECTION FORCE DISABLE BLOCK 2** / **PROTECTION FORCE DISABLE BLOCK 3**.

IMPORTANT: If this protection is disabled, the BCB cannot be closed.

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BESS V Unbalance Protection

Setpoint group	BESS Protections	**Related FW**	2.2.0
Range [units]	Enabled / Blocked / Protection Force Blocked 1 / Protection Force Blocked 2 / Protection Force Blocked 3 [-]		
Default value	Enabled	**Force value**	YES
Step	[-]		
Comm object	15669	**Related applications**	MINT, MPTM
Config level	Advanced		
Setpoint visibility	Always		
Description			

This setpoint enables or disables BESS V Unbalance Protection.

Behavior of protection is adjusted via setpoints **BESS V Unbalance** and **BESS V Unbalance Delay**. When relative difference between BESS voltages is over setpoint **BESS V Unbalance** for time longer than **BESS V Unbalance Delay** alarm **Sd BESS V Unbalance Ph-N** or **Sd BESS V Unbalance Ph-Ph** is activated.

IMPORTANT: Behavior of this protection is influenced by setpoint Connection type

Connection type	Compared values (maximum difference)
3Ph4Wire	**BESS Voltage L1-N**, **BESS Voltage L2-N** and **BESS Voltage L3-N** OR **BESS Voltage L1-L2**, **BESS Voltage L2-L3** and **BESS Voltage L3-L1**
High Leg D	**BESS Voltage L1-L2**, **BESS Voltage L2-L3** and **BESS Voltage L3-L1**
3Ph3Wire	**BESS Voltage L1-L2**, **BESS Voltage L2-L3** and **BESS Voltage L3-L1**
SplitPhase	**BESS Voltage L1-N**, **BESS Voltage L2-N** and **BESS Voltage L3-N**
MonoPhase	No protection is evaluated.

Setpoint options:

- Enabled / Blocked : Protection is enabled / blocked .
- Protection Force Block 1 / 2 / 3: Protection is enabled or disabled by the state of LBI **PROTECTION FORCE DISABLE BLOCK 1** / **PROTECTION FORCE DISABLE BLOCK 2** / **PROTECTION FORCE DISABLE BLOCK 3**.

IMPORTANT: If this protection is disabled, the BCB cannot be closed.

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Mains >V Protection

Setpoint group	BESS Protections	**Related FW**	2.2.0
Range [units]	Enabled / Blocked / Protection Force Blocked 1 / Protection Force Blocked 2 / Protection Force Blocked 3 [-]		
Default value	Enabled	**Force value**	YES
Step	[-]		
Comm object	20806	**Related applications**	MPTM
Config level	Advanced		
Setpoint visibility	Only if **Application Mode** = MPTM		
Description			

This setpoint enables or disables Mains >V Protection.

Behavior of protection is adjusted via setpoints **Mains >V**, **Mains >V Delay** and **Mains >V Hys**. When Mains voltage exceeds limit set by **Mains >V** for period longer than **Mains >V Delay** relevant history records is written to the history and MCB is opened if:

- **Controller Mode** = OFF
- **Controller Mode** = MAN
  and **Breaker state** = ParalOper
- **Controller Mode** = AUTO

Return from Mains >V can have hysteresis set by **Mains >V Hys**.

Value	History Record
Mains/Bus Voltage L1-N	**MAINS/BUS >V L1-N**
Mains/Bus Voltage L2-N	**MAINS/BUS >V L2-N**
Mains/Bus Voltage L3-N	**MAINS/BUS >V L3-N**
Mains/Bus Voltage L1-L2	**MAINS/BUS >V L1-L2**
Mains/Bus Voltage L2-L3	**MAINS/BUS >V L2-L3**
Mains/Bus Voltage L3-L1	**MAINS/BUS >V L3-L1**

Setpoint options:

- Enabled / Disabled: Protection is enabled / disabled.
- Protection Force Disable 1 / 2 / 3: Protection is enabled or disabled by the state of LBI **PROTECTION FORCE DISABLE BLOCK 1** / **PROTECTION FORCE DISABLE BLOCK 2** / **PROTECTION FORCE DISABLE BLOCK 3**.

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Mains >>V Protection

Setpoint group	BESS Protections	**Related FW**	2.2.0
Range [units]	Enabled / Blocked / Protection Force Blocked 1 / Protection Force Blocked 2 / Protection Force Blocked 3 [-]		
Default value	Enabled	**Force value**	YES
Step	[-]		
Comm object	20805	**Related applications**	MPTM
Config level	Advanced		
Setpoint visibility	Only if **Application Mode** = MPTM		

Description

This setpoint enables or disables Mains >>V Protection.

Behavior of protection is adjusted via setpoints **Mains >>V**, **Mains >>V Delay** and **Mains >>V Hys**. When Mains voltage exceeds limit set by **Mains >>V** for period longer than **Mains >>V Delay** relevant history records is written to the history and MCB is opened if:

- **Controller Mode** = OFF
- **Controller Mode** = MAN
  and **Breaker state** = ParalOper
- **Controller Mode** = AUTO

Return from Mains >>V can have hysteresis set by **Mains >>V Hys**.

Value	History Record
Mains/Bus Voltage L1-N	**MAINS/BUS >>V L1-N**
Mains/Bus Voltage L2-N	**MAINS/BUS >>V L2-N**
Mains/Bus Voltage L3-N	**MAINS/BUS >>V L3-N**
Mains/Bus Voltage L1-L2	**MAINS/BUS >>V L1-L2**
Mains/Bus Voltage L2-L3	**MAINS/BUS >>V L2-L3**
Mains/Bus Voltage L3-L1	**MAINS/BUS >>V L3-L1**

Setpoint options:

- Enabled / Disabled: Protection is enabled / disabled.
- Protection Force Disable 1 / 2 / 3: Protection is enabled or disabled by the state of LBI **PROTECTION FORCE DISABLE BLOCK 1** / **PROTECTION FORCE DISABLE BLOCK 2** / **PROTECTION FORCE DISABLE BLOCK 3**.

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Mains 10min Avg >V Protection

Setpoint group	BESS Protections	**Related FW**	2.2.0
Range [units]	Enabled / Blocked / Protection Force Blocked 1 / Protection Force Blocked 2 / Protection Force Blocked 3 [-]		
Default value	Enabled	**Force value**	YES
Step	[-]		
Comm object	13233	**Related applications**	MPTM
Config level	Advanced		
Setpoint visibility	Only if **Application Mode** = MPTM		
Description			

This setpoint enables or disables Mains 10min Avg >V Protection.

Behavior of protection is adjusted via setpoint **Mains 10min Avg >V**. When measured value exceeds limit set by **Mains 10min Avg >V** and the **Mains 10min Avg >V Delay** is elapsed the relevant history records is written to the history and MCB is opened if:

- **Controller Mode** = OFF
- **Controller Mode** = MAN
  and **Breaker state** = ParalOper
- **Controller Mode** = AUTO

Value	History Record
Mains Voltage 10min Avg L1-N	MP Mains 10minAvg >V L1-N
Mains Voltage 10min Avg L2-N	MP Mains 10minAvg >V L2-N
Mains Voltage 10min Avg L3-N	MP Mains 10minAvg >V L3-N
Mains Voltage 10min Avg L1-L2	MP Mains 10minAvg >V L1-L2
Mains Voltage 10min Avg L2-L3	MP Mains 10minAvg >V L2-L3
Mains Voltage 10min Avg L3-L1	MP Mains 10minAvg >V L3-L1

Setpoint options:

- Enabled / Disabled: Protection is enabled / disabled.
- Protection Force Disable 1 / 2 / 3: Protection is enabled or disabled by the state of LBI **Protection Force Disable Block 1** / **Protection Force Disable Block 2** / **Protection Force Disable Block 3**.

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Mains <V Protection

Setpoint group	BESS Protections	**Related FW**	2.2.0
Range [units]	Enabled / Blocked / Protection Force Blocked 1 / Protection Force Blocked 2 / Protection Force Blocked 3 [-]		
Default value	Enabled	**Force value**	YES
Step	[-]		
Comm object	20807	**Related applications**	MPTM
Config level	Advanced		
Setpoint visibility	Only if **Application Mode** = MPTM		

Description

This setpoint enables or disables Mains <V Protection.

Behavior of protection is adjusted via setpoints **Mains <V**, **Mains <V Delay** and **Mains <V Hys**. When Mains voltage drops below limit set by **Mains <V** for period longer than **Mains <V Delay** relevant history records is written to the history and MCB is opened if:

- **Controller Mode** = OFF
- **Controller Mode** = MAN
  and **Breaker state** = ParalOper
- **Controller Mode** = AUTO

Return from Mains <V can have hysteresis set by **Mains <V Hys**.

Value	History Record
Mains/Bus Voltage L1-N	**MAINS/BUS <V L1-N**
Mains/Bus Voltage L2-N	**MAINS/BUS <V L2-N**
Mains/Bus Voltage L3-N	**MAINS/BUS <V L3-N**
Mains/Bus Voltage L1-L2	**MAINS/BUS <V L1-L2**
Mains/Bus Voltage L2-L3	**MAINS/BUS <V L2-L3**
Mains/Bus Voltage L3-L1	**MAINS/BUS <V L3-L1**

Setpoint options:

- Enabled / Disabled: Protection is enabled / disabled.
- Protection Force Disable 1 / 2 / 3: Protection is enabled or disabled by the state of LBI **PROTECTION FORCE DISABLE BLOCK 1** / **PROTECTION FORCE DISABLE BLOCK 2** / **PROTECTION FORCE DISABLE BLOCK 3**.

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Mains <V Protection

Setpoint group	BESS Protections	**Related FW**	2.2.0
Range [units]	Enabled / Blocked / Protection Force Blocked 1 / Protection Force Blocked 2 / Protection Force Blocked 3 [-]		
Default value	Enabled	**Force value**	YES
Step	[-]		
Comm object	20808	**Related applications**	MPTM
Config level	Advanced		
Setpoint visibility	Only if **Application Mode** = MPTM		

Description

This setpoint enables or disables Mains <<V Protection.

Behavior of protection is adjusted via setpoints **Mains <<V**, **Mains <<V Delay** and **Mains <<V Hys**. When Mains voltage drops below limit set by **Mains <<V** for period longer than **Mains <<V Delay** relevant history records is written to the history and MCB is opened if:

- **Controller Mode** = OFF
- **Controller Mode** = MAN
  and **Breaker state** = ParalOper
- **Controller Mode** = AUTO

Return from Mains <<V can have hysteresis set by **Mains <<V Hys**.

Value	History Record
Mains/Bus Voltage L1-N	**MAINS/BUS <<V L1-N**
Mains/Bus Voltage L2-N	**MAINS/BUS <<V L2-N**
Mains/Bus Voltage L3-N	**MAINS/BUS <<V L3-N**
Mains/Bus Voltage L1-L2	**MAINS/BUS <<V L1-L2**
Mains/Bus Voltage L2-L3	**MAINS/BUS <<V L2-L3**
Mains/Bus Voltage L3-L1	**MAINS/BUS <<V L3-L1**

Setpoint options:

- Enabled / Disabled: Protection is enabled / disabled.
- Protection Force Disable 1 / 2 / 3: Protection is enabled or disabled by the state of LBI **PROTECTION FORCE DISABLE BLOCK 1** / **PROTECTION FORCE DISABLE BLOCK 2** / **PROTECTION FORCE DISABLE BLOCK 3**.

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Mains V Unbalance Protection

Setpoint group	BESS Protections	**Related FW**	2.2.0
Range [units]	Enabled / Blocked / Protection Force Blocked 1 / Protection Force Blocked 2 / Protection Force Blocked 3 [-]		
Default value	Enabled	**Force value**	YES
Step	[-]		
Comm object	20798	**Related applications**	MINT, MPTM
Config level	Advanced		
Setpoint visibility	Only if **Application Mode** = MPTM		

Description

This setpoint enables or disables Mains V Unbalance Protection.

Behavior of protection is adjusted via setpoints **Mains V Unbalance** and **Mains V Unbalance Delay**. When relative difference between Mains current is over setpoint **Mains V Unbalance** for time longer than **Mains V Unbalance Delay** alarm **Mains/Bus V Unbalance Ph-N** or **Mains/BusV Unbalance Ph-Ph** is activated.

> **IMPORTANT: Behavior of this protection is influenced by setpoint Connection type**

Connection type	Compared values (maximum difference)
3Ph4Wire	**Mains/Bus Voltage L1-N**, **Mains/Bus Voltage L2-N** and **Mains/Bus Voltage L3-N** OR **Mains/Bus Voltage L1-L2**, **Mains/Bus Voltage L2-L3** and **Mains/Bus Voltage L3-L1**
High Leg D	**Mains/Bus Voltage L1-L2**, **Mains/Bus Voltage L2-L3** and **Mains/Bus Voltage L3-L1**
3Ph3Wire	**Mains/Bus Voltage L1-L2**, **Mains/Bus Voltage L2-L3** and **Mains/Bus Voltage L3-L1**
SplitPhase	**Mains/Bus Voltage L1-N**, **Mains/Bus Voltage L2-N** and **Mains/Bus Voltage L3-N**
MonoPhase	No protection is evaluated.

List of History Records
Mains V Unbalance Ph-N
Mains V Unbalance Ph-Ph

Setpoint options:

- Enabled / Disabled: Protection is enabled / disabled.
- Protection Force Disable 1 / 2 / 3: Protection is enabled or disabled by the state of LBI **Protection Force Disable Block 1** / **Protection Force Disable Block 2** / **Protection Force Disable Block 3**.

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Subgroup: Frequency Protection

BESS >f Protection

Setpoint group	BESS Protections	**Related FW**	2.2.0
Range [units]	Enabled / Blocked / Protection Force Blocked 1 / Protection Force Blocked 2 / Protection Force Blocked 3 [-]		
Default value	Enabled	**Force value**	YES
Step	[-]		
Comm object	20809	**Related applications**	MINT, MPTM
Config level	Advanced		
Setpoint visibility	Always		
Description			

This setpoint enables or disables BESS >f Protection.

Behavior of protection is adjusted via setpoints **BESS >f** and **BESS >f Delay**. When **BESS Frequency** exceeds maximal accepted frequency for period longer than **BESS >f Delay** alarm **Sd BESS >f** is activated.

Note: f_{max} ***= Nominal Frequency + BESS >f***

Setpoint options:

- Enabled / Blocked : Protection is enabled / blocked .
- Protection Force Block 1 / 2 / 3: Protection is enabled or disabled by the state of LBI **PROTECTION FORCE DISABLE BLOCK 1** / **PROTECTION FORCE DISABLE BLOCK 2** / **PROTECTION FORCE DISABLE BLOCK 3**.

IMPORTANT: If this protection is disabled, the BCB cannot be closed.

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BESS <f Protection

Setpoint group	BESS Protections	**Related FW**	2.2.0
Range [units]	Enabled / Blocked / Protection Force Blocked 1 / Protection Force Blocked 2 / Protection Force Blocked 3 [-]		
Default value	Enabled	**Force value**	YES
Step	[-]		
Comm object	20810	**Related applications**	MINT, MPTM
Config level	Advanced		
Setpoint visibility	Always		
Description			

This setpoint enables or disables BESS <f Protection.

Behavior of protection is adjusted via setpoints **BESS <f** and **BESS <f Delay**. When **BESS Frequency** drops below minimal accepted frequency for period longer than **BESS <f Delay** alarm **Sd BESS <f** is activated.

Note: f_{min} ***= Nominal Frequency + BESS <f***

Setpoint options:

- Enabled / Blocked : Protection is enabled / blocked .
- Protection Force Block 1 / 2 / 3: Protection is enabled or disabled by the state of LBI **PROTECTION FORCE DISABLE BLOCK 1** / **PROTECTION FORCE DISABLE BLOCK 2** / **PROTECTION FORCE DISABLE BLOCK 3**.

IMPORTANT: If this protection is disabled, the BCB cannot be closed.

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Mains >f Protection

Setpoint group	BESS Protections	**Related FW**	2.2.0
Range [units]	Enabled / Blocked / Protection Force Blocked 1 / Protection Force Blocked 2 / Protection Force Blocked 3 [-]		
Default value	Enabled	**Force value**	YES
Step	[-]		
Comm object	20802	**Related applications**	MINT, MPTM
Config level	Advanced		
Setpoint visibility	Only if **Application Mode** = MPTM		
Description			

This setpoint adjusts the behavior Mains >f Protection.

Behavior of protection is adjusted via setpoints **Mains >f**, **Mains >f Delay** and **Mains >f Hys**. When **Mains/Bus Frequency** exceeds maximal accepted frequency for period longer than **Mains >f Delay**alarm **MAINS/BUS >F** is activated.

- **Controller Mode** = OFF
- **Controller Mode** = MAN
  and **Breaker state** = ParalOper
- **Controller Mode** = AUTO

Return from Mains >f can have hysteresis set by **Mains >f Hys**.

Note: f_{max} = ***Nominal Frequency*** + ***Mains >f***

Setpoint options:

- Enabled / Disabled: Protection is enabled / disabled.
- Protection Force Disable 1 / 2 / 3: Protection is enabled or disabled by the state of LBI **PROTECTION FORCE DISABLE BLOCK 1** / **PROTECTION FORCE DISABLE BLOCK 2** / **PROTECTION FORCE DISABLE BLOCK 3**.

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Mains >>f Protection

Setpoint group	BESS Protections	**Related FW**	2.2.0
Range [units]	Enabled / Blocked / Protection Force Blocked 1 / Protection Force Blocked 2 / Protection Force Blocked 3 [-]		
Default value	Enabled	**Force value**	YES
Step	[-]		
Comm object	20801	**Related applications**	MPTM
Config level	Advanced		
Setpoint visibility	Only if **Application Mode** = MPTM		

Description

This setpoint adjusts the behavior Mains >>f Protection.

Behavior of protection is adjusted via setpoints **Mains >>f**, **Mains >>f Delay** and **Mains >>f Hys**. When **Mains/Bus Frequency** exceeds maximal accepted frequency for period longer than **Mains >>f Delay** alarm **MAINS/BUS >>F** is activated.

- **Controller Mode** = OFF
- **Controller Mode** = MAN
  and **Breaker state** = ParalOper
- **Controller Mode** = AUTO

Return from Mains >>f can have hysteresis set by **Mains >>f Hys**.

Note: f_{max} = ***Nominal Frequency*** + ***Mains >>f***

Setpoint options:

- Enabled / Disabled: Protection is enabled / disabled.
- Protection Force Disable 1 / 2 / 3: Protection is enabled or disabled by the state of LBI **PROTECTION FORCE DISABLE BLOCK 1** / **PROTECTION FORCE DISABLE BLOCK 2** / **PROTECTION FORCE DISABLE BLOCK 3**.

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Mains <f Protection

Setpoint group	BESS Protections	**Related FW**	2.2.0
Range [units]	Enabled / Blocked / Protection Force Blocked 1 / Protection Force Blocked 2 / Protection Force Blocked 3 [-]		
Default value	Enabled	**Force value**	YES
Step	[-]		
Comm object	20803	**Related applications**	MPTM
Config level	Advanced		
Setpoint visibility	Only if **Application Mode** = MPTM		
Description			

This setpoint adjusts the behavior Mains <f Protection.

Behavior of protection is adjusted via setpoints **Mains <f**, **Mains <f Delay** and **Mains <f Hys**. When **Mains/Bus Frequency** drops below minimal accepted frequency for period longer than **Mains <f Delay** alarm **MAINS/BUS <F** is activated.

- **Controller Mode** = OFF
- **Controller Mode** = MAN
  and **Breaker state** = ParalOper
- **Controller Mode** = AUTO

Return from Mains <f can have hysteresis set by **Mains <f Hys**.

Note: f_{min} ***= Nominal Frequency - Mains <f***

Setpoint options:

- Enabled / Disabled: Protection is enabled / disabled.
- Protection Force Disable 1 / 2 / 3: Protection is enabled or disabled by the state of LBI **PROTECTION FORCE DISABLE BLOCK 1** / **PROTECTION FORCE DISABLE BLOCK 2** / **PROTECTION FORCE DISABLE BLOCK 3**.

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Mains <<f Protection

Setpoint group	BESS Protections	**Related FW**	2.2.0
Range [units]	Enabled / Blocked / Protection Force Blocked 1 / Protection Force Blocked 2 / Protection Force Blocked 3 [-]		
Default value	Enabled	**Force value**	YES
Step	[-]		
Comm object	20804	**Related applications**	MPTM
Config level	Advanced		
Setpoint visibility	Only if **Application Mode** = MPTM		
Description			

This setpoint adjusts the behavior Mains <<f Protection.

Behavior of protection is adjusted via setpoints **Mains <<f**, **Mains <<f Delay** and **Mains <<f Hys**. When **Mains/Bus Frequency** drops below minimal accepted frequency for period longer than **Mains <<f Delay** alarm **MAINS/BUS <<F** is activated.

- **Controller Mode** = OFF
- **Controller Mode** = MAN
  and **Breaker state** = ParalOper
- **Controller Mode** = AUTO

Return from Mains <<f can have hysteresis set by **Mains <<f Hys**.

Note: *f_{min} = **Nominal Frequency - Mains <<f***

Setpoint options:

- Enabled / Disabled: Protection is enabled / disabled.
- Protection Force Disable 1 / 2 / 3: Protection is enabled or disabled by the state of LBI **PROTECTION FORCE DISABLE BLOCK 1** / **PROTECTION FORCE DISABLE BLOCK 2** / **PROTECTION FORCE DISABLE BLOCK 3**.

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Subgroup: Phase Rotation Protection

Phase Rotation Protection

Setpoint group	Basic settings	**Related FW**	2.2.0
Range [units]	Clockwise / Counterclockwise [-]		
Default value	Clockwise	**Force value**	YES
Step	[-]		
Comm object	19709	**Related applications**	MINT, MPTM
Config level	Advanced		
Setpoint visibility	Always		
Description			

This setpoint enables or disables Bus Measurement Error protection.The alarm **ALI AC BusMains Ph Rotation Opposite** is activated when controller detects wrong phase rotation, e.g. **Phase Rotation**.

Setpoint options:

- Enabled / Blocked : Protection is enabled / blocked .
- Protection Force Block 1 / 2 / 3: Protection is enabled or disabled by the state of LBI **PROTECTION FORCE DISABLE BLOCK 1** / **PROTECTION FORCE DISABLE BLOCK 2** / **PROTECTION FORCE DISABLE BLOCK 3**.

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Subgroup: Bus Meas Error

Bus Meas Error

Setpoint group	BESS Protections	**Related FW**	2.2.0
Range [units]	Enabled / Blocked / Protection Force Blocked 1 / Protection Force Blocked 2 / Protection Force Blocked 3 [-]		
Default value	Enabled	**Force value**	YES
Step	[-]		
Comm object	10558	**Related applications**	MINT
Config level	Advanced		
Setpoint visibility	Only if **Application Mode** = MINT		
Description			

This setpoint enables or disables Bus Measurement Error protection.

Alarm **Bus Meas Error** is activated if controller detects a mismatch between the expected and currently measured voltage on the bus for period longer set by setpoint **Bus Meas Error Delay**. Mismatch means that measured voltage is lower/higher than **Bus Dead Level**, although the controller receives information about closed/opened breaker.

Setpoint options:

- Enabled / Blocked
- Protection Force Blocked 1 / 2 / 3: Protection is enabled or disabled by the state of LBI **PROTECTION FORCE DISABLE BLOCK 1** / **PROTECTION FORCE DISABLE BLOCK 2** / **PROTECTION FORCE DISABLE BLOCK 3**.

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Subgroup: Earth Fault Current Protection

Earth Fault Current Protection

Setpoint group	BESS Protections	**Related FW**	2.2.0
Range [units]	Enabled / Disabled / Protection Force Disable 1 / Protection Force Disable 2 / Protection Force Disable 3 [-]		
Default value	Enabled	**Force value**	YES
Step	[-]		
Comm object	10180	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Always		
Description			

This setpoint enables or disables Earth Fault Current Protection.

Bbehavior is adjusted via setpoints **IDMT Earth Fault Current Sd** and **IDMT Earth Fault Current Delay**. When the protection is triggered the alarm **Sd IDMT Earth Fault Current** is activated.

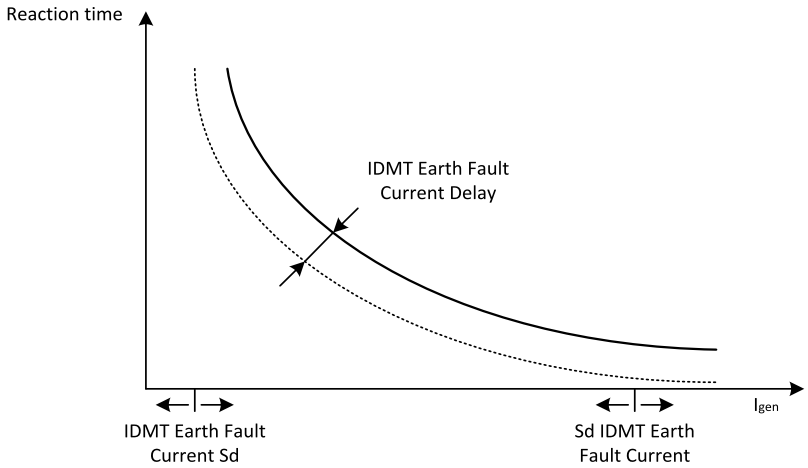
The reaction time is calculated by this formula:

$$\text{Reaction time} = \frac{IDMT\ \text{Earth Fault Current Delay} \times \text{IDMT Earth Fault Current } Sd}{I_{gen} - \text{IDMT Earth Fault Current Sd}}$$

I_{gen} = Maximum (**BESS Current L1**, **BESS Current L2**, **BESS Current L3**)

Example:
IDMT Earth Fault Current Sd = 10 A

	Delay [s]	I_{gen} [A]		
		≤10 A	11 A	20 A
Reaction Time [s]	0.1	No Reaction	1	0.1
	1	No Reaction	10	1
	10	No Reaction	100	10



IMPORTANT: The Earth Fault Current Protection and Mains Import Measurement shares same physical input ⑰ AUX CURRENT . At one moment this input can be used only for one purpose. The protection will work only if Mains Measurement P and Mains Measurement Q != Mains CT.

Setpoint options:

- Enabled / Disabled: Protection is enabled / disabled.
- Protection Force Disable 1 / 2 / 3: Protection is enabled or disabled by the state of LBI **Protection Force Disable Block 1** / **Protection Force Disable Block 2** / **Protection Force Disable Block 3**.

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Subgroup: Loss of Mains Protections

Vector Shift Protection

Setpoint group	BESS Protections	**Related FW**	2.2.0
Range [units]	Enabled / Parallel Only / Disabled [-]		
Default value	Disabled	**Force value**	YES
Step	[-]		
Comm object	10551	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Always		
Description			

This setpoint enables or disables the function of the built-in Vector Shift protection.

Behavior of protection is adjusted via setpoints **Vector Shift Limit** and **Vector Shift/ROCOF CB Selector**. When measured vector shift on **Mains/Bus Voltage L1-N** is over the **Vector Shift Limit**, breaker specified in **Vector Shift/ROCOF CB Selector** is opened and history record Vector Shift is written to the history.

Enabled	Protection is always active while MCB is closed.
Parallel Only	Protection is active only if **Breaker state** = ParalOper i.e. MCB and BCB are closed.
Disabled	Protection is disabled.

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ROCOF1 Protection

Setpoint group	BESS Protections	**Related FW**	2.2.0
Range [units]	Enabled / Parallel Only / Disabled [-]		
Default value	Disabled	**Force value**	YES
Step	[-]		
Comm object	9840	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Always		
Description			

This setpoint enables or disables the function of the built-in ROCOF1 Protection.

Behavior of protection is adjusted via setpoints **ROCOF1 Windows Length**, **ROCOF1 df/dt** and **Vector Shift/ROCOF CB Selector**.

When measured **ROCOF1** on **Mains/Bus Frequency** is over **ROCOF1 df/dt** in respective period given by **ROCOF1 Windows Length**, breaker specified in **Vector Shift/ROCOF CB Selector** is opened and history record ROCOF is written to the history. Maximal ROCOF is stored in **Max ROCOF1** which is reset every time when the breaker is closed again.

Note: *If a ROCOF is detected and consequently the MCB is opened, however Mains voltage and frequency remain in limits, the MCB is reclosed again after* ***MCB Close Delay****, as the Mains is evaluated as healthy.*

Enabled	Protection is always active while MCB is closed.
Parallel Only	Protection is active only if **Breaker state** = ParalOper i.e. MCB and BCB are closed.
Disabled	Protection is disabled.

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ROCOF2 Protection

Setpoint group	BESS Protections	**Related FW**	2.2.0
Range [units]	Enabled / Parallel Only / Disabled [-]		
Default value	Disabled	**Force value**	YES
Step	[-]		
Comm object	16145	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Always		

Description

This setpoint enables or disables the function of the built-in ROCOF2 Protection.

Behavior of protection is adjusted via setpoints **ROCOF2 Windows Length**, **ROCOF2 df/dt** and **Vector Shift/ROCOF CB Selector**.

When measured **ROCOF2** on **Mains/Bus Frequency** is over **ROCOF2 df/dt** in respective time given by **ROCOF2 Windows Length**, breaker specified in **Vector Shift/ROCOF CB Selector** is opened and history record ROCOF is written to the history. Maximal ROCOF is stored in **Max ROCOF2** which is reset every time when the breaker is closed again.

Note: *If a ROCOF is detected and consequently the MCB is opened, however Mains voltage and frequency remain in limits, the MCB is reclosed again after* ***MCB Close Delay****, as the Mains is evaluated as healthy.*

Enabled	Protection is always active while MCB is closed.
Parallel Only	Protection is active only if **Breaker state** = ParalOper i.e. MCB and BCB are closed.
Disabled	Protection is disabled.

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ROCOF3 Protection

Setpoint group	BESS Protections	**Related FW**	2.2.0
Range [units]	Enabled / Parallel Only / Disabled [-]		
Default value	Disabled	**Force value**	YES
Step	[-]		
Comm object	16146	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Always		

Description

This setpoint enables or disables the function of the built-in ROCOF3 Protection.

Behavior of protection is adjusted via setpoints **ROCOF3 Windows Length**, **ROCOF3 df/dt** and **Vector Shift/ROCOF CB Selector**.

When measured **ROCOF3** on **Mains/Bus Frequency** is over **ROCOF3 df/dt** in respective time given by **ROCOF3 Windows Length**, breaker specified in **Vector Shift/ROCOF CB Selector** is opened and history record ROCOF is written to the history. Maximal ROCOF is stored in **Max ROCOF3** which is reset every time when the breaker is closed again.

Note: *If a ROCOF is detected and consequently the MCB is opened, however Mains voltage and frequency remain in limits, the MCB is reclosed again after* ***MCB Close Delay****, as the Mains is evaluated as healthy.*

Enabled	Protection is always active while MCB is closed.
Parallel Only	Protection is active only if **Breaker state** = ParalOper i.e. MCB and BCB are closed.
Disabled	Protection is disabled.

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ROCOF4 Protection

Setpoint group	BESS Protections	**Related FW**	2.2.0
Range [units]	Enabled / Parallel Only / Disabled [-]		
Default value	Disabled	**Force value**	YES
Step	[-]		
Comm object	16147	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Always		

Description

This setpoint enables or disables the function of the built-in ROCOF4 Protection.

Behavior of protection is adjusted via setpoints **ROCOF4 Windows Length**, **ROCOF4 df/dt** and **Vector Shift/ROCOF CB Selector**.

When measured **ROCOF4** on **Mains/Bus Frequency** is over **ROCOF4 df/dt** in respective time given by **ROCOF4 Windows Length**, breaker specified in **Vector Shift/ROCOF CB Selector** is opened and history record ROCOF is written to the history. Maximal ROCOF is stored in **Max ROCOF4** which is reset every time when the breaker is closed again.

Note: *If a ROCOF is detected and consequently the MCB is opened, however Mains voltage and frequency remain in limits, the MCB is reclosed again after* ***MCB Close Delay****, as the Mains is evaluated as healthy.*

Enabled	Protection is always active while MCB is closed.
Parallel Only	Protection is active only if **Breaker state** = ParalOper i.e. MCB and BCB are closed.
Disabled	Protection is disabled.

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Subgroup: SOC Protection

BESS <SOC Protection

Setpoint group	BESS Protections	**Related FW**	2.2.0
Range [units]	Enabled / Blocked / Protection Force Blocked 1 / Protection Force Blocked 2 / Protection Force Blocked 3 [-]		
Default value	Enabled	**Force value**	YES
Step	[-]		
Comm object	20260	**Related applications**	MINT, MPTM
Config level	Advanced		
Setpoint visibility	Only if the setpoint **BESS** = InstalledAlways		
Description			

This setpoint enables or disables BESS <SOC Protection. When **BESS SOC** exceeds limit set by the setpoint **BESS <SOC** the alarm **Wrn SOC Low Alarm**.

Setpoint options:

- Enabled / Blocked : Protection is enabled / blocked .
- Protection Force Block 1 / 2 / 3: Protection is enabled or disabled by the state of LBI **PROTECTION FORCE DISABLE BLOCK 1** / **PROTECTION FORCE DISABLE BLOCK 2** / **PROTECTION FORCE DISABLE BLOCK 3**

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BESS >SOC Protection

Setpoint group	BESS Protections	**Related FW**	2.2.0
Range [units]	Enabled / Blocked / Protection Force Blocked 1 / Protection Force Blocked 2 / Protection Force Blocked 3 [-]		
Default value	Enabled	**Force value**	YES
Step	[-]		
Comm object	20259	**Related applications**	MINT, MPTM
Config level	Advanced		
Setpoint visibility	Only if the setpoint **BESS** = InstalledAlways		
Description			

This setpoint enables or disables BESS >SOC Protection. When **BESS SOC** exceeds limit set by the setpoint **BESS >SOC** the alarm **Wrn SOC High Alarm**.

Setpoint options:

- Enabled / Blocked : Protection is enabled / blocked .
- Protection Force Block 1 / 2 / 3: Protection is enabled or disabled by the state of LBI **PROTECTION FORCE DISABLE BLOCK 1** / **PROTECTION FORCE DISABLE BLOCK 2** / **PROTECTION FORCE DISABLE BLOCK 3**

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BESS <<SOC Protection

Setpoint group	BESS Protections	**Related FW**	2.2.0
Range [units]	Enabled / Blocked / Protection Force Blocked 1 / Protection Force Blocked 2 / Protection Force Blocked 3 [-]		
Default value	Enabled	**Force value**	YES
Step	[-]		
Comm object	20258	**Related applications**	MINT, MPTM
Config level	Advanced		
Setpoint visibility	Only if the setpoint **BESS** = InstalledAlways		
Description			

This setpoint enables or disables BESS <<SOC Protection. When **BESS SOC** exceeds limit set by the setpoint **BESS <<SOC** the alarm **Sd SOC Critical Low**.

Setpoint options:

- Enabled / Blocked : Protection is enabled / blocked .
- Protection Force Block 1 / 2 / 3: Protection is enabled or disabled by the state of LBI **PROTECTION FORCE DISABLE BLOCK 1** / **PROTECTION FORCE DISABLE BLOCK 2** / **PROTECTION FORCE DISABLE BLOCK 3**

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BESS >>SOC Protection

Setpoint group	BESS Protections	**Related FW**	2.2.0
Range [units]	Enabled / Blocked / Protection Force Blocked 1 / Protection Force Blocked 2 / Protection Force Blocked 3 [-]		
Default value	Enabled	**Force value**	YES
Step	[-]		
Comm object	20257	**Related applications**	MINT, MPTM
Config level	Advanced		
Setpoint visibility	Only if the setpoint **BESS** = InstalledAlways		
Description			

This setpoint enables or disables BESS >>SOC Protection. When **BESS SOC** exceeds limit set by the setpoint **BESS >>SOC** the alarm **Sd SOC Critical High**.

Setpoint options:

- Enabled / Blocked : Protection is enabled / blocked .
- Protection Force Block 1 / 2 / 3: Protection is enabled or disabled by the state of LBI **PROTECTION FORCE DISABLE BLOCK 1** / **PROTECTION FORCE DISABLE BLOCK 2** / **PROTECTION FORCE DISABLE BLOCK 3**

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BESS SOC Not Configured

Setpoint group	BESS Protections	**Related FW**	2.2.0
Range [units]	Enabled / Disabled		
Default value	Enabled	**Force value**	YES
Step	[-]		
Comm object	19646	**Related applications**	MINT, MPTM
Config level	Advanced		
Setpoint visibility	Always		
Description			
This setpoint enables or disables configuration of BESS SOC.			

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BESS SOC Not Available

Setpoint group	BESS Protections	**Related FW**	2.2.0
Range [units]	Enabled / Disabled		
Default value	Enabled	**Force value**	YES
Step	[-]		
Comm object	19647	**Related applications**	MINT, MPTM
Config level	Advanced		
Setpoint visibility	Always		
Description			
This setpoint enables or disables BESS SOC.			

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Subgroup: IDMT

IDMT Curve

Setpoint group	BESS Protections	**Related FW**	2.2.0
Range [units]	Comap/ANSI VIT/ANSI EIT/ANSI SIT/IEC VIT /IEC EIT/IEC SIT		
Default value	ComAp	**Force value**	YES
Step	[-]		
Comm object	8392	**Related applications**	MINT, MPTM
Config level	Advanced		
Setpoint visibility	Always		
Description			
Possibility to select IDMT curve based on different standards. SIT - standard intensive VIT - very intensive EIT - extremely intensive			

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Group: Load Shedding

Subgroup: Load Shedding

Load Shedding Active

Setpoint group	Load Shedding	**Related FW**	2.2.0
Range [units]	Disabled / Island only / IsL+Trip paral / All the time [-]		
Default value	Disabled	**Force value**	YES
Step	[-]		
Comm object	11001	**Related applications**	MINT, MPTM
Config level	Advanced		
Setpoint visibility	Allways		
Description			

This setpoint adjusts the activation of the **Load Shedding** function.

- **Disabled** – Function is disabled.
- **Island only** – Function is active when **Breaker state** = IslOper or **Breaker state** = MultIslOp.
  - **Load shedding outputs** are closed/opened one by one in island operations
  - All **Load shedding outputs** are closed at once when the BESS comes into the island operation if MCB and BCB were opened -> BESS started -> BCB closed.
- **IsL+Trip paral** – Function behaves same as Load Shedding Active = Island only and adds load shedding when **Breaker state** is changed from ParalOper/MultParOp to IslOper/MultIslOp .
  - **Load shedding outputs** are closed/opened one by one in island operations
  - All **Load shedding outputs** are closed at once when the BESS changes into island operation state in this way: MCB and BCB were opened -> BESS started -> BCB closed.
  - All **Load shedding outputs** are closed at once when the BESS changes into island operation state in this way: MCB and BCB were closed -> MCB opened.
- **All the time** – Function is active regardless of **Breaker state**.
  - All **Load shedding outputs** are never tripped at once when BCB is closed into parallel operation.
  - All **Load shedding outputs** are tripped at once when BCB is closed into island operation.

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Auto Load Reconnection

Setpoint group	Load Shedding	**Related FW**	2.2.0
Range [units]	Disabled / Enabled [-]		
Default value	Disabled	**Force value**	YES
Step	[-]		
Comm object	9649	**Related applications**	MINT, MPTM
Config level	Advanced		
Setpoint visibility	Only if **Load Shedding Active** is not Disabled		
Description			

This setpoint enables/disables Automatic **Load Shedding**.

Disabled	Rising edge of LBI **MANUAL LOAD RECONNECTION** lowers the load reduction stage by one while **BESS PMains Import P** drops under **Power Load Reconnection Level**.
Enabled	Load reduction stage is lowered by one when **BESS P** drops under **Power Load Reconnection Level** and period of **Load Reconnection Delay** elapsed from last load reduction stage lowering.

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Load Reconnection Delay

Setpoint group	Load Shedding	**Related FW**	2.2.0
Range [units]	0..600 [s]		
Default value	10 s	**Force value**	YES
Step	1 s		
Comm object	8893	**Related applications**	MINT, MPTM
Config level	Advanced		
Setpoint visibility	Only if **Load Shedding Active** is not Disabled		
Description			

This setpoint adjusts the delay between load reconnection during **Load Shedding** function.

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Subgroup: Power Load Shedding

Power Load Shedding

Setpoint group	Load Shedding	**Related FW**	2.2.0
Range [units]	Disabled / Enabled [-]		
Default value	Disabled	**Force value**	YES
Step	[-]		
Comm object	19681	**Related applications**	MINT, MPTM
Config level	Advanced		
Setpoint visibility	Always		
Description			
Enables or Disables the Power Load Shedding function.			

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Power Load Shedding Level

Setpoint group	Load Shedding	**Related FW**	2.2.0
Range [units]	**Power Load Reconnection Level** .. 200 [%] of **Installed Power** or **Nominal power**		
Default value	80 % of **Installed Power** or **Nominal power**	**Force value**	YES
Step	1 % of **Installed Power** or **Nominal power**		
Comm object	8884	**Related applications**	MINT, MPTM
Config level	Advanced		
Setpoint visibility	Only if **Load Shedding Active** is not Disabled		
Description			
This setpoint adjusts decisive level for load disconnection during **Load Shedding** function. ***Note:*** *The value of this setpoint relates to* ***Installed Power*** *only if* ***Installed Power*** *!= OFF, otherwise it relates to* ***Nominal power****.*			

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Power Load Shedding Delay

Setpoint group	Load Shedding	**Related FW**	2.2.0
Range [units]	0.0..600.0 [s]		
Default value	10 s	**Force value**	YES
Step	1 s		
Comm object	8887	**Related applications**	MINT, MPTM
Config level	Advanced		
Setpoint visibility	Only if **Load Shedding Active** is not Disabled		
Description			
This setpoint adjusts the delay between load disconnections during **Load Shedding** function.			

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Power Load Reconnection Level

Setpoint group	Load Shedding	**Related FW**	2.2.0
Range [units]	0 .. 20 [%] of **Installed Power** or **Nominal power**		
Default value	20 % of **Installed Power** or **Nominal power**	**Force value**	YES
Step	1 % of **Installed Power** or **Nominal power**		
Comm object	8890	**Related applications**	MINT, MPTM
Config level	Advanced		
Setpoint visibility	Only if **Load Shedding Active** is not Disabled		
Description			
This setpoint adjusts the decisive level between load reconnection during **Load Shedding** function. ***Note:*** *The value of this setpoint relates to **Installed Power** only if **Installed Power** != OFF, otherwise it relates to **Nominal power**.*			

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Subgroup: Apparent Load Shedding

Apparent Power Load Shedding

Setpoint group	Load Shedding	**Related FW**	2.2.0
Range [units]	Disabled / Enabled [-]		
Default value	Disabled	**Force value**	YES
Step	[-]		
Comm object	19682	**Related applications**	MINT, MPTM
Config level	Advanced		
Setpoint visibility	Always		
Description			
Enables or Disables the Current Load Shedding function.			

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Apparent Power Load Shedding Level

Setpoint group	Load Shedding	**Related FW**	2.2.0
Range [units]	20 .. 200 [%] of **Nominal power**		
Default value	80 % of **Nominal power**	**Force value**	YES
Step	1 % of **Nominal power**		
Comm object	8885	**Related applications**	MINT, MPTM
Config level	Advanced		
Setpoint visibility	Only if **Load Shedding Active** is not Disabled		
Description			
This setpoint adjusts decisive level for current disconnection during **Load Shedding** function.			

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Apparent Power Load Shedding Delay

Setpoint group	Load Shedding	**Related FW**	2.2.0
Range [units]	0.0 .. 600.0 [s]		
Default value	10 s	**Force value**	YES
Step	1 s		
Comm object	8888	**Related applications**	MINT, MPTM
Config level	Advanced		
Setpoint visibility	Only if **Load Shedding Active** is not Disabled		
Description			
This setpoint adjusts the delay between load disconnections during **Load Shedding** function.			

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Apparent Power Load Reconnection Level

Setpoint group	Load Shedding	**Related FW**	2.2.0
Range [units]	0 .. 20 [%] of **Nominal power**		
Default value	20 % of **Nominal power**	**Force value**	YES
Step	1 % of **Nominal power**		
Comm object	8891	**Related applications**	MINT, MPTM
Config level	Advanced		
Setpoint visibility	Only if **Load Shedding Active** is not Disabled		
Description			
This setpoint adjusts the decisive level between load reconnection during **Load Shedding** function.			

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Subgroup: Frequency Load Shedding

Frequency Load Shedding

Setpoint group	Load Shedding	**Related FW**	2.2.0
Range [units]	Disabled / Enabled [-]		
Default value	Disabled	**Force value**	YES
Step	[-]		
Comm object	19683	**Related applications**	MINT, MPTM
Config level	Advanced		
Setpoint visibility	Always		
Description			
Enables or Disables the Voltage Load Shedding function.			

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Frequency Load Shedding Level

Setpoint group	Load Shedding	**Related FW**	2.2.0
Range [units]	20 .. 200 [%] of **Nominal power**		
Default value	80 % of **Nominal power**	**Force value**	YES
Step	1 % of **Nominal power**		
Comm object	8886	**Related applications**	MINT, MPTM
Config level	Advanced		
Setpoint visibility	Only if **Load Shedding Active** != Disabled		
Description			
This setpoint adjusts decisive level for voltage disconnection during **Load Shedding** function.			

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Voltage Load Shedding Delay

Setpoint group	Load Shedding	**Related FW**	2.2.0
Range [units]	0.0..600.0 [s]		
Default value	10 s	**Force value**	YES
Step	1 s		
Comm object	8889	**Related applications**	MINT, MPTM
Config level	Advanced		
Setpoint visibility	Only if **Load Shedding Active** is not Disabled		
Description			
This setpoint adjusts the delay between load disconnections during **Load Shedding** function.			

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Frequency Load Reconnection Level

Setpoint group	Load Shedding	**Related FW**	2.2.0
Range [units]	0 .. 20 [%] of **Nominal power**		
Default value	20 % of **Nominal power**	**Force value**	YES
Step	1 % of **Nominal power**		
Comm object	8892	**Related applications**	MINT, MPTM
Config level	Advanced		
Setpoint visibility	Only if **Load Shedding Active** is not Disabled		
Description			
This setpoint adjusts the decisive level between load reconnection during **Load Shedding** function.			

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Subgroup: Battery SOC Load Shedding

Battery SOC Load Shedding

Setpoint group	Load Shedding	**Related FW**	2.2.0
Range [units]	Disabled / Enabled [-]		
Default value	Disabled	**Force value**	YES
Step	[-]		
Comm object	19684	**Related applications**	MINT, MPTM
Config level	Advanced		
Setpoint visibility	Always		
Description			
Enables or Disables the Battery SOC Shedding function.			

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Battery SOC Load Shedding Level 1 Reconnection Level

Setpoint group	Load Shedding	**Related FW**	2.2.0
Range [units]	0.00 .. **Battery SOC Shedding Level 1** [Hz]		
Default value	0.50 [Hz]	**Force value**	YES
Step	0.01 [Hz]		
Comm object	19686	**Related applications**	MINT, MPTM
Config level	Advanced		
Setpoint visibility	Only if **Load Shedding Active** is not Disabled		
Description			

Battery SOC Load Shedding is a function which prevents the deeper/faster discharging of the BESS. It uses the same load shedding outputs like Power or Frequency load shedding, but it works only for first three stages LBO **Load Shedding Stage 1**, LBO **Load Shedding Stage 2**, LBO **Load Shedding Stage 3**.
The Stage 1 is tripped if the SOC Level (Value **BESS SOC**) gets under the limit given by setpoint **Battery SOC Shedding Level 1** at least for time **Battery SOC Shedding Level 1 Delay**. The Load Shedding Stage 1 is deactivated (the LBO **Load Shedding Stage 1** is inactive) once the SOC rise over the **Battery SOC Load Shedding Level 1 Reconnection Level** for time given by setpoint **Load Reconnection Delay**.

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Battery SOC Shedding Level 1

Setpoint group	Load Shedding	**Related FW**	2.2.0
Range [units]	**Battery SOC Load Shedding Level 1 Reconnection Level** .. 5.00 [Hz]		
Default value	1.00 [Hz]	**Force value**	YES
Step	0.01 [Hz]		
Comm object	19688	**Related applications**	MINT, MPTM
Config level	Advanced		
Setpoint visibility	Only if **Load Shedding Active** != Disabled		
Description			

Battery SOC Load Shedding is a function which prevents the deeper/faster discharging of the BESS. It uses the same load shedding outputs like Power or Frequency load shedding, but it works only for first three stages LBO **Load Shedding Stage 1**, LBO **Load Shedding Stage 2**, LBO **Load Shedding Stage 3**.
The Stage 1 is tripped if the SOC Level (Value **BESS SOC**) gets under the limit given by setpoint **Battery SOC Shedding Level 1** at least for time **Battery SOC Shedding Level 1 Delay**. The Load Shedding Stage 1 is deactivated (the LBO **Load Shedding Stage 1** is inactive) once the SOC rise over the **Battery SOC Load Shedding Level 1 Reconnection Level** for time given by setpoint **Load Reconnection Delay**.

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Battery SOC Shedding Level 1 Delay

Setpoint group	Load Shedding	**Related FW**	2.2.0
Range [units]	0.0 .. 600.0 [s]		
Default value	10 s	**Force value**	YES
Step	1 s		
Comm object	19687	**Related applications**	MINT, MPTM
Config level	Advanced		
Setpoint visibility	Only if **Load Shedding Active** is not Disabled		
Description			

Battery SOC Load Shedding is a function which prevents the deeper/faster discharging of the BESS. It uses the same load shedding outputs like Power or Frequency load shedding, but it works only for first three stages LBO **Load Shedding Stage 1**, LBO **Load Shedding Stage 2**, LBO **Load Shedding Stage 3**.
The Stage 1 is tripped if the SOC Level (Value **BESS SOC**) gets under the limit given by setpoint **Battery SOC Shedding Level 1** at least for time **Battery SOC Shedding Level 1 Delay**. The Load Shedding Stage 1 is deactivated (the LBO **Load Shedding Stage 1** is inactive) once the SOC rise over the **Battery SOC Load Shedding Level 1 Reconnection Level** for time given by setpoint **Load Reconnection Delay**.

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Battery SOC Shedding Level 2

Setpoint group	Load Shedding	**Related FW**	2.2.0
Range [units]	**Battery SOC Load Shedding Level 1 Reconnection Level** .. 5.00 [Hz]		
Default value	1.00 [Hz]	**Force value**	YES
Step	0.01 [Hz]		
Comm object	18580	**Related applications**	MINT, MPTM
Config level	Advanced		
Setpoint visibility	Only if **Load Shedding Active** != Disabled		
Description			

Battery SOC Load Shedding is a function which prevents the deeper/faster discharging of the BESS. It uses the same load shedding outputs like Power or Frequency load shedding, but it works only for first three stages LBO **Load Shedding Stage 1**, LBO **Load Shedding Stage 2**, LBO **Load Shedding Stage 3**.
The Stage 2 is tripped if the SOC Level (Value **BESS SOC**) gets under the limit given by setpoint **Battery SOC Shedding Level 2** at least for time **Battery SOC Shedding Level 2 Delay**. The Load Shedding Stage 2 is deactivated (the LBO **Load Shedding Stage 2** is inactive) once the SOC rise over the **Battery SOC Shedding Level 1** for time given by setpoint **Load Reconnection Delay**.

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Battery SOC Shedding Level 2 Delay

Setpoint group	Load Shedding	**Related FW**	2.2.0
Range [units]	0.0 .. 600.0 [s]		
Default value	10 s	**Force value**	YES
Step	1 s		
Comm object	18582	**Related applications**	MINT, MPTM
Config level	Advanced		
Setpoint visibility	Only if **Load Shedding Active** is not Disabled		
Description			

Battery SOC Load Shedding is a function which prevents the deeper/faster discharging of the BESS. It uses the same load shedding outputs like Power or Frequency load shedding, but it works only for first three stages LBO **Load Shedding Stage 1**, LBO **Load Shedding Stage 2**, LBO **Load Shedding Stage 3**.
The Stage 2 is tripped if the SOC Level (Value **BESS SOC**) gets under the limit given by setpoint **Battery SOC Shedding Level 2** at least for time **Battery SOC Shedding Level 2 Delay**. The Load Shedding Stage 2 is deactivated (the LBO **Load Shedding Stage 2** is inactive) once the SOC rise over the **Battery SOC Shedding Level 1** for time given by setpoint **Load Reconnection Delay**.

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Battery SOC Shedding Level 3

Setpoint group	Load Shedding	**Related FW**	2.2.0
Range [units]	**Battery SOC Load Shedding Level 1 Reconnection Level** .. 5.00 [Hz]		
Default value	1.00 [Hz]	**Force value**	YES
Step	0.01 [Hz]		
Comm object	18581	**Related applications**	MINT, MPTM
Config level	Advanced		
Setpoint visibility	Only if **Load Shedding Active** != Disabled		
Description			

Battery SOC Load Shedding is a function which prevents the deeper/faster discharging of the BESS. It uses the same load shedding outputs like Power or Frequency load shedding, but it works only for first three stages LBO **Load Shedding Stage 1**, LBO **Load Shedding Stage 2**, LBO **Load Shedding Stage 3**.
The Stage 2 is tripped if the SOC Level (Value **BESS SOC**) gets under the limit given by setpoint **Battery SOC Shedding Level 3** at least for time **Battery SOC Shedding Level 3 Delay**. The Load Shedding Stage 3 is deactivated (the LBO **Load Shedding Stage 3** is inactive) once the SOC rise over the **Battery SOC Shedding Level 2** for time given by setpoint **Load Reconnection Delay**.

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Battery SOC Shedding Level 3 Delay

Setpoint group	Load Shedding	**Related FW**	2.2.0
Range [units]	0.0 .. 600.0 [s]		
Default value	10 s	**Force value**	YES
Step	1 s		
Comm object	18583	**Related applications**	MINT, MPTM
Config level	Advanced		
Setpoint visibility	Only if **Load Shedding Active** is not Disabled		
Description			

Battery SOC Load Shedding is a function which prevents the deeper/faster discharging of the BESS. It uses the same load shedding outputs like Power or Frequency load shedding, but it works only for first three stages LBO **Load Shedding Stage 1**, LBO **Load Shedding Stage 2**, LBO **Load Shedding Stage 3**.
The Stage 1 is tripped if the SOC Level (Value **BESS SOC**) gets under the limit given by setpoint **Battery SOC Shedding Level 1** at least for time **Battery SOC Shedding Level 1 Delay**. The Load Shedding Stage 1 is deactivated (the LBO **Load Shedding Stage 1** is inactive) once the SOC rise over the **Battery SOC Load Shedding Level 1 Reconnection Level** for time given by setpoint **Load Reconnection Delay**.

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Group: User Buttons

Subgroup: User Buttons

User Button 1

Setpoint group	User Buttons	**Related FW**	2.2.0
Range [units]	COMMAND / MAN ON / MAN OFF [-]		
Default value	COMMAND	**Force value**	YES
Step	[-]		
Comm object	20826	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Always		
Description			

This setpoint adjusts behavior of User Button 1 which is part of **User Buttons**.

COMMAND	User Button 1 is controlled by command from **External display**.
MAN ON	Value of the User Button 1 is still 1. ***Note:*** *You should always switch from MAN ON to MAN OFF before switching to COMMAND, otherwise value of the User Button 1 will be 1 until command is received.*
MAN OFF	Value of the User Button 1 is still 0.

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User Button 2

Setpoint group	User Buttons	**Related FW**	2.2.0
Range [units]	COMMAND / MAN ON / MAN OFF [-]		
Default value	COMMAND	**Force value**	YES
Step	[-]		
Comm object	20827	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Always		
Description			

This setpoint adjusts behavior of User Button 2 which is part of **User Buttons**.

COMMAND	User Button 2 is controlled by command from **External display**.
MAN ON	Value of the User Button 2 is still 1. ***Note:*** *You should always switch from MAN ON to MAN OFF before switching to COMMAND, otherwise value of the User Button 2 will be 1 until command is received.*
MAN OFF	Value of the User Button 2 is still 0.

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User Button 3

Setpoint group	User Buttons	**Related FW**	2.2.0
Range [units]	COMMAND / MAN ON / MAN OFF [-]		
Default value	COMMAND	**Force value**	YES
Step	[-]		
Comm object	20828	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Always		
Description			

This setpoint adjusts behavior of User Button 3 which is part of **User Buttons**.

COMMAND	User Button 3 is controlled by command from **External display**.
MAN ON	Value of the User Button 3 is still 1. ***Note:*** *You should always switch from MAN ON to MAN OFF before switching to COMMAND, otherwise value of the User Button 3 will be 1 until command is received.*
MAN OFF	Value of the User Button 3 is still 0.

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User Button 4

Setpoint group	User Buttons	**Related FW**	2.2.0
Range [units]	COMMAND / MAN ON / MAN OFF [-]		
Default value	COMMAND	**Force value**	YES
Step	[-]		
Comm object	20829	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Always		
Description			

This setpoint adjusts behavior of User Button 4 which is part of **User Buttons**.

COMMAND	User Button 4 is controlled by command from **External display**.
MAN ON	Value of the User Button 4 is still 1. ***Note:*** *You should always switch from MAN ON to MAN OFF before switching to COMMAND, otherwise value of the User Button 4 will be 1 until command is received.*
MAN OFF	Value of the User Button 4 is still 0.

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User Button 5

Setpoint group	User Buttons	**Related FW**	2.2.0
Range [units]	COMMAND / MAN ON / MAN OFF [-]		
Default value	COMMAND	**Force value**	YES
Step	[-]		
Comm object	20830	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Always		
Description			

This setpoint adjusts behavior of User Button 5 which is part of **User Buttons**.

COMMAND	User Button 5 is controlled by command from **External display**.
MAN ON	Value of the User Button 5 is still 1. ***Note:*** *You should always switch from MAN ON to MAN OFF before switching to COMMAND, otherwise value of the User Button 5 will be 1 until command is received.*
MAN OFF	Value of the User Button 5 is still 0.

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User Button 6

Setpoint group	User Buttons	**Related FW**	2.2.0
Range [units]	COMMAND / MAN ON / MAN OFF [-]		
Default value	COMMAND	**Force value**	YES
Step	[-]		
Comm object	20831	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Always		
Description			

This setpoint adjusts behavior of User Button 6 which is part of **User Buttons**.

COMMAND	User Button 6 is controlled by command from**External display**.
MAN ON	Value of the User Button 6 is still 1. ***Note:*** *You should always switch from MAN ON to MAN OFF before switching to COMMAND, otherwise value of the User Button 6 will be 1 until command is received.*
MAN OFF	Value of the User Button 6 is still 0.

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User Button 7

Setpoint group	User Buttons	**Related FW**	2.2.0
Range [units]	COMMAND / MAN ON / MAN OFF [-]		
Default value	COMMAND	**Force value**	YES
Step	[-]		
Comm object	20832	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Always		
Description			

This setpoint adjusts behavior of User Button 7 which is part of **User Buttons**.

COMMAND	User Button 7 is controlled by command from **External display**.
MAN ON	Value of the User Button 7 is still 1. ***Note:*** *You should always switch from MAN ON to MAN OFF before switching to COMMAND, otherwise value of the User Button 7 will be 1 until command is received.*
MAN OFF	Value of the User Button 7 is still 0.

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User Button 8

Setpoint group	User Buttons	**Related FW**	2.2.0
Range [units]	COMMAND / MAN ON / MAN OFF [-]		
Default value	COMMAND	**Force value**	YES
Step	[-]		
Comm object	20833	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Always		
Description			

This setpoint adjusts behavior of User Button 8 which is part of **User Buttons**.

COMMAND	User Button 8 is controlled by command from **External display**.
MAN ON	Value of the User Button 8 is still 1. ***Note:*** *You should always switch from MAN ON to MAN OFF before switching to COMMAND, otherwise value of the User Button 8 will be 1 until command is received.*
MAN OFF	Value of the User Button 8 is still 0.

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User Button 9

Setpoint group	User Buttons	**Related FW**	2.2.0
Range [units]	COMMAND / MAN ON / MAN OFF [-]		
Default value	COMMAND	**Force value**	YES
Step	[-]		
Comm object	20834	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Always		
Description			

This setpoint adjusts behavior of User Button 9 which is part of **User Buttons**.

COMMAND	User Button 9 is controlled by command from **External display**.
MAN ON	Value of the User Button 9 is still 1. ***Note:*** *You should always switch from MAN ON to MAN OFF before switching to COMMAND, otherwise value of the User Button 9 will be 1 until command is received.*
MAN OFF	Value of the User Button 9 is still 0.

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User Button 10

Setpoint group	User Buttons	**Related FW**	2.2.0
Range [units]	COMMAND / MAN ON / MAN OFF [-]		
Default value	COMMAND	**Force value**	YES
Step	[-]		
Comm object	20835	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Always		
Description			

This setpoint adjusts behavior of User Button 10 which is part of **User Buttons**.

COMMAND	User Button 10 is controlled by command from **External display**.
MAN ON	Value of the User Button 10 is still 1. ***Note:*** *You should always switch from MAN ON to MAN OFF before switching to COMMAND, otherwise value of the User Button 10 will be 1 until command is received.*
MAN OFF	Value of the User Button 10 is still 0.

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User Button 11

Setpoint group	User Buttons	**Related FW**	2.2.0
Range [units]	COMMAND / MAN ON / MAN OFF [-]		
Default value	COMMAND	**Force value**	YES
Step	[-]		
Comm object	20836	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Always		
Description			

This setpoint adjusts behavior of User Button 11 which is part of **User Buttons**.

COMMAND	User Button 11 is controlled by command from **External display**.
MAN ON	Value of the User Button 11 is still 1. ***Note:*** *You should always switch from MAN ON to MAN OFF before switching to COMMAND, otherwise value of the User Button 11 will be 1 until command is received.*
MAN OFF	Value of the User Button 11 is still 0.

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User Button 12

Setpoint group	User Buttons	**Related FW**	2.2.0
Range [units]	COMMAND / MAN ON / MAN OFF [-]		
Default value	COMMAND	**Force value**	YES
Step	[-]		
Comm object	20837	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Always		
Description			

This setpoint adjusts behavior of User Button 12 which is part of **User Buttons**.

COMMAND	User Button 12 is controlled by command from **External display**.
MAN ON	Value of the User Button 12 is still 1. ***Note:*** *You should always switch from MAN ON to MAN OFF before switching to COMMAND, otherwise value of the User Button 12 will be 1 until command is received.*
MAN OFF	Value of the User Button 12 is still 0.

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User Button 13

Setpoint group	User Buttons	**Related FW**	2.2.0
Range [units]	COMMAND / MAN ON / MAN OFF [-]		
Default value	COMMAND	**Force value**	YES
Step	[-]		
Comm object	20838	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Always		
Description			

This setpoint adjusts behavior of User Button 13 which is part of **User Buttons**.

COMMAND	User Button 13 is controlled by command from **External display**.
MAN ON	Value of the User Button 13 is still 1. ***Note:*** *You should always switch from MAN ON to MAN OFF before switching to COMMAND, otherwise value of the User Button 13 will be 1 until command is received.*
MAN OFF	Value of the User Button 13 is still 0.

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User Button 14

Setpoint group	User Buttons	**Related FW**	2.2.0
Range [units]	COMMAND / MAN ON / MAN OFF [-]		
Default value	COMMAND	**Force value**	YES
Step	[-]		
Comm object	20839	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Always		
Description			

This setpoint adjusts behavior of User Button 14 which is part of **User Buttons**.

COMMAND	User Button 14 is controlled by command from **External display**.
MAN ON	Value of the User Button 14 is still 1. ***Note:*** *You should always switch from MAN ON to MAN OFF before switching to COMMAND, otherwise value of the User Button 14 will be 1 until command is received.*
MAN OFF	Value of the User Button 14 is still 0.

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User Button 15

Setpoint group	User Buttons	**Related FW**	2.2.0
Range [units]	COMMAND / MAN ON / MAN OFF [-]		
Default value	COMMAND	**Force value**	YES
Step	[-]		
Comm object	20840	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Always		
Description			

This setpoint adjusts behavior of User Button 15 which is part of **User Buttons**.

COMMAND	User Button 15 is controlled by command from **External display**.
MAN ON	Value of the User Button 15 is still 1. ***Note:*** *You should always switch from MAN ON to MAN OFF before switching to COMMAND, otherwise value of the User Button 15 will be 1 until command is received.*
MAN OFF	Value of the User Button 15 is still 0.

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User Button 16

Setpoint group	User Buttons	**Related FW**	2.2.0
Range [units]	COMMAND / MAN ON / MAN OFF [-]		
Default value	COMMAND	**Force value**	YES
Step	[-]		
Comm object	20841	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Always		
Description			

This setpoint adjusts behavior of User Button 16 which is part of **User Buttons**.

COMMAND	User Button 16 is controlled by command from **External display**.
MAN ON	Value of the User Button 16 is still 1. ***Note:*** *You should always switch from MAN ON to MAN OFF before switching to COMMAND, otherwise value of the User Button 16 will be 1 until command is received.*
MAN OFF	Value of the User Button 16 is still 0.

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User Button 17

Setpoint group	User Buttons	**Related FW**	2.2.0
Range [units]	COMMAND / MAN ON / MAN OFF [-]		
Default value	COMMAND	**Force value**	YES
Step	[-]		
Comm object	20842	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Always		
Description			

This setpoint adjusts behavior of User Button 17 which is part of **User Buttons**.

COMMAND	User Button 17 is controlled by command from **External display**.
MAN ON	Value of the User Button 17 is still 1. ***Note:*** *You should always switch from MAN ON to MAN OFF before switching to COMMAND, otherwise value of the User Button 17 will be 1 until command is received.*
MAN OFF	Value of the User Button 17 is still 0.

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User Button 18

Setpoint group	User Buttons	**Related FW**	2.2.0
Range [units]	COMMAND / MAN ON / MAN OFF [-]		
Default value	COMMAND	**Force value**	YES
Step	[-]		
Comm object	20843	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Always		
Description			

This setpoint adjusts behavior of User Button 18 which is part of **User Buttons**.

COMMAND	User Button 18 is controlled by command from **External display**.
MAN ON	Value of the User Button 18 is still 1. ***Note:*** *You should always switch from MAN ON to MAN OFF before switching to COMMAND, otherwise value of the User Button 18 will be 1 until command is received.*
MAN OFF	Value of the User Button 18 is still 0.

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User Button 19

Setpoint group	User Buttons	**Related FW**	2.2.0
Range [units]	COMMAND / MAN ON / MAN OFF [-]		
Default value	COMMAND	**Force value**	YES
Step	[-]		
Comm object	20844	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Always		
Description			

This setpoint adjusts behavior of User Button 19 which is part of **User Buttons**.

COMMAND	User Button 19 is controlled by command from **External display**.
MAN ON	Value of the User Button 19 is still 1. ***Note:*** *You should always switch from MAN ON to MAN OFF before switching to COMMAND, otherwise value of the User Button 19 will be 1 until command is received.*
MAN OFF	Value of the User Button 19 is still 0.

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User Button 20

Setpoint group	User Buttons	**Related FW**	2.2.0
Range [units]	COMMAND / MAN ON / MAN OFF [-]		
Default value	COMMAND	**Force value**	YES
Step	[-]		
Comm object	20845	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Always		
Description			

This setpoint adjusts behavior of User Button 20 which is part of **User Buttons**.

COMMAND	User Button 20 is controlled by command from **External display**.
MAN ON	Value of the User Button 20 is still 1. ***Note:*** *You should always switch from MAN ON to MAN OFF before switching to COMMAND, otherwise value of the User Button 20 will be 1 until command is received.*
MAN OFF	Value of the User Button 20 is still 0.

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User Button 21

Setpoint group	User Buttons	**Related FW**	2.2.0
Range [units]	COMMAND / MAN ON / MAN OFF [-]		
Default value	COMMAND	**Force value**	YES
Step	[-]		
Comm object	20846	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Always		
Description			

This setpoint adjusts behavior of User Button 21 which is part of **User Buttons**.

COMMAND	User Button 21 is controlled by command from **External display**.
MAN ON	Value of the User Button 21 is still 1. ***Note:*** *You should always switch from MAN ON to MAN OFF before switching to COMMAND, otherwise value of the User Button 21 will be 1 until command is received.*
MAN OFF	Value of the User Button 21 is still 0.

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User Button 22

Setpoint group	User Buttons	**Related FW**	2.2.0
Range [units]	COMMAND / MAN ON / MAN OFF [-]		
Default value	COMMAND	**Force value**	YES
Step	[-]		
Comm object	20847	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Always		
Description			

This setpoint adjusts behavior of User Button 22 which is part of **User Buttons**.

COMMAND	User Button 22 is controlled by command from **External display**.
MAN ON	Value of the User Button 22 is still 1. ***Note:*** *You should always switch from MAN ON to MAN OFF before switching to COMMAND, otherwise value of the User Button 22 will be 1 until command is received.*
MAN OFF	Value of the User Button 22 is still 0.

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User Button 23

Setpoint group	User Buttons	**Related FW**	2.2.0
Range [units]	COMMAND / MAN ON / MAN OFF [-]		
Default value	COMMAND	**Force value**	YES
Step	[-]		
Comm object	20848	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Always		
Description			

This setpoint adjusts behavior of User Button 23 which is part of **User Buttons**.

COMMAND	User Button 23 is controlled by command from **External display**.
MAN ON	Value of the User Button 23 is still 1. ***Note:*** *You should always switch from MAN ON to MAN OFF before switching to COMMAND, otherwise value of the User Button 23 will be 1 until command is received.*
MAN OFF	Value of the User Button 23 is still 0.

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User Button 24

Setpoint group	User Buttons	**Related FW**	2.2.0
Range [units]	COMMAND / MAN ON / MAN OFF [-]		
Default value	COMMAND	**Force value**	YES
Step	[-]		
Comm object	20849	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Always		
Description			

This setpoint adjusts behavior of User Button 24 which is part of **User Buttons**.

COMMAND	User Button 24 is controlled by command from **External display**.
MAN ON	Value of the User Button 24 is still 1. ***Note:*** *You should always switch from MAN ON to MAN OFF before switching to COMMAND, otherwise value of the User Button 24 will be 1 until command is received.*
MAN OFF	Value of the User Button 24 is still 0.

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User Button 25

Setpoint group	User Buttons	**Related FW**	2.2.0
Range [units]	COMMAND / MAN ON / MAN OFF [-]		
Default value	COMMAND	**Force value**	YES
Step	[-]		
Comm object	20850	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Always		
Description			

This setpoint adjusts behavior of User Button 25 which is part of **User Buttons**.

COMMAND	User Button 25 is controlled by command from **External display**.
MAN ON	Value of the User Button 25 is still 1. ***Note:*** *You should always switch from MAN ON to MAN OFF before switching to COMMAND, otherwise value of the User Button 25 will be 1 until command is received.*
MAN OFF	Value of the User Button 25 is still 0.

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User Button 26

Setpoint group	User Buttons	**Related FW**	2.2.0
Range [units]	COMMAND / MAN ON / MAN OFF [-]		
Default value	COMMAND	**Force value**	YES
Step	[-]		
Comm object	20851	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Always		
Description			

This setpoint adjusts behavior of User Button 26 which is part of **User Buttons**.

COMMAND	User Button 26 is controlled by command from **External display**.
MAN ON	Value of the User Button 26 is still 1. ***Note:*** *You should always switch from MAN ON to MAN OFF before switching to COMMAND, otherwise value of the User Button 26 will be 1 until command is received.*
MAN OFF	Value of the User Button 26 is still 0.

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User Button 27

Setpoint group	User Buttons	**Related FW**	2.2.0
Range [units]	COMMAND / MAN ON / MAN OFF [-]		
Default value	COMMAND	**Force value**	YES
Step	[-]		
Comm object	20852	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Always		
Description			

This setpoint adjusts behavior of User Button 27 which is part of **User Buttons**.

COMMAND	User Button 27 is controlled by command from **External display**.
MAN ON	Value of the User Button 27 is still 1. ***Note:*** *You should always switch from MAN ON to MAN OFF before switching to COMMAND, otherwise value of the User Button 27 will be 1 until command is received.*
MAN OFF	Value of the User Button 27 is still 0.

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User Button 28

Setpoint group	User Buttons	**Related FW**	2.2.0
Range [units]	COMMAND / MAN ON / MAN OFF [-]		
Default value	COMMAND	**Force value**	YES
Step	[-]		
Comm object	20853	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Always		
Description			

This setpoint adjusts behavior of User Button 28 which is part of **User Buttons**.

COMMAND	User Button 28 is controlled by command from **External display**.
MAN ON	Value of the User Button 28 is still 1. ***Note:*** *You should always switch from MAN ON to MAN OFF before switching to COMMAND, otherwise value of the User Button 28 will be 1 until command is received.*
MAN OFF	Value of the User Button 28 is still 0.

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User Button 29

Setpoint group	User Buttons	**Related FW**	2.2.0
Range [units]	COMMAND / MAN ON / MAN OFF [-]		
Default value	COMMAND	**Force value**	YES
Step	[-]		
Comm object	20854	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Always		
Description			

This setpoint adjusts behavior of User Button 29 which is part of **User Buttons**.

COMMAND	User Button 29 is controlled by command from **External display**.
MAN ON	Value of the User Button 29 is still 1. ***Note:*** *You should always switch from MAN ON to MAN OFF before switching to COMMAND, otherwise value of the User Button 29 will be 1 until command is received.*
MAN OFF	Value of the User Button 29 is still 0.

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User Button 30

Setpoint group	User Buttons	**Related FW**	2.2.0
Range [units]	COMMAND / MAN ON / MAN OFF [-]		
Default value	COMMAND	**Force value**	YES
Step	[-]		
Comm object	20855	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Always		
Description			

This setpoint adjusts behavior of User Button 30 which is part of **User Buttons**.

COMMAND	User Button 30 is controlled by command from **External display**.
MAN ON	Value of the User Button 30 is still 1. ***Note:*** *You should always switch from MAN ON to MAN OFF before switching to COMMAND, otherwise value of the User Button 30 will be 1 until command is received.*
MAN OFF	Value of the User Button 30 is still 0.

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User Button 31

Setpoint group	User Buttons	**Related FW**	2.2.0
Range [units]	COMMAND / MAN ON / MAN OFF [-]		
Default value	COMMAND	**Force value**	YES
Step	[-]		
Comm object	20856	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Always		
Description			

This setpoint adjusts behavior of User Button 31 which is part of **User Buttons**.

COMMAND	User Button 31 is controlled by command from **External display**.
MAN ON	Value of the User Button 31 is still 1. ***Note:*** *You should always switch from MAN ON to MAN OFF before switching to COMMAND, otherwise value of the User Button 31 will be 1 until command is received.*
MAN OFF	Value of the User Button 31 is still 0.

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User Button 32

Setpoint group	User Buttons	**Related FW**	2.2.0
Range [units]	COMMAND / MAN ON / MAN OFF [-]		
Default value	COMMAND	**Force value**	YES
Step	[-]		
Comm object	20857	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Always		
Description			

This setpoint adjusts behavior of User Button 32 which is part of **User Buttons**.

COMMAND	User Button 32 is controlled by command from **External display**.
MAN ON	Value of the User Button 32 is still 1. ***Note:*** *You should always switch from MAN ON to MAN OFF before switching to COMMAND, otherwise value of the User Button 32 will be 1 until command is received.*
MAN OFF	Value of the User Button 32 is still 0.

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User Button 33

Setpoint group	User Buttons	**Related FW**	2.2.0
Range [units]	COMMAND / MAN ON / MAN OFF [-]		
Default value	COMMAND	**Force value**	YES
Step	[-]		
Comm object	17864	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Always		
Description			

This setpoint adjusts behavior of User Button 33 which is part of **User Buttons**.

COMMAND	User Button 33 is controlled by command from **External display**.
MAN ON	Value of the User Button 33 is still 1. ***Note:*** *You should always switch from MAN ON to MAN OFF before switching to COMMAND, otherwise value of the User Button 33 will be 1 until command is received.*
MAN OFF	Value of the User Button 33 is still 0.

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User Button 34

Setpoint group	User Buttons	**Related FW**	2.2.0
Range [units]	COMMAND / MAN ON / MAN OFF [-]		
Default value	COMMAND	**Force value**	YES
Step	[-]		
Comm object	17865	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Always		
Description			

This setpoint adjusts behavior of User Button 34 which is part of **User Buttons**.

COMMAND	User Button 34 is controlled by command from **External display**.
MAN ON	Value of the User Button 34 is still 1. ***Note:*** *You should always switch from MAN ON to MAN OFF before switching to COMMAND, otherwise value of the User Button 34 will be 1 until command is received.*
MAN OFF	Value of the User Button 34 is still 0.

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User Button 35

Setpoint group	User Buttons	**Related FW**	2.2.0
Range [units]	COMMAND / MAN ON / MAN OFF [-]		
Default value	COMMAND	**Force value**	YES
Step	[-]		
Comm object	17866	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Always		
Description			

This setpoint adjusts behavior of User Button 35 which is part of **User Buttons**.

COMMAND	User Button 35 is controlled by command from **External display**.
MAN ON	Value of the User Button 35 is still 1. ***Note:*** *You should always switch from MAN ON to MAN OFF before switching to COMMAND, otherwise value of the User Button 35 will be 1 until command is received.*
MAN OFF	Value of the User Button 35 is still 0.

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User Button 36

Setpoint group	User Buttons	**Related FW**	2.2.0
Range [units]	COMMAND / MAN ON / MAN OFF [-]		
Default value	COMMAND	**Force value**	YES
Step	[-]		
Comm object	17867	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Always		
Description			

This setpoint adjusts behavior of User Button 36 which is part of **User Buttons**.

COMMAND	User Button 36 is controlled by command from **External display**.
MAN ON	Value of the User Button 36 is still 1. ***Note:*** *You should always switch from MAN ON to MAN OFF before switching to COMMAND, otherwise value of the User Button 36 will be 1 until command is received.*
MAN OFF	Value of the User Button 36 is still 0.

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User Button 37

Setpoint group	User Buttons	**Related FW**	2.2.0
Range [units]	COMMAND / MAN ON / MAN OFF [-]		
Default value	COMMAND	**Force value**	YES
Step	[-]		
Comm object	17868	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Always		
Description			

This setpoint adjusts behavior of User Button 37 which is part of **User Buttons**.

COMMAND	User Button 37 is controlled by command from **External display**.
MAN ON	Value of the User Button 37 is still 1. ***Note:*** *You should always switch from MAN ON to MAN OFF before switching to COMMAND, otherwise value of the User Button 37 will be 1 until command is received.*
MAN OFF	Value of the User Button 37 is still 0.

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User Button 38

Setpoint group	User Buttons	**Related FW**	2.2.0
Range [units]	COMMAND / MAN ON / MAN OFF [-]		
Default value	COMMAND	**Force value**	YES
Step	[-]		
Comm object	17869	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Always		
Description			

This setpoint adjusts behavior of User Button 38 which is part of **User Buttons**.

COMMAND	User Button 38 is controlled by command from **External display**.
MAN ON	Value of the User Button 38 is still 1. ***Note:*** *You should always switch from MAN ON to MAN OFF before switching to COMMAND, otherwise value of the User Button 38 will be 1 until command is received.*
MAN OFF	Value of the User Button 38 is still 0.

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User Button 39

Setpoint group	User Buttons	**Related FW**	2.2.0
Range [units]	COMMAND / MAN ON / MAN OFF [-]		
Default value	COMMAND	**Force value**	YES
Step	[-]		
Comm object	17870	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Always		
Description			

This setpoint adjusts behavior of User Button 39 which is part of **User Buttons**.

COMMAND	User Button 39 is controlled by command from **External display**.
MAN ON	Value of the User Button 39 is still 1. ***Note:*** *You should always switch from MAN ON to MAN OFF before switching to COMMAND, otherwise value of the User Button 39 will be 1 until command is received.*
MAN OFF	Value of the User Button 39 is still 0.

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User Button 40

Setpoint group	User Buttons	**Related FW**	2.2.0
Range [units]	COMMAND / MAN ON / MAN OFF [-]		
Default value	COMMAND	**Force value**	YES
Step	[-]		
Comm object	17871	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Always		
Description			

This setpoint adjusts behavior of User Button 40 which is part of **User Buttons**.

COMMAND	User Button 40 is controlled by command from **External display**.
MAN ON	Value of the User Button 40 is still 1. ***Note:*** *You should always switch from MAN ON to MAN OFF before switching to COMMAND, otherwise value of the User Button 40 will be 1 until command is received.*
MAN OFF	Value of the User Button 40 is still 0.

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User Button 41

Setpoint group	User Buttons	**Related FW**	2.2.0
Range [units]	COMMAND / MAN ON / MAN OFF [-]		
Default value	COMMAND	**Force value**	YES
Step	[-]		
Comm object	17872	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Always		
Description			

This setpoint adjusts behavior of User Button 41 which is part of **User Buttons**.

COMMAND	User Button 41 is controlled by command from **External display**.
MAN ON	Value of the User Button 41 is still 1. ***Note:*** *You should always switch from MAN ON to MAN OFF before switching to COMMAND, otherwise value of the User Button 41 will be 1 until command is received.*
MAN OFF	Value of the User Button 41 is still 0.

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User Button 42

Setpoint group	User Buttons	**Related FW**	2.2.0
Range [units]	COMMAND / MAN ON / MAN OFF [-]		
Default value	COMMAND	**Force value**	YES
Step	[-]		
Comm object	17873	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Always		
Description			

This setpoint adjusts behavior of User Button 42 which is part of **User Buttons**.

COMMAND	User Button 42 is controlled by command from **External display**.
MAN ON	Value of the User Button 42 is still 1. ***Note:*** *You should always switch from MAN ON to MAN OFF before switching to COMMAND, otherwise value of the User Button 42 will be 1 until command is received.*
MAN OFF	Value of the User Button 42 is still 0.

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User Button 43

Setpoint group	User Buttons	**Related FW**	2.2.0
Range [units]	COMMAND / MAN ON / MAN OFF [-]		
Default value	COMMAND	**Force value**	YES
Step	[-]		
Comm object	17874	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Always		
Description			

This setpoint adjusts behavior of User Button 43 which is part of **User Buttons**.

COMMAND	User Button 43 is controlled by command from **External display**.
MAN ON	Value of the User Button 43 is still 1. ***Note:*** *You should always switch from MAN ON to MAN OFF before switching to COMMAND, otherwise value of the User Button 43 will be 1 until command is received.*
MAN OFF	Value of the User Button 43 is still 0.

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User Button 44

Setpoint group	User Buttons	**Related FW**	2.2.0
Range [units]	COMMAND / MAN ON / MAN OFF [-]		
Default value	COMMAND	**Force value**	YES
Step	[-]		
Comm object	17875	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Always		
Description			

This setpoint adjusts behavior of User Button 44 which is part of **User Buttons**.

COMMAND	User Button 44 is controlled by command from **External display**.
MAN ON	Value of the User Button 44 is still 1. ***Note:*** *You should always switch from MAN ON to MAN OFF before switching to COMMAND, otherwise value of the User Button 44 will be 1 until command is received.*
MAN OFF	Value of the User Button 44 is still 0.

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User Button 45

Setpoint group	User Buttons	**Related FW**	2.2.0
Range [units]	COMMAND / MAN ON / MAN OFF [-]		
Default value	COMMAND	**Force value**	YES
Step	[-]		
Comm object	17876	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Always		
Description			

This setpoint adjusts behavior of User Button 45 which is part of **User Buttons**.

COMMAND	User Button 45 is controlled by command from **External display**.
MAN ON	Value of the User Button 45 is still 1. ***Note:*** *You should always switch from MAN ON to MAN OFF before switching to COMMAND, otherwise value of the User Button 45 will be 1 until command is received.*
MAN OFF	Value of the User Button 45 is still 0.

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User Button 46

Setpoint group	User Buttons	**Related FW**	2.2.0
Range [units]	COMMAND / MAN ON / MAN OFF [-]		
Default value	COMMAND	**Force value**	YES
Step	[-]		
Comm object	17877	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Always		
Description			

This setpoint adjusts behavior of User Button 46 which is part of **User Buttons**.

COMMAND	User Button 46 is controlled by command from **External display**.
MAN ON	Value of the User Button 46 is still 1. ***Note:*** *You should always switch from MAN ON to MAN OFF before switching to COMMAND, otherwise value of the User Button 46 will be 1 until command is received.*
MAN OFF	Value of the User Button 46 is still 0.

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User Button 47

Setpoint group	User Buttons	**Related FW**	2.2.0
Range [units]	COMMAND / MAN ON / MAN OFF [-]		
Default value	COMMAND	**Force value**	YES
Step	[-]		
Comm object	17878	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Always		
Description			

This setpoint adjusts behavior of User Button 47 which is part of **User Buttons**.

COMMAND	User Button 47 is controlled by command from **External display**.
MAN ON	Value of the User Button 47 is still 1. ***Note:*** *You should always switch from MAN ON to MAN OFF before switching to COMMAND, otherwise value of the User Button 47 will be 1 until command is received.*
MAN OFF	Value of the User Button 47 is still 0.

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User Button 48

Setpoint group	User Buttons	**Related FW**	2.2.0
Range [units]	COMMAND / MAN ON / MAN OFF [-]		
Default value	COMMAND	**Force value**	YES
Step	[-]		
Comm object	17879	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Always		
Description			

This setpoint adjusts behavior of User Button 48 which is part of **User Buttons**.

COMMAND	User Button 48 is controlled by command from **External display**.
MAN ON	Value of the User Button 48 is still 1. ***Note:*** *You should always switch from MAN ON to MAN OFF before switching to COMMAND, otherwise value of the User Button 48 will be 1 until command is received.*
MAN OFF	Value of the User Button 48 is still 0.

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Group: Scheduler

Subgroup: Time & Date

Time

Setpoint group	Scheduler	**Related FW**	2.2.0
Range [units]	HH:MM:SS [-]		
Default value	0:0:0	**Force value**	NO
Step	[-]		
Comm object	24554	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Always		
Description			

Real time clock adjustment.

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Date

Setpoint group	Scheduler	**Related FW**	2.2.0
Range [units]	YYYY-MM-DD [-]		
Default value	2017-01-01	**Force value**	NO
Step	[-]		
Comm object	24553	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Always		
Description			
Actual date adjustment.			

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Time Stamp Act

Setpoint group	Scheduler	**Related FW**	2.2.0
Range [units]	Disabled / Condition / Always [-]		
Default value	Enabled	**Force value**	NO
Step	[-]		
Comm object	10532	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Always		
Description			

This setpoint adjusts the behavior of periodic history records.

Disabled	Periodic history records are disabled.
Condition	Periodic history records are enabled. Records are written to the history according to the setpoint Time Stamp Period if LBI Time Stamp Act is activated.
Always	Periodic history records are enabled. Records are written to the history according to setpoint Time Stamp Period.

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Time Stamp Period

Setpoint group	Scheduler	**Related FW**	2.2.0
Range [units]	Off / 1 .. 240 [min]		
Default value	60 min	**Force value**	YES
Step	1 min		
Comm object	8979	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Always		
Description			
Time interval for periodic history records. ***Note:*** *History record is made only when BESS is running.*			

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Time Zone

Setpoint group	Scheduler; CM-4G-GPS	**Related FW**	2.2.0
Range [units]	GMT-12:00 .. GMT+13:00 [hours]		
Default value	GMT+1:00	**Force value**	NO
Step	[-]		
Comm object	24366	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Always		
Description			
This setpoint is used to select the time zone where the controller is located. See your computer time zone setting (click on the time indicator located in the rightmost position of the Windows task bar) if you are not sure about your time zone. ***Note:*** *If the time zone is not selected properly the active e-mails may contain incorrect information about sending time, which may result in confusion when the respective problem actually occurred.*			

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DST Switching Mode

Setpoint group	Scheduler	**Related FW**	2.2.0
Range [units]	Disabled / Auto / Manual		
Default value	Disabled	**Force value**	NO
Step	[-]		
Comm object	20250	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Always		
Description			

This setpoints is used to enable or disable daylight saving time.

- **AUTO** - activation / deactivation of the DST, and changing of the RTC Time value accordingly is performed automatically by the controller. The user always sees valid local time without any action from his side.
- **MANUAL** - activation, and deactivation of the DST is performed manually by the user via the setpoint Time mode. Changing of the RTC Time value accordingly is then performed automatically by the controller. So the user does not need to readjust the RTC time, he only needs to select the proper **Time Mode**.
- **DISABLED** - Time mode is fixedly set to STD and the function does not perform any changes of RTC time.

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Time Mode

Setpoint group	Scheduler	**Related FW**	2.2.0
Range [units]	STD / DST		
Default value	STD	**Force value**	NO
Step	[-]		
Comm object	20249	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Only if DST Switching Mode = Manual		
Description			

In manual **DST Switching Mode** this input is used to adjust the actual time mode. If DST Switching Mode is set to any other option, this input is not taken into account.

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DST Period Rule

Setpoint group	Scheduler	**Related FW**	2.2.0
Range [units]	Australia / Chile / Europe / Mexico / New Zealand / Paraguay / US/Canada		
Default value	Europe	**Force value**	NO
Step	[-]		
Comm object	20251	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Only if DST Switching Mode = Auto		
Description			
Selection of the rule that will be applied for the calculation of the DST validity period.			

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Premortem History Period

Setpoint group	Scheduler	**Related FW**	2.2.0
Range [units]	100 ms, 300 ms, 500 ms, 1 s, 3 s		
Default value	3 s	**Force value**	YES
Step	[-]		
Comm object	14044	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Always		
Description			
This setpoint adjusts the period with which premortem history (fast history) records are written. ***Note:*** *There is always buffer for 60 records, no matter what the period is.* The fast history running in background is mirrored into the controller history records when a second level alarm occurs. Alarms that initialized flipping of the post-mortem history are: Shut down (SD), Slow stop (STP), Overspeed, Short Current, Breaker open & cool-down (BOC), Low power (LOP), Off load (OFL). Premortem history contains the same values in the history as the configuration done by configuration tool (GenConfig, InteliConfig). When any new alarm (SD, BOC, LOP, OFL, STP, Overspeed, short current) appears for the second time, only the new history records are added into the controller history log.			

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Subgroup: Sunrise/Sunset

Sunrise/Sunset Function

Setpoint group	Scheduler	**Related FW**	2.2.0
Range [units]	N/A [-]		
Default value	Disabled	**Force value**	NO
Step	N/A [-]		
Comm object	20210	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Always		
Description			
This setpoint enables the Sunrise/Sunset function.			

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Sunrise/Sunset Latitude

Setpoint group	Scheduler	**Related FW**	2.2.0
Range [units]	[° N]		
Default value	-90 ° N	**Force value**	YES
Step	0,0001 ° N		
Comm object	20214	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Only if **Sunrise/Sunset Function** = Enabled		
Description			
This setpoint is automatically set, if the coordinates from the GPS module are valid. From this setpoint and the setpoint **Sunrise/Sunset Longtitude** are calculated values in function Sunrise/Sunset.			

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Sunrise/Sunset Longtitude

Setpoint group	Scheduler	**Related FW**	2.2.0
Range [units]	[° E]		
Default value	-180 ° E	**Force value**	YES
Step	0,0001 ° E		
Comm object	20213	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Only if **Sunrise/Sunset Function** = Enabled		
Description			
This setpoint is automatically set, if the coordinates from the GPS module are valid. From this setpoint and the setpoint **Sunrise/Sunset Latitude** are calculated values in function Sunrise/Sunset.			

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Subgroup: Timer 1

Timer 1 Function

Setpoint group	Scheduler	**Related FW**	2.2.0
Range [units]	Disabled / Manual On / No Func / Mode OFF [-]		
Default value	Disable	**Force value**	YES
Step	[-]		
Comm object	15358	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Always		
Description			

This setpoint defines and enables the function of the Timer 1. The functions which are supposed to change the Controller Mode requires controller running in AUTO mode. The activation condition of the Timer is configured via setpoint **Timer 1 Setup**.

Once the Timer is activated the LBO **EXERCISE TIMER 1** is closed regardless of chosen timer function. If the CU is switched off when the Timer should be activated, the Timer will be activated immediately after the CU is switched on if the Timer condition is still fulfilled.

> **IMPORTANT: The LBO is activated always when the Timer should be activated e.g. even when controller is in different mode than AUTO.**

> **IMPORTANT: In case that Timer 1, Timer 2, etc. should be activated at the same time, the Timer with selected higher priority function is executed.**

Disabled	The Timer is disabled.
Manual On	The Timer is disabled but his binary output is activated (can be used for testing purposes).
No Func	There is no any other function, only binary output of the Timer is activated once the condition is fulfilled.
Mode OFF	The binary output of the Timer is internally connected to the Remote OFF binary input.

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Timer 1 Setup

Setpoint group	Scheduler	**Related FW**	2.2.0
Range [units]	N/A [-]		
Default value	N/A [-]	**Force value**	NO
Step	N/A [-]		
Comm object	10969	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Only if **Timer 1 Function** is not Disabled or Manual On		
Description			
Use this setpoint to setup the exercise Timer 1. See **Exercise Timers** for step by step manual.			

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Subgroup: Timer 2

Timer 2 Function

Setpoint group	Scheduler	**Related FW**	2.2.0
Range [units]	Disabled / Manual On / No Func / Mode OFF [-]		
Default value	Disabled [-]	**Force value**	YES
Step	[-]		
Comm object	15359	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Always		
Description			

This setpoint defines and enables the function of the Timer 2. The functions which are supposed to change the Controller Mode requires controller running in AUTO mode. The activation condition of the Timer is configured via setpoint **Timer 2 Setup**.

Once the Timer is activated the LBO **EXERCISE TIMER 2** is closed regardless of chosen timer function. If the CU is switched off when the Timer should be activated, the Timer will be activated immediately after the CU is switched on if the Timer condition is still fulfilled.

> **IMPORTANT: The LBO is activated always when the Timer should be activated e.g. even when controller is in different mode than AUTO.**

> **IMPORTANT: In case that Timer 1, Timer 2, etc. should be activated at the same time, the Timer with selected higher priority function is executed.**

Disabled	The Timer is disabled.
Manual On	The Timer is disabled but his binary output is activated (can be used for testing purposes).
No Func	There is no any other function, only binary output of the Timer is activated once the condition is fulfilled.
Mode OFF	The binary output of the Timer is internally connected to the Remote OFF binary input.

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Timer 2 Setup

Setpoint group	Scheduler	**Related FW**	2.2.0
Range [units]	N/A [-]		
Default value	N/A [-]	**Force value**	NO
Step	N/A [-]		
Comm object	10970	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Only if **Timer 2 Function** is not Disabled or Manual On		
Description			
Use this setpoint to setup the exercise Timer 2. See **Exercise Timers** for step by step manual.			

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Subgroup: Timer 3

Timer 3 Function

Setpoint group	Scheduler	**Related FW**	2.2.0
Range [units]	Disabled / Manual On / No Func / Mode OFF [-]		
Default value	Disable	**Force value**	YES
Step	[-]		
Comm object	15360	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Always		
Description			

This setpoint defines and enables the function of the Timer 3. The functions which are supposed to change the Controller Mode requires controller running in AUTO mode. The activation condition of the Timer is configured via setpoint **Timer 3 Setup**.

Once the Timer is activated the LBO **EXERCISE TIMER 3** is closed regardless of chosen timer function. If the CU is switched off when the Timer should be activated, the Timer will be activated immediately after the CU is switched on if the Timer condition is still fulfilled.

> **IMPORTANT: The LBO is activated always when the Timer should be activated e.g. even when controller is in different mode than AUTO.**

> **IMPORTANT: In case that Timer 1, Timer 2, etc. should be activated at the same time, the Timer with selected higher priority function is executed.**

Disabled	The Timer is disabled.
Manual On	The Timer is disabled but his binary output is activated (can be used for testing purposes).
No Func	There is no any other function, only binary output of the Timer is activated once the condition is fulfilled.
Mode OFF	The binary output of the Timer is internally connected to the Remote OFF binary input.

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Timer 3 Setup

Setpoint group	Scheduler	**Related FW**	2.2.0
Range [units]	N/A [-]		
Default value	N/A [-]	**Force value**	NO
Step	N/A [-]		
Comm object	10971	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Only if **Timer 3 Function** is not Disabled or Manual On		
Description			
Use this setpoint to setup the exercise Timer 3. See **Exercise Timers** for step by step manual.			

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Subgroup: Timer 4

Timer 4 Function

Setpoint group	Scheduler	**Related FW**	2.2.0
Range [units]	Disabled / Manual On / No Func / Mode OFF [-]		
Default value	Disable	**Force value**	YES
Step	[-]		
Comm object	15361	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Always		
Description			

This setpoint defines and enables the function of the Timer 4. The functions which are supposed to change the Controller Mode requires controller running in AUTO mode. The activation condition of the Timer is configured via setpoint **Timer 4 Setup**.

Once the Timer is activated the LBO **EXERCISE TIMER 4** is closed regardless of chosen timer function. If the CU is switched off when the Timer should be activated, the Timer will be activated immediately after the CU is switched on if the Timer condition is still fulfilled.

> **IMPORTANT: The LBO is activated always when the Timer should be activated e.g. even when controller is in different mode than AUTO.**

> **IMPORTANT: In case that Timer 1, Timer 2, etc. should be activated at the same time, the Timer with selected higher priority function is executed.**

Disabled	The Timer is disabled.
Manual On	The Timer is disabled but his binary output is activated (can be used for testing purposes).
No Func	There is no any other function, only binary output of the Timer is activated once the condition is fulfilled.
Mode OFF	The binary output of the Timer is internally connected to the Remote OFF binary input.

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Timer 4 Setup

Setpoint group	Scheduler	**Related FW**	2.2.0
Range [units]	N/A [-]		
Default value	N/A [-]	**Force value**	NO
Step	N/A [-]		
Comm object	10973	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Only if **Timer 4 Function** is not Disabled or Manual On		
Description			
Use this setpoint to setup the exercise Timer 4. See **Exercise Timers** for step by step manual.			

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Subgroup: Timer 5

Timer 5 Function

Setpoint group	Scheduler	**Related FW**	2.2.0
Range [units]	Disabled / Manual On / No Func / Mode OFF [-]		
Default value	Disable	**Force value**	YES
Step	[-]		
Comm object	15362	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Always		
Description			

This setpoint defines and enables the function of the Timer 5. The functions which are supposed to change the Controller Mode requires controller running in AUTO mode. The activation condition of the Timer is configured via setpoint **Timer 5 Setup**.

Once the Timer is activated the LBO **EXERCISE TIMER 5** is closed regardless of chosen timer function. If the CU is switched off when the Timer should be activated, the Timer will be activated immediately after the CU is switched on if the Timer condition is still fulfilled.

> **IMPORTANT: The LBO is activated always when the Timer should be activated e.g. even when controller is in different mode than AUTO.**

> **IMPORTANT: In case that Timer 1, Timer 2, etc. should be activated at the same time, the Timer with selected higher priority function is executed.**

Disabled	The Timer is disabled.
Manual On	The Timer is disabled but his binary output is activated (can be used for testing purposes).
No Func	There is no any other function, only binary output of the Timer is activated once the condition is fulfilled.
Mode OFF	The binary output of the Timer is internally connected to the Remote OFF binary input.

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Timer 5 Setup

Setpoint group	Scheduler	**Related FW**	2.2.0
Range [units]	N/A [-]		
Default value	N/A [-]	**Force value**	NO
Step	N/A [-]		
Comm object	10974	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Only if **Timer 5 Function** is not Disabled or Manual On		
Description			
Use this setpoint to setup the exercise Timer 5. See **Exercise Timers** for step by step manual.			

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Subgroup: Timer 6

Timer 6 Function

Setpoint group	Scheduler	**Related FW**	2.2.0
Range [units]	Disabled / Manual On / No Func / Mode OFF [-]		
Default value	Disable	**Force value**	YES
Step	[-]		
Comm object	15363	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Always		
Description			

This setpoint defines and enables the function of the Timer 6. The functions which are supposed to change the Controller Mode requires controller running in AUTO mode. The activation condition of the Timer is configured via setpoint **Timer 6 Setup**.

Once the Timer is activated the LBO **EXERCISE TIMER 6** is closed regardless of chosen timer function. If the CU is switched off when the Timer should be activated, the Timer will be activated immediately after the CU is switched on if the Timer condition is still fulfilled.

> **IMPORTANT: The LBO is activated always when the Timer should be activated e.g. even when controller is in different mode than AUTO.**

> **IMPORTANT: In case that Timer 1, Timer 2, etc. should be activated at the same time, the Timer with selected higher priority function is executed.**

Disabled	The Timer is disabled.
Manual On	The Timer is disabled but his binary output is activated (can be used for testing purposes).
No Func	There is no any other function, only binary output of the Timer is activated once the condition is fulfilled.
Mode OFF	The binary output of the Timer is internally connected to the Remote OFF binary input.

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Timer 6 Setup

Setpoint group	Scheduler	**Related FW**	2.2.0
Range [units]	N/A [-]		
Default value	N/A [-]	**Force value**	NO
Step	N/A [-]		
Comm object	10975	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Only if **Timer 6 Function** is not Disabled or Manual On		
Description			
Use this setpoint to setup the exercise Timer 6. See **Exercise Timers** for step by step manual.			

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Subgroup: Timer 7

Timer 7 Function

Setpoint group	Scheduler	**Related FW**	2.2.0
Range [units]	Disabled / Manual On / No Func / Mode OFF [-]		
Default value	Disable	**Force value**	YES
Step	[-]		
Comm object	15364	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Always		
Description			

This setpoint defines and enables the function of the Timer 7. The functions which are supposed to change the Controller Mode requires controller running in AUTO mode. The activation condition of the Timer is configured via setpoint **Timer 7 Setup**.

Once the Timer is activated the LBO **EXERCISE TIMER 7** is closed regardless of chosen timer function. If the CU is switched off when the Timer should be activated, the Timer will be activated immediately after the CU is switched on if the Timer condition is still fulfilled.

> **IMPORTANT: The LBO is activated always when the Timer should be activated e.g. even when controller is in different mode than AUTO.**

> **IMPORTANT: In case that Timer 1, Timer 2, etc. should be activated at the same time, the Timer with selected higher priority function is executed.**

Disabled	The Timer is disabled.
Manual On	The Timer is disabled but his binary output is activated (can be used for testing purposes).
No Func	There is no any other function, only binary output of the Timer is activated once the condition is fulfilled.
Mode OFF	The binary output of the Timer is internally connected to the Remote OFF binary input.

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Timer 7 Setup

Setpoint group	Scheduler	**Related FW**	2.2.0
Range [units]	N/A [-]		
Default value	N/A [-]	**Force value**	NO
Step	N/A [-]		
Comm object	10976	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Only if **Timer 7 Function** is not Disabled or Manual On		
Description			
Use this setpoint to setup the exercise Timer 7. See **Exercise Timers** for step by step manual.			

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Subgroup: Timer 8

Timer 8 Function

Setpoint group	Scheduler	**Related FW**	2.2.0
Range [units]	Disabled / Manual On / No Func / Mode OFF [-]		
Default value	Disable	**Force value**	YES
Step	[-]		
Comm object	15365	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Always		
Description			

This setpoint defines and enables the function of the Timer 8. The functions which are supposed to change the Controller Mode requires controller running in AUTO mode. The activation condition of the Timer is configured via setpoint **Timer 8 Setup**.

Once the Timer is activated the LBO **EXERCISE TIMER 8** is closed regardless of chosen timer function. If the CU is switched off when the Timer should be activated, the Timer will be activated immediately after the CU is switched on if the Timer condition is still fulfilled.

> **IMPORTANT: The LBO is activated always when the Timer should be activated e.g. even when controller is in different mode than AUTO.**

> **IMPORTANT: In case that Timer 1, Timer 2, etc. should be activated at the same time, the Timer with selected higher priority function is executed.**

Disabled	The Timer is disabled.
Manual On	The Timer is disabled but his binary output is activated (can be used for testing purposes).
No Func	There is no any other function, only binary output of the Timer is activated once the condition is fulfilled.
Mode OFF	The binary output of the Timer is internally connected to the Remote OFF binary input.

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Timer 8 Setup

Setpoint group	Scheduler	**Related FW**	2.2.0
Range [units]	N/A [-]		
Default value	N/A [-]	**Force value**	NO
Step	N/A [-]		
Comm object	10977	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Only if **Timer 8 Function** is not Disabled or Manual On		
Description			
Use this setpoint to setup the exercise Timer 8. See **Exercise Timers** for step by step manual.			

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Subgroup: Timer 9

Timer 9 Function

Setpoint group	Scheduler	**Related FW**	2.2.0
Range [units]	Disabled / Manual On / No Func / Mode OFF [-]		
Default value	Disable	**Force value**	YES
Step	[-]		
Comm object	15366	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Always		
Description			

This setpoint defines and enables the function of the Timer 9. The functions which are supposed to change the Controller Mode requires controller running in AUTO mode. The activation condition of the Timer is configured via setpoint **Timer 9 Setup**.

Once the Timer is activated the LBO **EXERCISE TIMER 9** is closed regardless of chosen timer function. If the CU is switched off when the Timer should be activated, the Timer will be activated immediately after the CU is switched on if the Timer condition is still fulfilled.

> **IMPORTANT: The LBO is activated always when the Timer should be activated e.g. even when controller is in different mode than AUTO.**

> **IMPORTANT: In case that Timer 1, Timer 2, etc. should be activated at the same time, the Timer with selected higher priority function is executed.**

Disabled	The Timer is disabled.
Manual On	The Timer is disabled but his binary output is activated (can be used for testing purposes).
No Func	There is no any other function, only binary output of the Timer is activated once the condition is fulfilled.
Mode OFF	The binary output of the Timer is internally connected to the Remote OFF binary input.

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Timer 9 Setup

Setpoint group	Scheduler	**Related FW**	2.2.0
Range [units]	N/A [-]		
Default value	N/A [-]	**Force value**	NO
Step	N/A [-]		
Comm object	10978	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Only if **Timer 9 Function** is not Disabled or Manual On		
Description			
Use this setpoint to setup the exercise Timer 9. See **Exercise Timers** for step by step manual.			

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Subgroup: Timer 10

Timer 10 Function

Setpoint group	Scheduler	**Related FW**	2.2.0
Range [units]	Disabled / Manual On / No Func / Mode OFF [-]		
Default value	Disable	**Force value**	YES
Step	[-]		
Comm object	15367	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Always		
Description			

This setpoint defines and enables the function of the Timer 10. The functions which are supposed to change the Controller Mode requires controller running in AUTO mode. The activation condition of the Timer is configured via setpoint **Timer 10 Setup**.

Once the Timer is activated the LBO **EXERCISE TIMER 10** is closed regardless of chosen timer function. If the CU is switched off when the Timer should be activated, the Timer will be activated immediately after the CU is switched on if the Timer condition is still fulfilled.

> **IMPORTANT: The LBO is activated always when the Timer should be activated e.g. even when controller is in different mode than AUTO.**

> **IMPORTANT: In case that Timer 1, Timer 2, etc. should be activated at the same time, the Timer with selected higher priority function is executed.**

Disabled	The Timer is disabled.
Manual On	The Timer is disabled but his binary output is activated (can be used for testing purposes).
No Func	There is no any other function, only binary output of the Timer is activated once the condition is fulfilled.
Mode OFF	The binary output of the Timer is internally connected to the Remote OFF binary input.

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Timer 10 Setup

Setpoint group	Scheduler	**Related FW**	2.2.0
Range [units]	N/A [-]		
Default value	N/A [-]	**Force value**	NO
Step	N/A [-]		
Comm object	10979	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Only if **Timer 10 Function** is not Disabled or Manual On		
Description			
Use this setpoint to setup the exercise Timer 10. See **Exercise Timers** for step by step manual.			

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Subgroup: Timer 11

Timer 11 Function

Setpoint group	Scheduler	**Related FW**	2.2.0
Range [units]	Disabled / Manual On / No Func / Mode OFF [-]		
Default value	Disable	**Force value**	YES
Step	[-]		
Comm object	15368	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Always		
Description			

This setpoint defines and enables the function of the Timer 11. The functions which are supposed to change the Controller Mode requires controller running in AUTO mode. The activation condition of the Timer is configured via setpoint **Timer 11 Setup**.

Once the Timer is activated the LBO **EXERCISE TIMER 11** is closed regardless of chosen timer function. If the CU is switched off when the Timer should be activated, the Timer will be activated immediately after the CU is switched on if the Timer condition is still fulfilled.

> **IMPORTANT: The LBO is activated always when the Timer should be activated e.g. even when controller is in different mode than AUTO.**

> **IMPORTANT: In case that Timer 1, Timer 2, etc. should be activated at the same time, the Timer with selected higher priority function is executed.**

Disabled	The Timer is disabled.
Manual On	The Timer is disabled but his binary output is activated (can be used for testing purposes).
No Func	There is no any other function, only binary output of the Timer is activated once the condition is fulfilled.
Mode OFF	The binary output of the Timer is internally connected to the Remote OFF binary input.

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Timer 11 Setup

Setpoint group	Scheduler	**Related FW**	2.2.0
Range [units]	N/A [-]		
Default value	N/A [-]	**Force value**	NO
Step	N/A [-]		
Comm object	10980	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Only if **Timer 11 Function** is not Disabled or Manual On		
Description			
Use this setpoint to setup the exercise Timer 11. See **Exercise Timers** for step by step manual.			

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Subgroup: Timer 12

Timer 12 Function

Setpoint group	Scheduler	**Related FW**	2.2.0
Range [units]	Disabled / Manual On / No Func / Mode OFF [-]		
Default value	Disable	**Force value**	YES
Step	[-]		
Comm object	15369	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Always		
Description			

This setpoint defines and enables the function of the Timer 12. The functions which are supposed to change the Controller Mode requires controller running in AUTO mode. The activation condition of the Timer is configured via setpoint **Timer 12 Setup**.

Once the Timer is activated the LBO **EXERCISE TIMER 12** is closed regardless of chosen timer function. If the CU is switched off when the Timer should be activated, the Timer will be activated immediately after the CU is switched on if the Timer condition is still fulfilled.

> **IMPORTANT: The LBO is activated always when the Timer should be activated e.g. even when controller is in different mode than AUTO.**

> **IMPORTANT: In case that Timer 1, Timer 2, etc. should be activated at the same time, the Timer with selected higher priority function is executed.**

Disabled	The Timer is disabled.
Manual On	The Timer is disabled but his binary output is activated (can be used for testing purposes).
No Func	There is no any other function, only binary output of the Timer is activated once the condition is fulfilled.
Mode OFF	The binary output of the Timer is internally connected to the Remote OFF binary input.

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Timer 12 Setup

Setpoint group	Scheduler	**Related FW**	2.2.0
Range [units]	N/A [-]		
Default value	N/A [-]	**Force value**	NO
Step	N/A [-]		
Comm object	10981	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Only if **Timer 12 Function** is not Disabled or Manual On		
Description			
Use this setpoint to setup the exercise Timer 12. See **Exercise Timers** for step by step manual.			

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Subgroup: Timer 13

Timer 13 Function

Setpoint group	Scheduler	**Related FW**	2.2.0
Range [units]	Disabled / Manual On / No Func / Mode OFF [-]		
Default value	Disable	**Force value**	YES
Step	[-]		
Comm object	15370	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Always		
Description			

This setpoint defines and enables the function of the Timer 13. The functions which are supposed to change the Controller Mode requires controller running in AUTO mode. The activation condition of the Timer is configured via setpoint **Timer 13 Setup**.

Once the Timer is activated the LBO **EXERCISE TIMER 13** is closed regardless of chosen timer function. If the CU is switched off when the Timer should be activated, the Timer will be activated immediately after the CU is switched on if the Timer condition is still fulfilled.

> **IMPORTANT: The LBO is activated always when the Timer should be activated e.g. even when controller is in different mode than AUTO.**

> **IMPORTANT: In case that Timer 1, Timer 2, etc. should be activated at the same time, the Timer with selected higher priority function is executed.**

Disabled	The Timer is disabled.
Manual On	The Timer is disabled but his binary output is activated (can be used for testing purposes).
No Func	There is no any other function, only binary output of the Timer is activated once the condition is fulfilled.
Mode OFF	The binary output of the Timer is internally connected to the Remote OFF binary input.

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Timer 13 Setup

Setpoint group	Scheduler	**Related FW**	2.2.0
Range [units]	N/A [-]		
Default value	N/A [-]	**Force value**	NO
Step	N/A [-]		
Comm object	10982	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Only if **Timer 13 Function** != Disabled or Manual On		
Description			
Use this setpoint to setup the exercise Timer 13. See **Exercise Timers** for step by step manual.			

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Subgroup: Timer 14

Timer 14 Function

Setpoint group	Scheduler	**Related FW**	2.2.0
Range [units]	Disabled / Manual On / No Func / Mode OFF [-]		
Default value	Disable	**Force value**	YES
Step	[-]		
Comm object	15371	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Always		
Description			

This setpoint defines and enables the function of the Timer 14. The functions which are supposed to change the Controller Mode requires controller running in AUTO mode. The activation condition of the Timer is configured via setpoint **Timer 14 Setup**.

Once the Timer is activated the LBO **EXERCISE TIMER 14** is closed regardless of chosen timer function. If the CU is switched off when the Timer should be activated, the Timer will be activated immediately after the CU is switched on if the Timer condition is still fulfilled.

> **IMPORTANT: The LBO is activated always when the Timer should be activated e.g. even when controller is in different mode than AUTO.**

> **IMPORTANT: In case that Timer 1, Timer 2, etc. should be activated at the same time, the Timer with selected higher priority function is executed.**

Disabled	The Timer is disabled.
Manual On	The Timer is disabled but his binary output is activated (can be used for testing purposes).
No Func	There is no any other function, only binary output of the Timer is activated once the condition is fulfilled.
Mode OFF	The binary output of the Timer is internally connected to the Remote OFF binary input.

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Timer 14 Setup

Setpoint group	Scheduler	**Related FW**	2.2.0
Range [units]	N/A [-]		
Default value	N/A [-]	**Force value**	NO
Step	N/A [-]		
Comm object	10983	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Only if **Timer 14 Function** != Disabled or Manual On		
Description			
Use this setpoint to setup the exercise Timer 14. See **Exercise Timers** for step by step manual.			

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Subgroup: Timer 15

Timer 15 Function

Setpoint group	Scheduler	**Related FW**	2.2.0
Range [units]	Disabled / Manual On / No Func / Mode OFF [-]		
Default value	Disable	**Force value**	YES
Step	[-]		
Comm object	15372	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Always		
Description			

This setpoint defines and enables the function of the Timer 15. The functions which are supposed to change the Controller Mode requires controller running in AUTO mode. The activation condition of the Timer is configured via setpoint **Timer 15 Setup**.

Once the Timer is activated the LBO **EXERCISE TIMER 15** is closed regardless of chosen timer function. If the CU is switched off when the Timer should be activated, the Timer will be activated immediately after the CU is switched on if the Timer condition is still fulfilled.

> **IMPORTANT: The LBO is activated always when the Timer should be activated e.g. even when controller is in different mode than AUTO.**

> **IMPORTANT: In case that Timer 1, Timer 2, etc. should be activated at the same time, the Timer with selected higher priority function is executed.**

Disabled	The Timer is disabled.
Manual On	The Timer is disabled but his binary output is activated (can be used for testing purposes).
No Func	There is no any other function, only binary output of the Timer is activated once the condition is fulfilled.
Mode OFF	The binary output of the Timer is internally connected to the Remote OFF binary input.

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Timer 15 Setup

Setpoint group	Scheduler	**Related FW**	2.2.0
Range [units]	N/A [-]		
Default value	N/A [-]	**Force value**	NO
Step	N/A [-]		
Comm object	10984	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Only if **Timer 15 Function** != Disabled or Manual On		
Description			
Use this setpoint to setup the exercise Timer 15. See **Exercise Timers** for step by step manual.			

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Subgroup: Timer 16

Timer 16 Function

Setpoint group	Scheduler	**Related FW**	2.2.0
Range [units]	Disabled / Manual On / No Func / Mode OFF [-]		
Default value	Disable	**Force value**	YES
Step	[-]		
Comm object	15373	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Always		
Description			

This setpoint defines and enables the function of the Timer 16. The functions which are supposed to change the Controller Mode requires controller running in AUTO mode. The activation condition of the Timer is configured via setpoint **Timer 16 Setup**.

Once the Timer is activated the LBO **EXERCISE TIMER 16** is closed regardless of chosen timer function. If the CU is switched off when the Timer should be activated, the Timer will be activated immediately after the CU is switched on if the Timer condition is still fulfilled.

> **IMPORTANT: The LBO is activated always when the Timer should be activated e.g. even when controller is in different mode than AUTO.**

> **IMPORTANT: In case that Timer 1, Timer 2, etc. should be activated at the same time, the Timer with selected higher priority function is executed.**

Disabled	The Timer is disabled.
Manual On	The Timer is disabled but his binary output is activated (can be used for testing purposes).
No Func	There is no any other function, only binary output of the Timer is activated once the condition is fulfilled.
Mode OFF	The binary output of the Timer is internally connected to the Remote OFF binary input.

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Timer 16 Setup

Setpoint group	Scheduler	**Related FW**	2.2.0
Range [units]	N/A [-]		
Default value	N/A [-]	**Force value**	NO
Step	N/A [-]		
Comm object	10985	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Only if **Timer 16 Function** != Disabled or Manual On		
Description			
Use this setpoint to setup the exercise Timer 16. See **Exercise Timers** for step by step manual.			

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Subgroup: Timer 17

Timer 17 Function

Setpoint group	Scheduler	**Related FW**	2.2.0
Range [units]	Disabled / Manual On / No Func / Mode OFF [-]		
Default value	Disable	**Force value**	YES
Step	[-]		
Comm object	17820	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Always		
Description			

This setpoint defines and enables the function of the Timer 17. The functions which are supposed to change the Controller Mode requires controller running in AUTO mode. The activation condition of the Timer is configured via setpoint **Timer 17 Setup**.

Once the Timer is activated the LBO **EXERCISE TIMER 17** is closed regardless of chosen timer function. If the CU is switched off when the Timer should be activated, the Timer will be activated immediately after the CU is switched on if the Timer condition is still fulfilled.

> **IMPORTANT: The LBO is activated always when the Timer should be activated e.g. even when controller is in different mode than AUTO.**

> **IMPORTANT: In case that Timer 1, Timer 2, etc. should be activated at the same time, the Timer with selected higher priority function is executed.**

Disabled	The Timer is disabled.
Manual On	The Timer is disabled but his binary output is activated (can be used for testing purposes).
No Func	There is no any other function, only binary output of the Timer is activated once the condition is fulfilled.
Mode OFF	The binary output of the Timer is internally connected to the Remote OFF binary input.

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Timer 17 Setup

Setpoint group	Scheduler	**Related FW**	2.2.0
Range [units]	N/A [-]		
Default value	N/A [-]	**Force value**	NO
Step	N/A [-]		
Comm object	17836	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Only if **Timer 17 Function** != Disabled or Manual On		
Description			
Use this setpoint to setup the exercise Timer 17. See **Exercise Timers** for step by step manual.			

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Subgroup: Timer 18

Timer 18 Function

Setpoint group	Scheduler	**Related FW**	2.2.0
Range [units]	Disabled / Manual On / No Func / Mode OFF [-]		
Default value	Disable	**Force value**	YES
Step	[-]		
Comm object	17821	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Always		
Description			

This setpoint defines and enables the function of the Timer 18. The functions which are supposed to change the Controller Mode requires controller running in AUTO mode. The activation condition of the Timer is configured via setpoint **Timer 18 Setup**.

Once the Timer is activated the LBO **EXERCISE TIMER 18** is closed regardless of chosen timer function. If the CU is switched off when the Timer should be activated, the Timer will be activated immediately after the CU is switched on if the Timer condition is still fulfilled.

> **IMPORTANT: The LBO is activated always when the Timer should be activated e.g. even when controller is in different mode than AUTO.**

> **IMPORTANT: In case that Timer 1, Timer 2, etc. should be activated at the same time, the Timer with selected higher priority function is executed.**

Disabled	The Timer is disabled.
Manual On	The Timer is disabled but his binary output is activated (can be used for testing purposes).
No Func	There is no any other function, only binary output of the Timer is activated once the condition is fulfilled.
Mode OFF	The binary output of the Timer is internally connected to the Remote OFF binary input.

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Timer 18 Setup

Setpoint group	Scheduler	**Related FW**	2.2.0
Range [units]	N/A [-]		
Default value	N/A [-]	**Force value**	NO
Step	N/A [-]		
Comm object	17837	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Only if **Timer 18 Function** != Disabled or Manual On		
Description			
Use this setpoint to setup the exercise Timer 18. See **Exercise Timers** for step by step manual.			

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Subgroup: Timer 19

Timer 19 Function

Setpoint group	Scheduler	**Related FW**	2.2.0
Range [units]	Disabled / Manual On / No Func / Mode OFF [-]		
Default value	Disable	**Force value**	YES
Step	[-]		
Comm object	17822	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Always		
Description			

This setpoint defines and enables the function of the Timer 19. The functions which are supposed to change the Controller Mode requires controller running in AUTO mode. The activation condition of the Timer is configured via setpoint **Timer 19 Setup**.

Once the Timer is activated the LBO **EXERCISE TIMER 19** is closed regardless of chosen timer function. If the CU is switched off when the Timer should be activated, the Timer will be activated immediately after the CU is switched on if the Timer condition is still fulfilled.

> **IMPORTANT: The LBO is activated always when the Timer should be activated e.g. even when controller is in different mode than AUTO.**

> **IMPORTANT: In case that Timer 1, Timer 2, etc. should be activated at the same time, the Timer with selected higher priority function is executed.**

Disabled	The Timer is disabled.
Manual On	The Timer is disabled but his binary output is activated (can be used for testing purposes).
No Func	There is no any other function, only binary output of the Timer is activated once the condition is fulfilled.
Mode OFF	The binary output of the Timer is internally connected to the Remote OFF binary input.

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Timer 19 Setup

Setpoint group	Scheduler	**Related FW**	2.2.0
Range [units]	N/A [-]		
Default value	N/A [-]	**Force value**	NO
Step	N/A [-]		
Comm object	17838	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Only if **Timer 19 Function** != Disabled or Manual On		
Description			
Use this setpoint to setup the exercise Timer 19. See **Exercise Timers** for step by step manual.			

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Subgroup: Timer 20

Timer 20 Function

Setpoint group	Scheduler	**Related FW**	2.2.0
Range [units]	Disabled / Manual On / No Func / Mode OFF [-]		
Default value	Disable	**Force value**	YES
Step	[-]		
Comm object	17823	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Always		
Description			

This setpoint defines and enables the function of the Timer 20. The functions which are supposed to change the Controller Mode requires controller running in AUTO mode. The activation condition of the Timer is configured via setpoint **Timer 20 Setup**.

Once the Timer is activated the LBO **EXERCISE TIMER 20** is closed regardless of chosen timer function. If the CU is switched off when the Timer should be activated, the Timer will be activated immediately after the CU is switched on if the Timer condition is still fulfilled.

> **IMPORTANT: The LBO is activated always when the Timer should be activated e.g. even when controller is in different mode than AUTO.**

> **IMPORTANT: In case that Timer 1, Timer 2, etc. should be activated at the same time, the Timer with selected higher priority function is executed.**

Disabled	The Timer is disabled.
Manual On	The Timer is disabled but his binary output is activated (can be used for testing purposes).
No Func	There is no any other function, only binary output of the Timer is activated once the condition is fulfilled.
Mode OFF	The binary output of the Timer is internally connected to the Remote OFF binary input.

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Timer 20 Setup

Setpoint group	Scheduler	**Related FW**	2.2.0
Range [units]	N/A [-]		
Default value	N/A [-]	**Force value**	NO
Step	N/A [-]		
Comm object	17839	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Only if **Timer 20 Function** != Disabled or Manual On		
Description			
Use this setpoint to setup the exercise Timer 20. See **Exercise Timers** for step by step manual.			

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Subgroup: Timer 21

Timer 21 Function

Setpoint group	Scheduler	**Related FW**	2.2.0
Range [units]	Disabled / Manual On / No Func / Mode OFF [-]		
Default value	Disable	**Force value**	YES
Step	[-]		
Comm object	17824	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Always		
Description			

This setpoint defines and enables the function of the Timer 21. The functions which are supposed to change the Controller Mode requires controller running in AUTO mode. The activation condition of the Timer is configured via setpoint **Timer 21 Setup**.

Once the Timer is activated the LBO **EXERCISE TIMER 21** is closed regardless of chosen timer function. If the CU is switched off when the Timer should be activated, the Timer will be activated immediately after the CU is switched on if the Timer condition is still fulfilled.

> **IMPORTANT: The LBO is activated always when the Timer should be activated e.g. even when controller is in different mode than AUTO.**

> **IMPORTANT: In case that Timer 1, Timer 2, etc. should be activated at the same time, the Timer with selected higher priority function is executed.**

Disabled	The Timer is disabled.
Manual On	The Timer is disabled but his binary output is activated (can be used for testing purposes).
No Func	There is no any other function, only binary output of the Timer is activated once the condition is fulfilled.
Mode OFF	The binary output of the Timer is internally connected to the Remote OFF binary input.

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Timer 21 Setup

Setpoint group	Scheduler	**Related FW**	2.2.0
Range [units]	N/A [-]		
Default value	N/A [-]	**Force value**	NO
Step	N/A [-]		
Comm object	17840	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Only if **Timer 21 Function** != Disabled or Manual On		
Description			
Use this setpoint to setup the exercise Timer 21. See **Exercise Timers** for step by step manual.			

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Subgroup: Timer 22

Timer 22 Function

Setpoint group	Scheduler	**Related FW**	2.2.0
Range [units]	Disabled / Manual On / No Func / Mode OFF [-]		
Default value	Disable	**Force value**	YES
Step	[-]		
Comm object	17825	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Always		
Description			

This setpoint defines and enables the function of the Timer 22. The functions which are supposed to change the Controller Mode requires controller running in AUTO mode. The activation condition of the Timer is configured via setpoint **Timer 22 Setup**.

Once the Timer is activated the LBO **EXERCISE TIMER 22** is closed regardless of chosen timer function. If the CU is switched off when the Timer should be activated, the Timer will be activated immediately after the CU is switched on if the Timer condition is still fulfilled.

> **IMPORTANT: The LBO is activated always when the Timer should be activated e.g. even when controller is in different mode than AUTO.**

> **IMPORTANT: In case that Timer 1, Timer 2, etc. should be activated at the same time, the Timer with selected higher priority function is executed.**

Disabled	The Timer is disabled.
Manual On	The Timer is disabled but his binary output is activated (can be used for testing purposes).
No Func	There is no any other function, only binary output of the Timer is activated once the condition is fulfilled.
Mode OFF	The binary output of the Timer is internally connected to the Remote OFF binary input.

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Timer 22 Setup

Setpoint group	Scheduler	**Related FW**	2.2.0
Range [units]	N/A [-]		
Default value	N/A [-]	**Force value**	NO
Step	N/A [-]		
Comm object	17841	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Only if **Timer 22 Function** != Disabled or Manual On		
Description			
Use this setpoint to setup the exercise Timer 22. See **Exercise Timers** for step by step manual.			

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Subgroup: Timer 23

Timer 23 Function

Setpoint group	Scheduler	**Related FW**	2.2.0
Range [units]	Disabled / Manual On / No Func / Mode OFF [-]		
Default value	Disable	**Force value**	YES
Step	[-]		
Comm object	17826	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Always		
Description			

This setpoint defines and enables the function of the Timer 23. The functions which are supposed to change the Controller Mode requires controller running in AUTO mode. The activation condition of the Timer is configured via setpoint **Timer 23 Setup**.

Once the Timer is activated the LBO **EXERCISE TIMER 23** is closed regardless of chosen timer function. If the CU is switched off when the Timer should be activated, the Timer will be activated immediately after the CU is switched on if the Timer condition is still fulfilled.

> **IMPORTANT: The LBO is activated always when the Timer should be activated e.g. even when controller is in different mode than AUTO.**

> **IMPORTANT: In case that Timer 1, Timer 2, etc. should be activated at the same time, the Timer with selected higher priority function is executed.**

Disabled	The Timer is disabled.
Manual On	The Timer is disabled but his binary output is activated (can be used for testing purposes).
No Func	There is no any other function, only binary output of the Timer is activated once the condition is fulfilled.
Mode OFF	The binary output of the Timer is internally connected to the Remote OFF binary input.

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Timer 23 Setup

Setpoint group	Scheduler	**Related FW**	2.2.0
Range [units]	N/A [-]		
Default value	N/A [-]	**Force value**	NO
Step	N/A [-]		
Comm object	17842	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Only if **Timer 23 Function** != Disabled or Manual On		
Description			
Use this setpoint to setup the exercise Timer 23. See **Exercise Timers** for step by step manual.			

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Subgroup: Timer 24

Timer 24 Function

Setpoint group	Scheduler	**Related FW**	2.2.0
Range [units]	Disabled / Manual On / No Func / Mode OFF [-]		
Default value	Disable	**Force value**	YES
Step	[-]		
Comm object	17827	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Always		
Description			

This setpoint defines and enables the function of the Timer 24. The functions which are supposed to change the Controller Mode requires controller running in AUTO mode. The activation condition of the Timer is configured via setpoint **Timer 24 Setup**.

Once the Timer is activated the LBO **EXERCISE TIMER 24** is closed regardless of chosen timer function. If the CU is switched off when the Timer should be activated, the Timer will be activated immediately after the CU is switched on if the Timer condition is still fulfilled.

> **IMPORTANT: The LBO is activated always when the Timer should be activated e.g. even when controller is in different mode than AUTO.**

> **IMPORTANT: In case that Timer 1, Timer 2, etc. should be activated at the same time, the Timer with selected higher priority function is executed.**

Disabled	The Timer is disabled.
Manual On	The Timer is disabled but his binary output is activated (can be used for testing purposes).
No Func	There is no any other function, only binary output of the Timer is activated once the condition is fulfilled.
Mode OFF	The binary output of the Timer is internally connected to the Remote OFF binary input.

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Timer 24 Setup

Setpoint group	Scheduler	**Related FW**	2.2.0
Range [units]	N/A [-]		
Default value	N/A [-]	**Force value**	NO
Step	N/A [-]		
Comm object	17843	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Only if **Timer 24 Function** != Disabled or Manual On		
Description			
Use this setpoint to setup the exercise Timer 24. See **Exercise Timers** for step by step manual.			

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Subgroup: Timer 25

Timer 25 Function

Setpoint group	Scheduler	**Related FW**	2.2.0
Range [units]	Disabled / Manual On / No Func / Mode OFF [-]		
Default value	Disable	**Force value**	YES
Step	[-]		
Comm object	17828	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Always		
Description			

This setpoint defines and enables the function of the Timer 25. The functions which are supposed to change the Controller Mode requires controller running in AUTO mode. The activation condition of the Timer is configured via setpoint **Timer 25 Setup**.

Once the Timer is activated the LBO **EXERCISE TIMER 25** is closed regardless of chosen timer function. If the CU is switched off when the Timer should be activated, the Timer will be activated immediately after the CU is switched on if the Timer condition is still fulfilled.

> **IMPORTANT: The LBO is activated always when the Timer should be activated e.g. even when controller is in different mode than AUTO.**

> **IMPORTANT: In case that Timer 1, Timer 2, etc. should be activated at the same time, the Timer with selected higher priority function is executed.**

Disabled	The Timer is disabled.
Manual On	The Timer is disabled but his binary output is activated (can be used for testing purposes).
No Func	There is no any other function, only binary output of the Timer is activated once the condition is fulfilled.
Mode OFF	The binary output of the Timer is internally connected to the Remote OFF binary input.

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Timer 25 Setup

Setpoint group	Scheduler	**Related FW**	2.2.0
Range [units]	N/A [-]		
Default value	N/A [-]	**Force value**	NO
Step	N/A [-]		
Comm object	17844	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Only if **Timer 25 Function** != Disabled or Manual On		
Description			
Use this setpoint to setup the exercise Timer 25. See **Exercise Timers** for step by step manual.			

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Subgroup: Timer 26

Timer 26 Function

Setpoint group	Scheduler	**Related FW**	2.2.0
Range [units]	Disabled / Manual On / No Func / Mode OFF [-]		
Default value	Disable	**Force value**	YES
Step	[-]		
Comm object	17829	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Always		
Description			

This setpoint defines and enables the function of the Timer 26. The functions which are supposed to change the Controller Mode requires controller running in AUTO mode. The activation condition of the Timer is configured via setpoint **Timer 26 Setup**.

Once the Timer is activated the LBO **EXERCISE TIMER 26** is closed regardless of chosen timer function. If the CU is switched off when the Timer should be activated, the Timer will be activated immediately after the CU is switched on if the Timer condition is still fulfilled.

> **IMPORTANT: The LBO is activated always when the Timer should be activated e.g. even when controller is in different mode than AUTO.**

> **IMPORTANT: In case that Timer 1, Timer 2, etc. should be activated at the same time, the Timer with selected higher priority function is executed.**

Disabled	The Timer is disabled.
Manual On	The Timer is disabled but his binary output is activated (can be used for testing purposes).
No Func	There is no any other function, only binary output of the Timer is activated once the condition is fulfilled.
Mode OFF	The binary output of the Timer is internally connected to the Remote OFF binary input.

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Timer 26 Setup

Setpoint group	Scheduler	**Related FW**	2.2.0
Range [units]	N/A [-]		
Default value	N/A [-]	**Force value**	NO
Step	N/A [-]		
Comm object	17845	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Only if **Timer 26 Function** != Disabled or Manual On		
Description			
Use this setpoint to setup the exercise Timer 26. See **Exercise Timers** for step by step manual.			

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Subgroup: Timer 27

Timer 27 Function

Setpoint group	Scheduler	**Related FW**	2.2.0
Range [units]	Disabled / Manual On / No Func / Mode OFF [-]		
Default value	Disable	**Force value**	YES
Step	[-]		
Comm object	17830	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Always		
Description			

This setpoint defines and enables the function of the Timer 27. The functions which are supposed to change the Controller Mode requires controller running in AUTO mode. The activation condition of the Timer is configured via setpoint **Timer 27 Setup**.

Once the Timer is activated the LBO **EXERCISE TIMER 27** is closed regardless of chosen timer function. If the CU is switched off when the Timer should be activated, the Timer will be activated immediately after the CU is switched on if the Timer condition is still fulfilled.

> **IMPORTANT: The LBO is activated always when the Timer should be activated e.g. even when controller is in different mode than AUTO.**

> **IMPORTANT: In case that Timer 1, Timer 2, etc. should be activated at the same time, the Timer with selected higher priority function is executed.**

Disabled	The Timer is disabled.
Manual On	The Timer is disabled but his binary output is activated (can be used for testing purposes).
No Func	There is no any other function, only binary output of the Timer is activated once the condition is fulfilled.
Mode OFF	The binary output of the Timer is internally connected to the Remote OFF binary input.

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Timer 27 Setup

Setpoint group	Scheduler	**Related FW**	2.2.0
Range [units]	N/A [-]		
Default value	N/A [-]	**Force value**	NO
Step	N/A [-]		
Comm object	17846	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Only if **Timer 27 Function** != Disabled or Manual On		
Description			
Use this setpoint to setup the exercise Timer 27. See **Exercise Timers** for step by step manual.			

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Subgroup: Timer 28

Timer 28 Function

Setpoint group	Scheduler	**Related FW**	2.2.0
Range [units]	Disabled / Manual On / No Func / Mode OFF [-]		
Default value	Disable	**Force value**	YES
Step	[-]		
Comm object	17831	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Always		
Description			

This setpoint defines and enables the function of the Timer 28. The functions which are supposed to change the Controller Mode requires controller running in AUTO mode. The activation condition of the Timer is configured via setpoint **Timer 28 Setup**.

Once the Timer is activated the LBO **EXERCISE TIMER 28** is closed regardless of chosen timer function. If the CU is switched off when the Timer should be activated, the Timer will be activated immediately after the CU is switched on if the Timer condition is still fulfilled.

> **IMPORTANT: The LBO is activated always when the Timer should be activated e.g. even when controller is in different mode than AUTO.**

> **IMPORTANT: In case that Timer 1, Timer 2, etc. should be activated at the same time, the Timer with selected higher priority function is executed.**

Disabled	The Timer is disabled.
Manual On	The Timer is disabled but his binary output is activated (can be used for testing purposes).
No Func	There is no any other function, only binary output of the Timer is activated once the condition is fulfilled.
Mode OFF	The binary output of the Timer is internally connected to the Remote OFF binary input.

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Timer 28 Setup

Setpoint group	Scheduler	**Related FW**	2.2.0
Range [units]	N/A [-]		
Default value	N/A [-]	**Force value**	NO
Step	N/A [-]		
Comm object	17847	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Only if **Timer 28 Function** != Disabled or Manual On		
Description			
Use this setpoint to setup the exercise Timer 28. See **Exercise Timers** for step by step manual.			

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Subgroup: Timer 29

Timer 29 Function

Setpoint group	Scheduler	**Related FW**	2.2.0
Range [units]	Disabled / Manual On / No Func / Mode OFF [-]		
Default value	Disable	**Force value**	YES
Step	[-]		
Comm object	17832	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Always		
Description			

This setpoint defines and enables the function of the Timer 29. The functions which are supposed to change the Controller Mode requires controller running in AUTO mode. The activation condition of the Timer is configured via setpoint **Timer 29 Setup**.

Once the Timer is activated the LBO **EXERCISE TIMER 29** is closed regardless of chosen timer function. If the CU is switched off when the Timer should be activated, the Timer will be activated immediately after the CU is switched on if the Timer condition is still fulfilled.

> **IMPORTANT: The LBO is activated always when the Timer should be activated e.g. even when controller is in different mode than AUTO.**

> **IMPORTANT: In case that Timer 1, Timer 2, etc. should be activated at the same time, the Timer with selected higher priority function is executed.**

Disabled	The Timer is disabled.
Manual On	The Timer is disabled but his binary output is activated (can be used for testing purposes).
No Func	There is no any other function, only binary output of the Timer is activated once the condition is fulfilled.
Mode OFF	The binary output of the Timer is internally connected to the Remote OFF binary input.

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Timer 29 Setup

Setpoint group	Scheduler	**Related FW**	2.2.0
Range [units]	N/A [-]		
Default value	N/A [-]	**Force value**	NO
Step	N/A [-]		
Comm object	17848	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Only if **Timer 29 Function** != Disabled or Manual On		
Description			
Use this setpoint to setup the exercise Timer 29. See **Exercise Timers** for step by step manual.			

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Subgroup: Timer 30

Timer 30 Function

Setpoint group	Scheduler	**Related FW**	2.2.0
Range [units]	Disabled / Manual On / No Func / Mode OFF [-]		
Default value	Disable	**Force value**	YES
Step	[-]		
Comm object	17833	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Always		
Description			

This setpoint defines and enables the function of the Timer 30. The functions which are supposed to change the Controller Mode requires controller running in AUTO mode. The activation condition of the Timer is configured via setpoint **Timer 30 Setup**.

Once the Timer is activated the LBO **EXERCISE TIMER 30** is closed regardless of chosen timer function. If the CU is switched off when the Timer should be activated, the Timer will be activated immediately after the CU is switched on if the Timer condition is still fulfilled.

> **IMPORTANT: The LBO is activated always when the Timer should be activated e.g. even when controller is in different mode than AUTO.**

> **IMPORTANT: In case that Timer 1, Timer 2, etc. should be activated at the same time, the Timer with selected higher priority function is executed.**

Disabled	The Timer is disabled.
Manual On	The Timer is disabled but his binary output is activated (can be used for testing purposes).
No Func	There is no any other function, only binary output of the Timer is activated once the condition is fulfilled.
Mode OFF	The binary output of the Timer is internally connected to the Remote OFF binary input.

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Timer 30 Setup

Setpoint group	Scheduler	**Related FW**	2.2.0
Range [units]	N/A [-]		
Default value	N/A [-]	**Force value**	NO
Step	N/A [-]		
Comm object	17849	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Only if **Timer 30 Function** != Disabled or Manual On		
Description			
Use this setpoint to setup the exercise Timer 30. See **Exercise Timers** for step by step manual.			

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Group: Maintenance Timers

Subgroup: Maintenance Timer 1

Maintenance Timer 1 RunHours

Setpoint group	Maintenance Timers	**Related FW**	2.2.0
Range [units]	1 .. 9999 [h] / Disabled		
Default value	Disabled	**Force value**	NO
Step	1 h		
Comm object	13853	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Always		
Description			
This setpoint defines how much BESS running hours (**Running Hours**) needs to be counted down by the maintenance timer until value **Maintenance Timer 1 RunHours** reach zero and alarm **Maintenance Timer 1 RunHours** with LBO **AL MAINTENANCE 1** are activated. Once the alarm is activated the timer continue counting down to negative values. The value 10 000 will disable the Maintenance Timer function and the counter value disappears from controllers statistics. ***Note:*** *Setpoint itself does not change during countdown of timer.*			

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Maintenance Timer 1 Interval

Setpoint group	Maintenance Timers	**Related FW**	2.2.0
Range [units]	1 .. 36 [mo] / Disabled		
Default value	Disabled	**Force value**	NO
Step	1 mo		
Comm object	20583	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Always		
Description			

This setpoint defines how much months needs to be counted down by the maintenance timer until value **Maintenance Timer 1 Interval** reach zero and alarm **Maintenance 1 Interval** with LBO **AL MAINTENANCE 1** are activated.

Once the alarm is activated the timer continue counting down to negative values. The value 37 will disable the Maintenance Timer function and the counter value disappears from controllers statistics.

Note: *Setpoint itself does not change during countdown of timer.*

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Maintenance Timer 1 Protection

Setpoint group	Maintenance Timers	**Related FW**	2.2.0
Range [units]	Warning / Stp [-]		
Default value	Warning	**Force value**	NO
Step	[-]		
Comm object	20586	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Always		
Description			

This setpoint defines type of the maintenance timer alarm (Wrn / Stp) for both setpoints / alarms **Maintenance Timer 1 RunHours** / **Maintenance Timer 1 RunHours** and **Maintenance Timer 1 Interval** / **Maintenance 1 Interval**.

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Subgroup: Maintenance Timer 2

Maintenance Timer 2 RunHours

Setpoint group	Maintenance Timers	**Related FW**	2.2.0
Range [units]	1 .. 9999 [h] / Disabled		
Default value	Disabled	**Force value**	NO
Step	1 h		
Comm object	13854	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Always		
Description			

This setpoint defines how much BESS running hours (**Running Hours**) needs to be counted down by the maintenance timer until value **Maintenance Timer 2 RunHours** reach zero and alarm **Maintenance 2 RunHours** with LBO **AL MAINTENANCE 2** are activated. Once the alarm is activated the timer continue counting down to negative values. The value 10 000 will disable the Maintenance Timer function and the counter value disappears from controllers statistics.

Note: *Setpoint itself does not change during countdown of timer.*

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Maintenance Timer 2 Interval

Setpoint group	Maintenance Timers	**Related FW**	2.2.0
Range [units]	1 .. 36 [mo] / Disabled		
Default value	Disabled	**Force value**	NO
Step	1 mo		
Comm object	20584	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Always		
Description			

This setpoint defines how much months needs to be counted down by the maintenance timer until value **Maintenance Timer 2 Interval** reach zero and alarm **Maintenance 2 Interval** with LBO **AL MAINTENANCE 2** are activated.

Once the alarm is activated the timer continue counting down to negative values. The value 37 will disable the Maintenance Timer function and the counter value disappears from controllers statistics.

Note: *Setpoint itself does not change during countdown of timer.*

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Maintenance Timer 2 Protection

Setpoint group	Maintenance Timers	**Related FW**	2.2.0
Range [units]	Warning / Stp [-]		
Default value	Warning	**Force value**	NO
Step	[-]		
Comm object	20587	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Always		
Description			
This setpoint defines type of the maintenance timer alarm (Wrn / Stp) for both setpoints / alarms **Maintenance Timer 2 RunHours** / **Maintenance 2 RunHours** and **Maintenance Timer 2 Interval** / **Maintenance 2 Interval**.			

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Subgroup: Maintenance Timer 3

Maintenance Timer 3 RunHours

Setpoint group	Maintenance Timers	**Related FW**	2.2.0
Range [units]	1 .. 9999 [h] / Disabled		
Default value	Disabled	**Force value**	NO
Step	1 h		
Comm object	13855	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Always		
Description			
This setpoint defines how much BESS running hours (**Running Hours**) needs to be counted down by the maintenance timer until value **Maintenance Timer 3 RunHours** reach zero and alarm **Maintenance 3 RunHours** with LBO **AL MAINTENANCE 3** are activated. Once the alarm is activated the timer continue counting down to negative values. The value 10 000 will disable the Maintenance Timer function and the counter value disappears from controllers statistics. ***Note:*** *Setpoint itself does not change during countdown of timer.*			

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Maintenance Timer 3 Interval

Setpoint group	Maintenance Timers	**Related FW**	2.2.0
Range [units]	1 .. 36 [mo] / Disabled		
Default value	Disabled	**Force value**	NO
Step	1 mo		
Comm object	20585	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Always		
Description			

This setpoint defines how much months needs to be counted down by the maintenance timer until value **Maintenance Timer 3 Interval** reach zero and alarm **Maintenance 3 Interval** with LBO **AL MAINTENANCE 3** are activated.

Once the alarm is activated the timer continue counting down to negative values. The value 37 will disable the Maintenance Timer function and the counter value disappears from controllers statistics.

Note: *Setpoint itself does not change during countdown of timer.*

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Maintenance Timer 3 Protection

Setpoint group	Maintenance Timers	**Related FW**	2.2.0
Range [units]	Warning / Stp [-]		
Default value	Warning	**Force value**	NO
Step	[-]		
Comm object	20588	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Always		
Description			

This setpoint defines type of the maintenance timer alarm (Wrn / Stp) for both setpoints / alarms **Maintenance Timer 3 RunHours** / **Maintenance 3 RunHours** and **Maintenance Timer 3 Interval** / **Maintenance 3 Interval**.

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Subgroup: Maintenance Timer 4

Maintenance Timer 4 RunHours

Setpoint group	Maintenance Timers	**Related FW**	2.2.0
Range [units]	1 .. 9999 [h] / Disabled		
Default value	Disabled	**Force value**	NO
Step	1 h		
Comm object	13856	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Always		
Description			

This setpoint defines how much BESS running hours (**Running Hours**) needs to be counted down by the maintenance timer until value **Maintenance Timer 4 RunHours** reach zero and alarm **Maintenance 4 RunHours** with LBO **AL MAINTENANCE 4** are activated.

Once the alarm is activated the timer continue counting down to negative values. The value 10 000 will disable the Maintenance Timer function and the counter value disappears from controllers statistics.

Note: *Setpoint itself does not change during countdown of timer.*

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Maintenance Timer 4 Interval

Setpoint group	Maintenance Timers	**Related FW**	2.2.0
Range [units]	1 .. 36 [mo] / Disabled		
Default value	Disabled	**Force value**	NO
Step	1 mo		
Comm object	20291	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Always		
Description			

This setpoint defines how much months needs to be counted down by the maintenance timer until value **Maintenance Timer 4 Interval** reach zero and alarm **Maintenance 4 Interval** with LBO **AL MAINTENANCE 4** are activated.

Once the alarm is activated the timer continue counting down to negative values. The value 37 will disable the Maintenance Timer function and the counter value disappears from controllers statistics.

Note: *Setpoint itself does not change during countdown of timer.*

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Maintenance Timer 4 Protection

Setpoint group	Maintenance Timers	**Related FW**	2.2.0
Range [units]	Warning / Stp [-]		
Default value	Warning	**Force value**	NO
Step	[-]		
Comm object	20290	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Always		
Description			
This setpoint defines type of the maintenance timer alarm (Wrn / Stp) for both setpoints / alarms **Maintenance Timer 4 RunHours** / **Maintenance 4 RunHours** and **Maintenance Timer 4 Interval** / **Maintenance 4 Interval**.			

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Group: Geo-Fencing

Subgroup: Geo-Fencing

Geo-Fencing

Setpoint group	Geo-Fencing	**Related FW**	2.2.0
Range [units]	Disable/Enable/LBI Enable		
Default value	Disable	**Force value**	
Step			
Comm object	11681	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Only if relevant modules is installed.		
Description			
This setpoint enables or disables geo-fencing function.			

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Subgroup: Position

Home Latitude

Setpoint group	Geo-Fencing	**Related FW**	2.2.0
Range [units]	-90,0000..90,0000 []		
Default value	0,0000	**Force value**	
Step	0,0001		
Comm object	14606	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Only if relevant module is installed.		
Description			

This setpoint adjust latitude of "home" position. Home is position where BESS should runs. Positions on north hemisphere have positive value, position on south hemisphere have negative value.

Note: *This value with Home Latitude are used for counting Fence Radius 1 and Fence Radius 2.*

Note: *This value can be also obtained automatically via logical binary input Geo Home Position. In case of activation of this binary input for at least 2 seconds, setpoint will be adjusted automatically from actual coordinates from GPS signal.*

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Home Longitude

Setpoint group	Geo-Fencing	**Related FW**	2.2.0
Range [units]	-180,0000..180,0000 []		
Default value	0,0000	**Force value**	
Step	0,0001		
Comm object	14607	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Only if relevant modules is installed.		
Description			

This setpoint adjust longitude of "home" position. Home is position where BESS should runs. Positions on east hemisphere have positive value, position on west hemisphere have negative value.

Note: *This value with Home Longitude are used for counting Fence Radius 1 and Fence Radius 2.*

Note: *This value can be also obtained automatically via logical binary input Geo Home Position. In case of activation of this binary input for at least 2 seconds, setpoint will be adjusted automatically from actual coordinates from GPS signal.*

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Subgroup: Fence 1

Fence 1 Protection

Setpoint group	Geo-Fencing	**Related FW**	2.2.0
Range [units]	HistRecOnl/Wrn/Sd/BOC		
Default value	HistRecOnl	**Force value**	
Step			
Comm object	14610	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Only if relevant modules is installed.		
Description			

Protection type for geo-fencing 1 protection. Fence of circle area is adjusted by setpoint **Fence 1 Radius**. Delay for protection is adjusted by setpoint**Fence 1 Delay**.

Protection Types:

HistRecOnl: Position of BESS is only measured and displayed on the LCD screen but not used for protection. History record is made if position is out of **Fence 1 Radius**.

Wrn: Position of gen-set is used for warning protection only. Protection is activated when position of the gen-set is out of **Fence 1 Radius**.

Sd: Position of BESS is used for shutdown protection. Protection is activated when position of the BESS is out of **Fence 1 Radius**.

BOC:Position of gen-set is used for BOC (Breaker Open and Cooling) protection. Protection is activated when position of the BESS is out of **Fence 1 Radius**.

Note: *Protection is activated also when GPS signal is lost for **Fence 1 Delay**.*

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Fence 1 Radius

Setpoint group	Geo-Fencing	**Related FW**	2.2.0
Range [units]	0..99,9 [km]		
Default value	0 km	**Force value**	
Step	0,1 km		
Comm object	11677	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Only if relevant modules is installed.		
Description			

Radius for circle area 1. When the BESS leaves this area,**Fence 1 Protection** is activated after**Fence 1 Delay**.

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Fence 1 Delay

Setpoint group	Geo-Fencing	**Related FW**	2.2.0
Range [units]	0..3600 [s]		
Default value	0 s	**Force value**	
Step	1 s		
Comm object	11682	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Only if relevant modules is installed.		
Description			
Delay for **Fence 1 Protection**.			

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Subgroup: Fence 2

Fence 2 Protection

Setpoint group	Geo-Fencing	**Related FW**	2.2.0
Range [units]	HistRecOnl/Wrn/Sd/BOC		
Default value	HistRecOnl	**Force value**	
Step			
Comm object	14611	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Only if relevant modules is installed.		
Description			

Protection type for geo-fencing 1 protection. Fence of circle area is adjusted by setpoint **Fence 2 Radius**. Delay for protection is adjusted by setpoint**Fence 2 Delay**.

Protection Types:

HistRecOnl: Position of BESS is only measured and displayed on the LCD screen but not used for protection. History record is made if position is out of **Fence 2 Radius**.

Wrn: Position of BESS is used for warning protection only. Protection is activated when position of the BESS is out of **Fence 2 Radius**.

Sd: Position of BESS is used for shutdown protection. Protection is activated when position of the BESS is out of **Fence 2 Radius**.

BOC:Position of BESS is used for BOC (Breaker Open and Cooling) protection. Protection is activated when position of the BESS is out of **Fence 1 Radius**.

Note: *Protection is activated also when GPS signal is lost for**Fence 2 Delay**.*

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Fence 2 Radius

Setpoint group	Geo-Fencing	**Related FW**	2.2.0
Range [units]	0..99,9 [km]		
Default value	0 km	**Force value**	
Step	0,1 km		
Comm object	14608	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Only if relevant modules is installed.		
Description			
Radius for circle area 1. When the BESS leaves this area,**Fence 1 Protection** is activated after**Fence 1 Delay**.			

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Fence 2 Delay

Setpoint group	Geo-Fencing	**Related FW**	2.2.0
Range [units]	0..3600 [s]		
Default value	0 s	**Force value**	
Step	1 s		
Comm object	14609	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Only if relevant modules is installed.		
Description			
Delay for**Fence 2 Protection**.			

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Group: Plug-In Modules

Subgroup: Slot A

Slot A

Setpoint group	Plug-In Modules	**Related FW**	2.2.0
Range [units]	ENABLED / DISABLED [-]		
Default value	ENABLED	**Force value**	NO
Step	[-]		
Comm object	24280	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Always		
Description			
This setpoint enable or disable module in slot A. ***Note:*** *The controller has to be power cycled after changing this setpoint.*			

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Subgroup: Slot B

Slot B

Setpoint group	Plug-In Modules	**Related FW**	2.2.0
Range [units]	ENABLED / DISABLED [-]		
Default value	ENABLED	**Force value**	NO
Step	[-]		
Comm object	24279	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Always		
Description			
This setpoint enable or disable module in slot B. ***Note:*** *The controller has to be power cycled after changing this setpoint.*			

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Group: CM-RS232-485

Subgroup: COM1 Setting

COM1 Mode

Setpoint group	CM-RS232-485	**Related FW**	2.2.0
Range [units]	Direct / MODBUS / DualSlave / Dual Master [-]		
Default value	Direct	**Force value**	NO
Step	[-]		
Comm object	24522	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Only if relevant module is installed		
Description			
Communication protocol switch for the COM1 channel.			

Direct	InteliConfig communication protocol via serial cable.
MODBUS	MODBUS protocol.
DualSlave	Dual operation protocol – slave function
DualMaster	Dual operation protocol – master function

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COM1 Communication Speed

Setpoint group	CM-RS232-485	**Related FW**	2.2.0
Range [units]	9600 / 19200 / 38400 / 57600 / 115200[bps]		
Default value	57600 bps	**Force value**	NO
Step	[-]		
Comm object	24341	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Only if relevant module is installed + conditioned by the setpoint **COM1 Mode**		
Description			
If the direct mode is selected on COM1 channel, the direct communication speed of controller part of line can be adjusted here. Speed of second part of line has to be adjusted to the same value.			

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COM1 Modbus Mode

Setpoint group	CM-RS232-485	**Related FW**	2.2.0
Range [units]	8N1 / 8N2 / 8E1 [-]		
Default value	8N1	**Force value**	NO
Step	[-]		
Comm object	23867	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Only if relevant module is installed		
Description			
This setpoint adjusts communication mode of Modbus-RTU.			

Possible options

8N1	8 data bits, 1 stop bit, no parity
8N2	8 data bits, 2 stop bits, no parity
8E1	8 data bits, 1 stop bit, even parity

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COM1 MODBUS Communication Speed

Setpoint group	CM-RS232-485	**Related FW**	2.2.0
Range [units]	9600 / 19200 / 38400 / 57600 / 115200 [bps]		
Default value	9600 bps	**Force value**	NO
Step	[-]		
Comm object	24477	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Only if relevant module is installed + conditioned by the setpoint **COM1 Mode**		
Description			
If the MODBUS mode is selected on COM1 channel, the MODBUS communication speed can be adjusted here.			

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Subgroup: COM2 Setting

COM2 Mode

Setpoint group	CM-RS232-485	**Related FW**	2.2.0
Range [units]	Direct / MODBUS / DualSlave / Dual Master [-]		
Default value	Direct	**Force value**	NO
Step	[-]		
Comm object	24451	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Only if relevant module is installed		
Description			

Communication protocol switch for the COM2 channel.

Direct	InteliConfig communication protocol via serial cable.
MODBUS	MODBUS protocol.
DualSlave	Dual operation protocol – slave function
DualMaster	Dual operation protocol – master function

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COM2 Communication Speed

Setpoint group	CM-RS232-485	**Related FW**	2.2.0
Range [units]	9600 / 19200 / 38400 / 57600 / 115200[bps]		
Default value	57600 bps	**Force value**	NO
Step	[-]		
Comm object	24340	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Only if relevant module is installed + conditioned by the setpoint **COM2 Mode**		

Description
If the direct mode is selected on COM2 channel, the direct communication speed of controller part of line can be adjusted here. Speed of second part of line has to be adjusted to the same value.

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COM2 Modbus Mode

Setpoint group	CM-RS232-485	**Related FW**	2.2.0
Range [units]	8N1 / 8N2 / 8E1 [-]		
Default value	8N1	**Force value**	NO
Step	[-]		
Comm object	23866	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Only if relevant module is installed		
Description			

This setpoint adjusts communication mode of Modbus-RTU.

Possible options

8N1	8 data bits, 1 stop bit, no parity
8N2	8 data bits, 2 stop bits, no parity
8E1	8 data bits, 1 stop bit, even parity

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COM2 MODBUS Communication Speed

Setpoint group	CM-RS232-485	**Related FW**	2.2.0
Range [units]	9600 / 19200 / 38400 / 57600 / 115200 [bps]		
Default value	9600 bps	**Force value**	NO
Step	[-]		
Comm object	24420	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Only if relevant module is installed		
Description			

If the MODBUS mode is selected on COM2 channel, the MODBUS communication speed can be adjusted here.

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Group: CM-4G-GPS

Subgroup: Cellular Interface

Internet Connection

Setpoint group	CM-4G-GPS	**Related FW**	2.2.0
Range [units]	Enabled / Disabled [-]		
Default value	Enabled	**Force value**	NO
Step	[-]		
Comm object	24315	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Only if relevant module is installed		
Description			
This setpoint adjust the communication mode of module.			

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Network Mode

Setpoint group	CM-4G-GPS	**Related FW**	2.2.0
Range [units]	2G / 3G / 4G / Automatic [-]		
Default value	Automatic	**Force value**	NO
Step	[-]		
Comm object	24132	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Only if relevant module is installed		
Description			
This setpoint adjusts preferred connection type of CM-4G-GPS module.			

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Access Point Name

Setpoint group	CM-4G-GPS	**Related FW**	2.2.0
Range [units]	0 .. 31 characters [-]		
Default value	internet	**Force value**	NO
Step	[-]		
Comm object	24363	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Only if relevant module is installed + conditioned by the setpoint **Internet Connection**		
Description			
APN (Access Point Name) of the network, provided by GSM operator.			

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Connection Check IP1

Setpoint group	CM-4G-GPS	**Related FW**	2.2.0
Range [units]	[-]		
Default value	"empty"	**Force value**	NO
Step	[-]		
Comm object	23978	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Only if relevant module is installed + conditioned by the setpoint **Internet Connection**		

Description

IP address of reliable server in the internet.

To provide maximal reliability of wireless cellular connection the module is equipped with function that periodically checks the data connection over the cellular network is working.

This function is based on periodical sending of ICMP messages (known as "ping") to reliable servers in the internet and checking of their responses. If there is not any response received from any of the servers (at least one setpoint Connection Check IP1, IP2, IP3 is filled with IP address) for certain time period, the cellular connection is considered as non-working and the module will close and reestablish the connection.

If all three servers are not defined (setpoints Connection Check IP1, IP2, IP3 have empty addresses) then the cellular connection check is disabled

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Connection Check IP2

Setpoint group	CM-4G-GPS	**Related FW**	2.2.0
Range [units]	[-]		
Default value	"empty"	**Force value**	NO
Step	[-]		
Comm object	23977	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Only if relevant module is installed + conditioned by the setpoint **Internet Connection**		

Description

IP address of reliable server in the internet.

To provide maximal reliability of wireless cellular connection the module is equipped with function that periodically checks the data connection over the cellular network is working.

This function is based on periodical sending of ICMP messages (known as "ping") to reliable servers in the internet and checking of their responses. If there is not any response received from any of the servers (at least one setpoint Connection Check IP1, IP2, IP3 is filled with IP address) for certain time period, the cellular connection is considered as non-working and the module will close and reestablish the connection.

If all three servers are not defined (setpoints Connection Check IP1, IP2, IP3 have empty addresses) then the cellular connection check is disabled

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Connection Check IP3

Setpoint group	CM-4G-GPS	**Related FW**	2.2.0
Range [units]	[-]		
Default value	"empty"	**Force value**	NO
Step	[-]		
Comm object	23976	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Only if relevant module is installed + conditioned by the setpoint **Internet Connection**		
Description			

IP address of reliable server in the internet.

To provide maximal reliability of wireless cellular connection the module is equipped with function that periodically checks the data connection over the cellular network is working.

This function is based on periodical sending of ICMP messages (known as "ping") to reliable servers in the internet and checking of their responses. If there is not any response received from any of the servers (at least one setpoint Connection Check IP1, IP2, IP3 is filled with IP address) for certain time period, the cellular connection is considered as non-working and the module will close and reestablish the connection.

If all three servers are not defined (setpoints Connection Check IP1, IP2, IP3 have empty addresses) then the cellular connection check is disabled

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Subgroup: TCP/IP Settings

DNS Mode

Setpoint group	CM-4G-GPS	**Related FW**	2.2.0
Range [units]	Automatic / Manual [-]		
Default value	Automatic	**Force value**	NO
Step	[-]		
Comm object	23988	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Only if relevant module is installed		
Description			

This setpoint enables to enter DNS server addresses manually, even with the **Internet Connection** set to Automatic.

Automatic	DNS server addresses automatically obtained from a DHCP server are used
Manual	**DNS IP Address 1** and **DNS IP Address 2** can be adjusted manually. Use this option to resolve e.g. internet access policy related issue, if local DNS server addresses automatically obtained from a DHCP server do not work

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DNS IP Address 1

Setpoint group	CM-4G-GPS	**Related FW**	2.2.0
Range [units]	Valid IP address [-]		
Default value	8.8.8.8	**Force value**	NO
Step	[-]		
Comm object	24314	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Only if relevant module is installed		
Description			
The setpoint is used to select the method how the DNS Address 1 is adjusted. If **DNS Mode** is MANUAL this setpoint is used to adjust the domain name server (DNS), which is needed to translate domain names in email addresses and server names into correct IP addresses. If **DNS Mode** is AUTOMATIC this setpoint is inactive. The DNS server IP address is assigned by the DHCP server.			

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DNS IP Address 2

Setpoint group	CM-4G-GPS	**Related FW**	2.2.0
Range [units]	Valid IP address [-]		
Default value	8.8.8.8	**Force value**	NO
Step	[-]		
Comm object	23986	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Only if relevant module is installed		
Description			
The setpoint is used to select the method how the DNS Address 2 is adjusted. If **DNS Mode** is FIXED this setpoint is used to adjust the domain name server (DNS), which is needed to translate domain names in email addresses and server names into correct IP addresses. If **DNS Mode** is AUTOMATIC this setpoint is inactive. The DNS server IP address is assigned by the DHCP server.			

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IP Firewall

Setpoint group	CM-4G-GPS	**Related FW**	2.2.0
Range [units]	ENABLED / DISABLED [-]		
Default value	DISABLED	**Force value**	NO
Step	[-]		
Comm object	23959	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Only if relevant module is installed		
Description			

This setpoints enables to switch on the built-in Firewall functionality.

DISABLED	The firewall function is switched off
ENABLED	The firewall function is switched on, use InteliConfig to setup the firewall rules (configuration card Others – Firewall)

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Subgroup: AirGate Settings

AirGate Connection

Setpoint group	CM-4G-GPS	**Related FW**	2.2.0
Range [units]	Disabled/ Enabled [-]		
Default value	Enabled	**Force value**	NO
Step	[-]		
Comm object	23968	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Only if relevant module is installed + conditioned by the setpoint **Internet Connection**		
Description			

This setpoint enable or disable AirGate connection via CM-4G-GPS.

DISABLED:	Only SMS are sent. Internet-enabled SIM card is not required. AirGate is not used.
ENABLED	This mode uses the "AirGate" service. Internet-enabled SIM card must be used. The AirGate server address is adjusted by the setpoint **AirGate Address**.

> **IMPORTANT: When this setpoint is changed the controller has to be restarted to apply changes.**

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AirGate Address

Setpoint group	ETH Interface 2 - Untrusted	**Related FW**	2.2.0
Range [units]	0 .. 31 characters [-]		
Default value	global.airgate.link	**Force value**	NO
Step	[-]		
Comm object	24364	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Always		
Description			
This setpoint is used for entering the domain name or IP address of the AirGate server. Use the free AirGate server provided by ComAp at global.airgate.link.			

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Airgate Port

Setpoint group	CM-4G-GPS	**Related FW**	2.2.0
Range [units]	1 .. 65535 [-]		
Default value	54440	**Force value**	NO
Step	1		
Comm object	24091	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Only if relevant module is installed + conditioned by the setpoint **Internet Connection**		
Description			
This port is used for TCP communication with the AirGate server. ***Note:*** *Use port 54440 for standard ComAp AirGate service.*			

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Subgroup: ComAp Client Settings

ComAp Client Inactivity Timeout

Setpoint group	ETH Interface 1 - TrustedETH Interface 2 - Untrusted	**Related FW**	2.2.0
Range [units]	0 .. 65535 [s]		
Default value	60 s	**Force value**	YES
Step	1 s		
Comm object	24098	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Always		
Description			
Connection (TCP socket) is closed by controller, if a client (e.g. InteliConfig) does not communicate for this time. This timeout applies to both direct and AirGate connection.			

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Direct Connection

Setpoint group	ETH Interface 2 - Untrusted	**Related FW**	2.2.0
Range [units]	Disabled / Enabled [-]		
Default value	Enabled	**Force value**	NO
Step	[-]		
Comm object	23961	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Only if relevant module is installed		
Description			
Use this to enable/disable direct connection of a ComAp client (e.g. InteliConfig) to the IP address of the controller. ***Note:*** *For Direct connection the controller IP address must be reachable from the client IP address.*			

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Direct Connection Port

Setpoint group	ETH Interface 2 - Untrusted	**Related FW**	2.2.0
Range [units]	1 .. 65535 [-]		
Default value	23	**Force value**	NO
Step	[-]		
Comm object	23960	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Only if relevant module is installed		
Description			
This port is used to listen for an incoming TCP connection if Direct Connection is ENABLED.			

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Subgroup: E-mail Settings

SMTP Server Address

Setpoint group	ETH Interface 2 - Untrusted	**Related FW**	2.2.0
Range [units]	0..31 characters [-]		
Default value	global.airgate.link:9925	**Force value**	NO
Step	[-]		
Comm object	23962	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Always		
Description			
This setpoint is used for entering the domain name (e.g. smtp.yourprovider.com) or IP address (e.g. 74.125.39.109) or number of port (with colon like a first mark) of the SMTP server. Ask your internet provider or IT manager for this information. ***Note:*** *You may use also any public SMTP server which does not require connection over SSL/TLS channels.*			

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SMTP Sender Address

Setpoint group	ETH Interface 2 - Untrusted	**Related FW**	2.2.0
Range [units]	0..31 characters [-]		
Default value	[-]	**Force value**	NO
Step	[-]		
Comm object	23884	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Always		
Description			

Enter an existing email address into this setpoint. This address will be used as sender address in active e-mails that will be sent from the controller.

> ***Note:*** *It is not needed to enter an existing email address, nevertheless valid email format needs to be followed.*

> **IMPORTANT: This item is obligatory when emails are configured.**

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SMTP User Name

Setpoint group	ETH Interface 2 - Untrusted	**Related FW**	2.2.0
Range [units]	0..31 characters [-]		
Default value	[-]	**Force value**	NO
Step	[-]		
Comm object	23883	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Always		
Description			

Use this setpoint to enter the username for the SMTP server. Leave the setpoint blank if the SMTP server does not require authentication.

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SMTP User Password

Setpoint group	ETH Interface 2 - Untrusted	**Related FW**	2.2.0
Range [units]	0..15 characters [-]		
Default value	[-]	**Force value**	NO
Step	[-]		
Comm object	23882	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Always		
Description			
Use this setpoint to enter the password for the SMTP server. Leave the setpoint blank if the SMTP server does not require authentication.			

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SMTP Encryption

Setpoint group	ETH Interface 2 - Untrusted	**Related FW**	2.2.0
Range [units]	NONE / SSL/TLS / STARTTLS [-]		
Default value	NONE	**Force value**	NO
Step	[-]		
Comm object	23965	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Always		
Description			

This setpoint selects encryption type for SMTP session.

NONE	Session is without of any encryption.
SSL/TLS	Encrypted channel is created first and only after that session is created.
STARTTLS	Session is created without of encryption and after command STARTTLS it is switched to encrypted session.

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E-mail Address 1

Setpoint group	ETH Interface 2 - Untrusted	**Related FW**	2.2.0
Range [units]	0..63 characters [-]		
Default value	[-]	**Force value**	NO
Step	[-]		
Comm object	24298	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Always		
Description			
Enter a valid e-mail address where event and alarm messages will be sent.			

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E-mail Address 4

Setpoint group	ETH Interface 2 - Untrusted	**Related FW**	2.2.0
Range [units]	0..63 characters [-]		
Default value	[-]	**Force value**	NO
Step	[-]		
Comm object	24144	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Always		
Description			
Enter a valid e-mail address where event and alarm messages will be sent.			

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E-mail Address 3

Setpoint group	ETH Interface 2 - Untrusted	**Related FW**	2.2.0
Range [units]	0..63 characters [-]		
Default value	[-]	**Force value**	NO
Step	[-]		
Comm object	24145	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Always		
Description			
Enter a valid e-mail address where event and alarm messages will be sent.			

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E-mail Address 2

Setpoint group	ETH Interface 2 - Untrusted	**Related FW**	2.2.0
Range [units]	0..63 characters [-]		
Default value	[-]	**Force value**	NO
Step	[-]		
Comm object	24297	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Always		
Description			
Enter a valid e-mail address where event and alarm messages will be sent.			

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Subgroup: Messages Settings

Telephone Number 1

Setpoint group	CM-4G-GPS	**Related FW**	2.2.0
Range [units]	0 .. 31 characters [-]		
Default value	[-]	**Force value**	NO
Step	[-]		
Comm object	24296	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	always		
Description			
Enter in this setpoint a valid GSM phone number where the alarm messages shall be sent. For GSM numbers use either the national format (i.e. the number you would dial if you wanted to make a local call) or the full international format beginning with a "+" character followed by the country prefix. **IMPORTANT: Telephone number has to be entered without spaces.**			

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Telephone Number 2

Setpoint group	CM-4G-GPS	**Related FW**	2.2.0
Range [units]	0 .. 31 characters [-]		
Default value	[-]	**Force value**	NO
Step	[-]		
Comm object	24295	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	always		
Description			
Enter in this setpoint a valid GSM phone number where the alarm messages shall be sent. For GSM numbers use either the national format (i.e. the number you would dial if you wanted to make a local call) or the full international format beginning with a "+" character followed by the country prefix. **IMPORTANT: Telephone number has to be entered without spaces.**			

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Telephone Number 3

Setpoint group	CM-4G-GPS	**Related FW**	2.2.0
Range [units]	0 .. 31 characters [-]		
Default value	[-]	**Force value**	NO
Step	[-]		
Comm object	24143	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	always		
Description			
Enter in this setpoint a valid GSM phone number where the alarm messages shall be sent. For GSM numbers use either the national format (i.e. the number you would dial if you wanted to make a local call) or the full international format beginning with a "+" character followed by the country prefix. **IMPORTANT: Telephone number has to be entered without spaces.**			

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Telephone Number 4

Setpoint group	CM-4G-GPS	**Related FW**	2.2.0
Range [units]	0 .. 31 characters [-]		
Default value	[-]	**Force value**	NO
Step	[-]		
Comm object	24142	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	always		
Description			
Enter in this setpoint a valid GSM phone number where the alarm messages shall be sent. For GSM numbers use either the national format (i.e. the number you would dial if you wanted to make a local call) or the full international format beginning with a "+" character followed by the country prefix. **IMPORTANT: Telephone number has to be entered without spaces.**			

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E-mail Language

Setpoint group	ETH Interface 2 - Untrusted	**Related FW**	2.2.0
Range [units]	Depends on controller's supported languages. [-]		
Default value	English	**Force value**	NO
Step	[-]		
Comm object	24299	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Always		
Description			
Use this setpoint to set the language of Event, Warning, etc. e-mails.			

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PVBO Message

Setpoint group	ETH Interface 2 - Untrusted	**Related FW**	2.2.0
Range [units]	Enabled / Disabled [-]		
Default value	Enabled	**Force value**	YES
Step	[-]		
Comm object	10926	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Always		
Description			
This setpoint enables or disables sending of PVBO Messages.			

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Sd Message

Setpoint group	ETH Interface 2 - Untrusted CM-4G-GPS Ethernet	**Related FW**	2.2.0
Range [units]	Enabled / Disabled [-]		
Default value	Enabled	**Force value**	YES
Step	[-]		
Comm object	8484	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Always		
Description			
This setpoint enables or disables sending of Shutdown Messages.			

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Stp Message

Setpoint group	Ethernet	**Related FW**	2.2.0
Range [units]	Enabled/Disabled		
Default value	Enabled	**Force value**	
Step	[-]		
Comm object	8485	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Always		
Description			
This setpoint enables or disables sending of messages.			

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Wrn Message

Setpoint group	ETH Interface 2 - Untrusted	**Related FW**	2.2.0
Range [units]	Enabled / Disabled [-]		
Default value	Enabled	**Force value**	YES
Step	[-]		
Comm object	8482	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Always		
Description			
This setpoint enables or disables sending of Warning Messages.			

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Subgroup: GPS Settings

GPS Tracking

Setpoint group	CM-4G-GPS	**Related FW**	2.2.0
Range [units]	Enabled / Disabled [-]		
Default value	Enabled	**Force value**	NO
Step	[-]		
Comm object	23975	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Only if relevant module is installed + conditioned by the setpoint **Internet Connection**		
Description			
If GPS tracking is enabled the module sends position/speed data to the controller with period 10 s.			

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Subgroup: RTC Synchronization

Time Zone

Setpoint group	Scheduler; CM-4G-GPS	**Related FW**	2.2.0
Range [units]	GMT-12:00 .. GMT+13:00 [hours]		
Default value	GMT+1:00	**Force value**	NO
Step	[-]		
Comm object	24366	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Always		
Description			
This setpoint is used to select the time zone where the controller is located. See your computer time zone setting (click on the time indicator located in the rightmost position of the Windows task bar) if you are not sure about your time zone. ***Note:*** *If the time zone is not selected properly the active e-mails may contain incorrect information about sending time, which may result in confusion when the respective problem actually occurred.*			

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NTP Clock Sync

Setpoint group	CM-4G-GPS	**Related FW**	2.2.0
Range [units]	DISABLED / ENABLED [-]		
Default value	DISABLED	**Force value**	NO
Step	[-]		
Comm object	23964	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Only if relevant module is installed		
Description			
This setpoint is used to enable/disable controller time synchronization with exact time from an NTP server. The period of synchronization is 1 hour or when the cotnroller is reset or when the setpoint is reset (Enabled->Disabled->Enabled).			

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NTP Server

Setpoint group	CM-4G-GPS	**Related FW**	2.2.0
Range [units]	[-]		
Default value	pool.ntp.org	**Force value**	NO
Step	[-]		
Comm object	23963	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Only if relevant module is installed		
Description			
NTP server address.			

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GPS Clock Sync

Setpoint group	CM-4G-GPS	**Related FW**	2.2.0
Range [units]	Enabled / Disabled [-]		
Default value	Enabled	**Force value**	NO
Step	[-]		
Comm object	23974	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Only if relevant module is installed + conditioned by the setpoint **Internet Connection**		
Description			
This setpoint is used to enable/disable synchronization of the controller's time with the exact time from GPS. The module sends UTC timestamp to the controller after reset/power on and then in period of 60 minutes.			

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11.1.4 Values

What values are:

Values (or quantities) are analog or binary data objects, measured or computed by the controller, that are intended for reading from the controller screen, PC, MODBUS, etc. Values are organized into groups according to their meaning.

For full list of values go to the chapter **List of values**

Invalid flag

If valid data is not available for a particular value, the invalid flag is set to it. This situation may be due to the following:

- The value is not being evaluated in the scope of the current application and configuration.
- Sensor fail has been detected on an analog input.
- The configured ECU or extension module does not provide the particular value.
- The communication with the ECU or extension module is interrupted.

A value containing the invalid flag is displayed as “####” in InteliConfig and on the controller screen. If such a value is read out via MODBUS, it will contain the data 32768 in the case of signed values and 65535 in the case of unsigned values.

List of group of values

Group: BESS 900
Group: PV 912
Group: WT 964
Group: Universal Gensets 978
Group: Mains/Bus 1021
Group: Load 1022
Group: Grid Codes 1023
Group: Mains/Bus 1033
Group: System 1049
Group: Power Management 1054
Group: Frequency/Load Control 1059
Group: Voltage/PF Control 1063
Group: Controller I/O 1069
Group: TotalMultiBESS 1072
Group: Statistics 1073
Group: Info 1088
Group: User Buttons 1101
Group: Log Bout 1103
Group: Scheduler 1107
Group: CM-4G-GPS 1116
Group: Ethernet 1123

Group: PLC 1133
Group: Remote Control 1155
Group: DIST-IN 1-32 1158
Group: DIST-IN 33-64 1165
Group: SH Modules 1172
Group: Virtual Shared OUT 1180

List of values

Group: BESS 900
BESS P 900
BESS P L1 900
BESS P L2 900
BESS P L3 900
BESS Q 901
BESS Q L1 901
BESS Q L2 901
BESS Q L3 901
BESS S 902
BESS S L1 902
BESS S L2 902
BESS S L3 902
BESS Power Factor 903
BESS Load Character 903
BESS Power Factor L1 903
BESS Load Character L1 903
BESS Power Factor L2 903
BESS Load Character L2 904
BESS Power Factor L3 904
BESS Load Character L3 904
BESS Voltage THD L1 904
BESS Voltage THD L2 904
BESS Voltage THD L3 905
BESS Current THD L1 905
BESS Current THD L2 905
BESS Current THD L3 905
BESS Frequency 905
BESS Voltage L1-N 906
BESS Voltage L2-N 906
BESS Voltage L3-N 906
BESS Voltage L1-L2 906
BESS Voltage L2-L3 906
BESS Voltage L3-L1 907
BESS Voltage 907
BESS V Unbalance Ph-N 907
BESS V Unbalance Ph-Ph 907
BESS Current L1 908
BESS Current L2 908
BESS Current L3 908
BESS Current Unbalance 908
Earth Fault Current 909
BESS Nominal Capacity 909
BESS Max Charging P 909
BESS Max Discharging P 910
BESS SOC 910
BESS Temperature 910
Slip Frequency 911
Slip Angle 911
BESS P 10min Avg 911
BESS Q 10min Avg 911
BESS S 10min Avg 912
Group: PV 912
Subgroup: PV Aggregated 912
PV Nominal P 912
PV Actual P 912
PV Actual Q 912
PV Actual S 913
PV Actual Power Factor 913
PV Actual Load Character 913
PV Power Factor Request 913
Curtailment Output 914
Subgroup: PV Curtailment Counter 914
PV Max P 914
PV Curtailed P 914
PV Curtailed P Relative 914
Total Curtailed PV kWh Rel 915
Annual Curtailed PV kWh Rel 915
Monthly Curtailed PV kWh Rel 915
Weekly Curtailed PV kWh Rel 916
Daily Curtailed PV kWh Rel 916
Subgroup: PV 1 916

PV 1 Nominal P 916
PV 1 Actual P 917
PV 1 Actual Q 917
PV 1 Actual S 917
PV 1 Actual Power Factor 917
PV 1 Actual Load Character 918
Subgroup: PV 2 918
PV 2 Nominal P 918
PV 2 Actual P 918
PV 2 Actual Q 918
PV 2 Actual S 919
PV 2 Actual Power Factor 919
PV 2 Actual Load Character 919
Subgroup: PV 3 919
PV 3 Nominal P 919
PV 3 Actual P 920
PV 3 Actual Q 920
PV 3 Actual S 920
PV 3 Actual Power Factor 920
PV 3 Actual Load Character 921
Subgroup: PV 4 921
PV 4 Nominal P 921
PV 4 Actual P 921
PV 4 Actual Q 921
PV 4 Actual S 922
PV 4 Actual Power Factor 922
PV 4 Actual Load Character 922
Subgroup: PV 5 922
PV 5 Nominal P 922
PV 5 Actual P 923
PV 5 Actual Q 923
PV 5 Actual S 923
PV 5 Actual Power Factor 923
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Group: BESS

BESS P

Value group	BESS	**Related FW**	2.2.0
Units	kW		
Comm object	8202	**Related applications**	MINT, MPTM
Description			
Active power of the BESS. ***Note:*** *This value can be also switched into one decimal see* ***Power Formats And Units****.*			

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BESS P L1

Value group	Value Group BESS	**Related FW**	2.2.0
Units	kW		
Comm object	8524	**Related applications**	MINT, MPTM
Description			
Active power of the L1 phase of the BESS. ***Note:*** *This value can be also switched into one decimal see* ***Power Formats And Units****.*			

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BESS P L2

Value group	Value Group BESS	**Related FW**	2.2.0
Units	kW		
Comm object	8525	**Related applications**	MINT, MPTM
Description			
Active power of the L2 phase of the BESS. ***Note:*** *This value can be also switched into one decimal see* ***Power Formats And Units****.*			

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BESS P L3

Value group	Value Group BESS	**Related FW**	2.2.0
Units	kW		
Comm object	8526	**Related applications**	MINT, MPTM
Description			
Active power of the L3 phase of the BESS. ***Note:*** *This value can be also switched into one decimal see* ***Power Formats And Units****.*			

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BESS Q

Value group	Value Group BESS	**Related FW**	2.2.0
Units	kVAr		
Comm object	8203	**Related applications**	MINT, MPTM
Description			
Reactive power of the BESS. ***Note:*** *This value can be also switched into one decimal see* ***Power Formats And Units****.*			

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BESS Q L1

Value group	Value Group BESS	**Related FW**	2.2.0
Units	kVAr		
Comm object	8527	**Related applications**	MINT, MPTM
Description			
Reactive power of the L1 phase of the BESS. ***Note:*** *This value can be also switched into one decimal see* ***Power Formats And Units****.*			

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BESS Q L2

Value group	Value Group BESS	**Related FW**	2.2.0
Units	kVAr		
Comm object	8528	**Related applications**	MINT, MPTM
Description			
Reactive power of the L2 phase of the BESS. ***Note:*** *This value can be also switched into one decimal see* ***Power Formats And Units****.*			

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BESS Q L3

Value group	Value Group BESS	**Related FW**	2.2.0
Units	kVAr		
Comm object	8529	**Related applications**	MINT, MPTM
Description			
Reactive power of the L3 phase of the BESS. ***Note:*** *This value can be also switched into one decimal see* ***Power Formats And Units****.*			

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BESS S

Value group	Value Group BESS	**Related FW**	2.2.0
Units	kVA		
Comm object	8565	**Related applications**	MINT, MPTM
Description			
Apparent power of the BESS. ***Note:*** *This value can be also switched into one decimal see* ***Power Formats And Units****.*			

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BESS S L1

Value group	Value Group BESS	**Related FW**	2.2.0
Units	kVA		
Comm object	8530	**Related applications**	MINT, MPTM
Description			
Apparent power of the L1 phase of the BESS. ***Note:*** *This value can be also switched into one decimal see* ***Power Formats And Units****.*			

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BESS S L2

Value group	Value Group BESS	**Related FW**	2.2.0
Units	kVA		
Comm object	8531	**Related applications**	MINT, MPTM
Description			
Apparent power of the L2 phase of the BESS. ***Note:*** *This value can be also switched into one decimal see* ***Power Formats And Units****.*			

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BESS S L3

Value group	Value Group BESS	**Related FW**	2.2.0
Units	kVA		
Comm object	8532	**Related applications**	MINT, MPTM
Description			
Apparent power of the L3 phase of the BESS. ***Note:*** *This value can be also switched into one decimal see* ***Power Formats And Units****.*			

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BESS Power Factor

Value group	BESS	**Related FW**	2.2.0
Units	[-]		
Comm object	16156	**Related applications**	MINT, MPTM
Description			
Power factor of the BESS.			

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BESS Load Character

Value group	BESS	**Related FW**	2.2.0
Units	[-]		
Comm object	8395	**Related applications**	MINT, MPTM
Description			
Load character of the BESS. L = inductive load, C = capacitive load, and R = resistive load (**BESS Power Factor** = 1).			

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BESS Power Factor L1

Value group	BESS	**Related FW**	2.2.0
Units	[-]		
Comm object	16160	**Related applications**	MINT, MPTM
Description			
Power factor of the L1 phase of the BESS.			

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BESS Load Character L1

Value group	BESS	**Related FW**	2.2.0
Units	[-]		
Comm object	8626	**Related applications**	MINT, MPTM
Description			
Load character of the L1 phase of the BESS. L = inductive load, C = capacitive load, and R = resistive load (**BESS Power Factor L1** = 1).			

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BESS Power Factor L2

Value group	BESS	**Related FW**	2.2.0
Units	[-]		
Comm object	16161	**Related applications**	MINT, MPTM
Description			
Power factor of the L2 phase of the BESS.			

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BESS Load Character L2

Value group	BESS	**Related FW**	2.2.0
Units	[-]		
Comm object	8627	**Related applications**	MINT, MPTM
Description			
Load character of the L2 phase of the BESS. L = inductive load, C = capacitive load, and R = resistive load (**BESS Power Factor L2** = 1).			

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BESS Power Factor L3

Value group	BESS	**Related FW**	2.2.0
Units	[-]		
Comm object	16162	**Related applications**	MINT, MPTM
Description			
Power factor of the L3 phase of the BESS.			

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BESS Load Character L3

Value group	BESS	**Related FW**	2.2.0
Units	[-]		
Comm object	8628	**Related applications**	MINT, MPTM
Description			
Load character of the L3 phase of the BESS. L = inductive load, C = capacitive load, and R = resistive load (**BESS Power Factor L3** = 1).			

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BESS Voltage THD L1

Value group	BESSMains/Bus	**Related FW**	2.2.0
Units	%		
Comm object	16052	**Related applications**	MINT, MPTM
Description			
This value represents **Voltage Total Harmonic Distortion** of **BESS Voltage L1-N**.			

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BESS Voltage THD L2

Value group	BESSMains/Bus	**Related FW**	2.2.0
Units	%		
Comm object	16053	**Related applications**	MINT, MPTM
Description			
This value represents **Voltage Total Harmonic Distortion** of **BESS Voltage L2-N**.			

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BESS Voltage THD L3

Value group	BESSMains/Bus	**Related FW**	2.2.0
Units	%		
Comm object	16054	**Related applications**	MINT, MPTM
Description			
This value represents **Voltage Total Harmonic Distortion** of **BESS Voltage L3-N**.			

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BESS Current THD L1

Value group	Value Group BESS	**Related FW**	2.2.0
Units	%		
Comm object	16056	**Related applications**	MINT, MPTM
Description			
This value represents **Current Total Harmonic Distortion** of **BESS Current L1**.			

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BESS Current THD L2

Value group	Value Group BESS	**Related FW**	2.2.0
Units	%		
Comm object	16057	**Related applications**	MINT, MPTM
Description			
This value represents **Current Total Harmonic Distortion** of **BESS Current L2**.			

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BESS Current THD L3

Value group	Value Group BESS	**Related FW**	2.2.0
Units	%		
Comm object	16058	**Related applications**	MINT, MPTM
Description			
This value represents **Current Total Harmonic Distortion** of **BESS Current L3**.			

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BESS Frequency

Value group	Value Group BESS	**Related FW**	2.2.0
Units	Hz		
Comm object	20799	**Related applications**	MINT, MPTM
Description			
This is the value of BESS Frequency.			

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BESS Voltage L1-N

Value group	BESS	**Related FW**	2.2.0
Units	V		
Comm object	8192	**Related applications**	MINT, MPTM
Description			
Voltage of the L1 phase of the BESS.			

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BESS Voltage L2-N

Value group	BESS	**Related FW**	2.2.0
Units	V		
Comm object	8193	**Related applications**	MINT, MPTM
Description			
Voltage of the L2 phase of the BESS.			

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BESS Voltage L3-N

Value group	BESS	**Related FW**	2.2.0
Units	V		
Comm object	8194	**Related applications**	MINT, MPTM
Description			
Voltage of the L3 phase of the BESS.			

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BESS Voltage L1-L2

Value group	BESSMains/Bus	**Related FW**	2.2.0
Units	V		
Comm object	9628	**Related applications**	MINT, MPTM
Description			
Phase to phase voltage between the L1 and L2 phases of the BESS.			

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BESS Voltage L2-L3

Value group	BESSMains/Bus	**Related FW**	2.2.0
Units	V		
Comm object	9629	**Related applications**	MINT, MPTM
Description			
Phase to phase voltage between the L2 and L3 phases of the BESS.			

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BESS Voltage L3-L1

Value group	BESSMains/Bus	**Related FW**	2.2.0
Units	V		
Comm object	9630	**Related applications**	MINT, MPTM
Description			
Phase to phase voltage between the L3 and L1 phases of the BESS.			

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BESS Voltage

Value group	BESSMains/Bus	**Related FW**	2.2.0
Units	V		
Comm object	10645	**Related applications**	MINT, MPTM
Description			
Average value of all voltage phases of the BESS.			

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BESS V Unbalance Ph-N

Value group	BESS	**Related FW**	2.2.0
Units	V		
Comm object	10548	**Related applications**	MINT, MPTM
Description			
This value contains the maximum difference of values **BESS Voltage L1-N**, **BESS Voltage L2-N**, **BESS Voltage L3-N** at a given moment. ***Note:*** *Difference of the values and the evaluation of the protection is influenced by the setpoint* ***Connection type****.*			

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BESS V Unbalance Ph-Ph

Value group	BESSMains/Bus	**Related FW**	2.2.0
Units	V		
Comm object	17336	**Related applications**	MINT, MPTM
Description			
This value contains the maximum difference of values **BESS Voltage L1-L2**, **BESS Voltage L2-L3**, **BESS Voltage L3-L1** at a given moment. ***Note:*** *Difference of the values and the evaluation of the protection is influenced by the setpoint* ***Connection type****.*			

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BESS Current L1

Value group	Value Group BESS	**Related FW**	2.2.0
Units	A		
Comm object	8198	**Related applications**	MINT, MPTM
Description			
Current of the L1 phase of the BESS. ***Note:*** *This value can be also switched into one decimal see* ***Power Formats And Units****.*			

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BESS Current L2

Value group	Value Group BESS	**Related FW**	2.2.0
Units	A		
Comm object	8199	**Related applications**	MINT, MPTM
Description			
Current of the L2 phase of the BESS. ***Note:*** *This value can be also switched into one decimal see* ***Power Formats And Units****.*			

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BESS Current L3

Value group	Value Group BESS	**Related FW**	2.2.0
Units	A		
Comm object	8200	**Related applications**	MINT, MPTM
Description			
Current of the L3 phase of the BESS. ***Note:*** *This value can be also switched into one decimal see* ***Power Formats And Units****.*			

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BESS Current Unbalance

Value group	Value Group BESS	**Related FW**	2.2.0
Units	A		
Comm object	10550	**Related applications**	MINT, MPTM
Description			
This value contains the maximum difference of values **BESS Current L1**, **BESS Current L2** and **BESS Current L3**. ***Note:*** *Difference of the values and the evaluation of the protection is influenced by the setpoint* ***Connection type****.*			

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Earth Fault Current

Value group	Value Group BESS	**Related FW**	2.2.0
Units	A		
Comm object	15381	**Related applications**	MINT, MPTM
Description			
Measured fault value for evaluation of **Earth Fault Current Protection**. ***Note:*** *This value is filled with 0 all the time if* ***Application Mode*** *= MPTM and* ***Mains Measurement P*** *= CT.*			

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BESS Nominal Capacity

Value group	Value Group BESS	**Related FW**	2.2.0
Units	kWh		
Comm object	15859	**Related applications**	MINT, MPTM
Description			
This value represents nominal capacity of the Energy Storage.The value is taken from the LAI **BESS CAPACITY**.			

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BESS Max Charging P

Value group	Value Group BESS	**Related FW**	2.2.0
Units	kW		
Comm object	17893	**Related applications**	MINT, MPTM
Description			
This value reflects the input of LAI **BESS 01 MAX CHARGING P**. It defines the maximum charging power of the BESS. If the LAI is configured and provides a valid value, then this value is used in all related functions, where it replaces the nominal power of the BESS. This value also reflects the ability of the BESS to continue charging. However, it is not purely a representation of the value obtained through the LAI. The value also considers the BESS's capability to continue charging. If, for any reason, charging the BESS is generally prohibited (for example, due to reaching the maximum SOC), this value tends toward zero. See the chapter on **Max. charging/discharging power of the BESS**.			

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BESS Max Discharging P

Value group	Value Group BESS	**Related FW**	2.2.0
Units	kW		
Comm object	17892	**Related applications**	MINT, MPTM
Description			
This value reflects the input of LAI **BESS 01 MAX DISCHARGING P**. It defines the maximum charging power of the BESS. If the LAI is configured and provides a valid value, then this value is used in all related functions, where it replaces the nominal power of the BESS. This value also reflects the ability of the BESS to continue discharging. However, it is not purely a representation of the value obtained through the LAI. The value also considers the BESS's capability to continue discharging. If, for any reason, discharging the BESS is generally prohibited (for example, due to reaching the minimum SOC), this value tends toward zero. See the chapter on **Max. charging/discharging power of the BESS**.			

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BESS SOC

Value group	Value Group BESS	**Related FW**	2.2.0
Units	%		
Comm object	15857	**Related applications**	MINT, MPTM
Description			
Actual state of charge of the Energy Storage.The value is taken from the LAI **BESS 01 SOC**. More information can be seen in chapter **BESS SOC Control**.			

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BESS Temperature

Value group	Value Group BESS	**Related FW**	2.2.0
Units	°C		
Comm object	15861	**Related applications**	MINT, MPTM
Description			
Actual BESS temperature.The value is taken from the LAI **BESS TEMPERATUREBESS TEMPERATUREBESS TEMPERATURE**.			

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Slip Frequency

Value group	Mains/Bus	**Related FW**	2.2.0
Units	Hz		
Comm object	8224	**Related applications**	MINT, MPTM
Description			
Slip frequency during synchronization.			

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Slip Angle

Value group	Mains/Bus	**Related FW**	2.2.0
Units	°		
Comm object	8225	**Related applications**	MINT, MPTM
Description			
Slip angle during synchronization.			

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BESS P 10min Avg

Value group	BESS	**Related FW**	2.2.0
Units	kW		
Comm object	16073	**Related applications**	MPTM
Description			
This value contains 10-minutes average of **BESS P**. See **10-minutes averages** for more information. ***Note:*** *This value can be also switched into one decimal see* ***Power Formats And Units****.Value is reset to 0 with opening of BCB.*			

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BESS Q 10min Avg

Value group	BESS	**Related FW**	2.2.0
Units	kVAr		
Comm object	16080	**Related applications**	MPTM
Description			
This value contains 10-minutes average of **BESS Q**. See **10-minutes averages** for more information. ***Note:*** *This value can be also switched into one decimal see* ***Power Formats And Units****.Value is reset to 0 with opening of BCB.*			

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BESS S 10min Avg

Value group	Value Group BESS	**Related FW**	2.2.0
Units	kVA		
Comm object	16081	**Related applications**	MPTM
Description			
This value contains 10-minutes average of **BESS S**. See **10-minutes averages** for more information. ***Note:*** *This value can be also switched into one decimal see* ***Power Formats And Units****.Value is reset to 0 with opening of BCB.*			

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Group: PV

Subgroup: PV Aggregated

PV Nominal P

Value group	PV	**Related FW**	2.2.0
Units	kW		
Comm object	15596	**Related applications**	MINT, MPTM
Description			
This value shows nominal power of PV inverters.			

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PV Actual P

Value group	PV	**Related FW**	2.2.0
Units	kW		
Comm object	15594	**Related applications**	MINT, MPTM
Description			
Actual active power produced by PV inverters.			

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PV Actual Q

Value group	PV	**Related FW**	2.2.0
Units	kVAr		
Comm object	15595	**Related applications**	MINT, MPTM
Description			
Actual reactive power produced by PV inverters.			

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PV Actual S

Value group	PV	**Related FW**	2.2.0
Units	kVA		
Comm object	15891	**Related applications**	MINT, MPTM
Description			
Actual apparent power produced by PV inverters.			

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PV Actual Power Factor

Value group	PV	**Related FW**	2.2.0
Units	[-]		
Comm object	20162	**Related applications**	MINT, MPTM
Description			
This value represents the actual power factor of PV inverters.			

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PV Actual Load Character

Value group	PV	**Related FW**	2.2.0
Units	[-]		
Comm object	15678	**Related applications**	MINT, MPTM
Description			
This value represents actual load character of the PV inverters.			

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PV Power Factor Request

Value group	PV	**Related FW**	2.2.0
Units	[-]		
Comm object	20184	**Related applications**	MINT, MPTM
Description			
This value shows the actual PF request required from the PV inverters. See the chapter **Participation of the PV in reactive power Q Control**.			

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Curtailment Output

Value group	PV	Related FW	2.2.0
Units	% of **PV Nominal P**		
Comm object	14364	Related applications	MINT, MPTM
Description			
This value shows maximal percentage power which can be provided by the output of the PV inverter in case the **PV Output control** function is used.			

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Subgroup: PV Curtailment Counter

PV Max P

Value group	PV	Related FW	2.2.0
Units	kW		
Comm object	19553	Related applications	MINT, MPTM
Description			
The total potential PV output across all arrays.			

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PV Curtailed P

Value group	PV	Related FW	2.2.0
Units	kW		
Comm object	19554	Related applications	MINT, MPTM
Description			
The value of actual curtailed power.			

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PV Curtailed P Relative

Value group	PV	Related FW	2.2.0
Units	kW		
Comm object	19555	Related applications	MINT, MPTM
Description			
This value represents the ratio of actual curtailed power (**PV Curtailed P**) to the total potential PV output (**PV Max P**).			

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Total Curtailed PV kWh Rel

Value group	PV	**Related FW**	2.2.0
Units	%		
Comm object	18711	**Related applications**	MINT, MPTM
Description			
This is a statistic value related to the Curtailment Counter functionality. It has meaning of the relative value of curtailed energy compared to the PV arrays potential output. Actually it says how big part of the PV energy was wasted due to the curtailment. If **Irradiation of PV Array 1** is not configured, then this statistics is not counted.			

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Annual Curtailed PV kWh Rel

Value group	PV	**Related FW**	2.2.0
Units	%		
Comm object	18712	**Related applications**	MINT, MPTM
Description			
This is a statistic value related to the Curtailment Counter functionality. It has meaning of the relative value of curtailed energy compared to the PV arrays potential output. Actually it says how big part of the PV energy was wasted due to the curtailment in interval of one year. This Value is reset together every new year begin. If **Irradiation of PV Array 1** is not configured, then this statistics is not counted.			

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Monthly Curtailed PV kWh Rel

Value group	PV	**Related FW**	2.2.0
Units	%		
Comm object	18713	**Related applications**	MINT, MPTM
Description			
This is a statistic value related to the Curtailment Counter functionality. It has meaning of the relative value of curtailed energy compared to the PV arrays potential output. Actually it says how big part of the PV energy was wasted due to the curtailment in interval of one month. This Value is reset together every new month begin. If **Irradiation of PV Array 1** is not configured, then this statistics is not counted.			

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Weekly Curtailed PV kWh Rel

Value group	PV	**Related FW**	2.2.0
Units	%		
Comm object	18714	**Related applications**	MINT, MPTM
Description			
This is a statistic value related to the Curtailment Counter functionality. It has meaning of the relative value of curtailed energy compared to the PV arrays potential output. Actually it says how big part of the PV energy was wasted due to the curtailment in interval of one week. This Value is reset together every new week begin (Sunday midnight). If **IRRADIATION OF PV ARRAY 1** is not configured, then this statistics is not counted.			

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Daily Curtailed PV kWh Rel

Value group	PV	**Related FW**	2.2.0
Units	%		
Comm object	18715	**Related applications**	MINT, MPTM
Description			
This is a statistic value related to the Curtailment Counter functionality. It has meaning of the relative value of curtailed energy compared to the PV arrays potential output. Actually it says how big part of the PV energy was wasted due to the curtailment in interval of one day. This Value is reset together every new day begin (midnight). If **IRRADIATION OF PV ARRAY 1** is not configured, then this statistics is not counted.			

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Subgroup: PV 1

PV 1 Nominal P

Value group	PV	**Related FW**	2.2.0
Units	kW		
Comm object	19879	**Related applications**	MINT, MPTM
Description			
This value shows nominal power of PV inverter 1.			

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PV 1 Actual P

Value group	PV	**Related FW**	2.2.0
Units	kW		
Comm object	19878	**Related applications**	MINT, MPTM
Description			
Actual active power produced by PV inverter 1.			

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PV 1 Actual Q

Value group	PV	**Related FW**	2.2.0
Units	kVAr		
Comm object	19877	**Related applications**	MINT, MPTM
Description			
Actual reactive power produced by PV inverter 1.			

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PV 1 Actual S

Value group	PV	**Related FW**	2.2.0
Units	kVA		
Comm object	19876	**Related applications**	MINT, MPTM
Description			
Actual apparent power produced by PV inverter 1.			

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PV 1 Actual Power Factor

Value group	PV	**Related FW**	2.2.0
Units	[-]		
Comm object	19875	**Related applications**	MINT, MPTM
Description			
This value represents the actual power factor of PV inverter 1.			

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PV 1 Actual Load Character

Value group	PV	**Related FW**	2.2.0
Units	[-]		
Comm object	19874	**Related applications**	MINT, MPTM
Description			
This value represents actual load character of the PV inverter 1.			

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Subgroup: PV 2

PV 2 Nominal P

Value group	PV	**Related FW**	2.2.0
Units	kW		
Comm object	19873	**Related applications**	MINT, MPTM
Description			
This value shows nominal power of PV inverter 2.			

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PV 2 Actual P

Value group	PV	**Related FW**	2.2.0
Units	kW		
Comm object	19872	**Related applications**	MINT, MPTM
Description			
Actual active power produced by PV inverter 2.			

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PV 2 Actual Q

Value group	PV	**Related FW**	2.2.0
Units	kVAr		
Comm object	19871	**Related applications**	MINT, MPTM
Description			
Actual reactive power produced by PV inverter 2.			

back to List of values

PV 2 Actual S

Value group	PV	**Related FW**	2.2.0
Units	kVA		
Comm object	19870	**Related applications**	MINT, MPTM
Description			
Actual apparent power produced by PV inverter 2.			

back to List of values

PV 2 Actual Power Factor

Value group	PV	**Related FW**	2.2.0
Units	[-]		
Comm object	19869	**Related applications**	MINT, MPTM
Description			
This value represents the actual power factor of PV inverter 2.			

back to List of values

PV 2 Actual Load Character

Value group	PV	**Related FW**	2.2.0
Units	[-]		
Comm object	19868	**Related applications**	MINT, MPTM
Description			
This value represents actual load character of the PV inverter 2.			

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Subgroup: PV 3

PV 3 Nominal P

Value group	PV	**Related FW**	2.2.0
Units	kW		
Comm object	19867	**Related applications**	MINT, MPTM
Description			
This value shows nominal power of PV inverter 3.			

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PV 3 Actual P

Value group	PV	**Related FW**	2.2.0
Units	kW		
Comm object	19866	**Related applications**	MINT, MPTM
Description			
Actual active power produced by PV inverter 3.			

back to List of values

PV 3 Actual Q

Value group	PV	**Related FW**	2.2.0
Units	kVAr		
Comm object	19865	**Related applications**	MINT, MPTM
Description			
Actual reactive power produced by PV inverter 3.			

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PV 3 Actual S

Value group	PV	**Related FW**	2.2.0
Units	kVA		
Comm object	19864	**Related applications**	MINT, MPTM
Description			
Actual apparent power produced by PV inverter 3.			

back to List of values

PV 3 Actual Power Factor

Value group	PV	**Related FW**	2.2.0
Units	[-]		
Comm object	19863	**Related applications**	MINT, MPTM
Description			
This value represents the actual power factor of PV inverter 3.			

back to List of values

PV 3 Actual Load Character

Value group	PV	**Related FW**	2.2.0
Units	[-]		
Comm object	19862	**Related applications**	MINT, MPTM
Description			
This value represents actual load character of the PV inverter 3.			

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Subgroup: PV 4

PV 4 Nominal P

Value group	PV	**Related FW**	2.2.0
Units	kW		
Comm object	19861	**Related applications**	MINT, MPTM
Description			
This value shows nominal power of PV inverter 4.			

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PV 4 Actual P

Value group	PV	**Related FW**	2.2.0
Units	kW		
Comm object	19860	**Related applications**	MINT, MPTM
Description			
Actual active power produced by PV inverter 4.			

back to List of values

PV 4 Actual Q

Value group	PV	**Related FW**	2.2.0
Units	kVAr		
Comm object	19859	**Related applications**	MINT, MPTM
Description			
Actual reactive power produced by PV inverter 4.			

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PV 4 Actual S

Value group	PV	**Related FW**	2.2.0
Units	kVA		
Comm object	19858	**Related applications**	MINT, MPTM
Description			
Actual apparent power produced by PV inverter 4.			

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PV 4 Actual Power Factor

Value group	PV	**Related FW**	2.2.0
Units	[-]		
Comm object	19857	**Related applications**	MINT, MPTM
Description			
This value represents the actual power factor of PV inverter 4.			

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PV 4 Actual Load Character

Value group	PV	**Related FW**	2.2.0
Units	[-]		
Comm object	19856	**Related applications**	MINT, MPTM
Description			
This value represents actual load character of the PV inverter 4.			

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Subgroup: PV 5

PV 5 Nominal P

Value group	PV	**Related FW**	2.2.0
Units	kW		
Comm object	19855	**Related applications**	MINT, MPTM
Description			
This value shows nominal power of PV inverter 5.			

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PV 5 Actual P

Value group	PV	**Related FW**	2.2.0
Units	kW		
Comm object	19854	**Related applications**	MINT, MPTM
Description			
Actual active power produced by PV inverter 5.			

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PV 5 Actual Q

Value group	PV	**Related FW**	2.2.0
Units	kVAr		
Comm object	19853	**Related applications**	MINT, MPTM
Description			
Actual reactive power produced by PV inverter 5.			

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PV 5 Actual S

Value group	PV	**Related FW**	2.2.0
Units	kVA		
Comm object	19852	**Related applications**	MINT, MPTM
Description			
Actual apparent power produced by PV inverter 5.			

back to List of values

PV 5 Actual Power Factor

Value group	PV	**Related FW**	2.2.0
Units	[-]		
Comm object	19851	**Related applications**	MINT, MPTM
Description			
This value represents the actual power factor of PV inverter 5.			

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PV 5 Actual Load Character

Value group	PV	**Related FW**	2.2.0
Units	[-]		
Comm object	19850	**Related applications**	MINT, MPTM
Description			
This value represents actual load character of the PV inverter 5.			

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Subgroup: PV 6

PV 6 Nominal P

Value group	PV	**Related FW**	2.2.0
Units	kW		
Comm object	19849	**Related applications**	MINT, MPTM
Description			
This value shows nominal power of PV inverter 6.			

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PV 6 Actual P

Value group	PV	**Related FW**	2.2.0
Units	kW		
Comm object	19848	**Related applications**	MINT, MPTM
Description			
Actual active power produced by PV inverter 6.			

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PV 6 Actual Q

Value group	PV	**Related FW**	2.2.0
Units	kVAr		
Comm object	19847	**Related applications**	MINT, MPTM
Description			
Actual reactive power produced by PV inverter 6.			

back to List of values

PV 6 Actual S

Value group	PV	**Related FW**	2.2.0
Units	kVA		
Comm object	19846	**Related applications**	MINT, MPTM
Description			
Actual apparent power produced by PV inverter 6.			

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PV 6 Actual Power Factor

Value group	PV	**Related FW**	2.2.0
Units	[-]		
Comm object	19845	**Related applications**	MINT, MPTM
Description			
This value represents the actual power factor of PV inverter 6.			

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PV 6 Actual Load Character

Value group	PV	**Related FW**	2.2.0
Units	[-]		
Comm object	19844	**Related applications**	MINT, MPTM
Description			
This value represents actual load character of the PV inverter 6.			

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Subgroup: PV 7

PV 7 Nominal P

Value group	PV	**Related FW**	2.2.0
Units	kW		
Comm object	19843	**Related applications**	MINT, MPTM
Description			
This value shows nominal power of PV inverter 7.			

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PV 7 Actual P

Value group	PV	**Related FW**	2.2.0
Units	kW		
Comm object	19842	**Related applications**	MINT, MPTM
Description			
Actual active power produced by PV inverter 7.			

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PV 7 Actual Q

Value group	PV	**Related FW**	2.2.0
Units	kVAr		
Comm object	19841	**Related applications**	MINT, MPTM
Description			
Actual reactive power produced by PV inverter 7.			

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PV 7 Actual S

Value group	PV	**Related FW**	2.2.0
Units	kVA		
Comm object	19840	**Related applications**	MINT, MPTM
Description			
Actual apparent power produced by PV inverter 7.			

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PV 7 Actual Power Factor

Value group	PV	**Related FW**	2.2.0
Units	[-]		
Comm object	19839	**Related applications**	MINT, MPTM
Description			
This value represents the actual power factor of PV inverter 7.			

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PV 7 Actual Load Character

Value group	PV	**Related FW**	2.2.0
Units	[-]		
Comm object	19838	**Related applications**	MINT, MPTM
Description			
This value represents actual load character of the PV inverter 7.			

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Subgroup: PV 8

PV 8 Nominal P

Value group	PV	**Related FW**	2.2.0
Units	kW		
Comm object	19837	**Related applications**	MINT, MPTM
Description			
This value shows nominal power of PV inverter 8.			

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PV 8 Actual P

Value group	PV	**Related FW**	2.2.0
Units	kW		
Comm object	19836	**Related applications**	MINT, MPTM
Description			
Actual active power produced by PV inverter 8.			

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PV 8 Actual Q

Value group	PV	**Related FW**	2.2.0
Units	kVAr		
Comm object	19835	**Related applications**	MINT, MPTM
Description			
Actual reactive power produced by PV inverter 8.			

back to List of values

PV 8 Actual S

Value group	PV	**Related FW**	2.2.0
Units	kVA		
Comm object	19834	**Related applications**	MINT, MPTM
Description			
Actual apparent power produced by PV inverter 8.			

back to List of values

PV 8 Actual Power Factor

Value group	PV	**Related FW**	2.2.0
Units	[-]		
Comm object	19833	**Related applications**	MINT, MPTM
Description			
This value represents the actual power factor of PV inverter 8.			

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PV 8 Actual Load Character

Value group	PV	**Related FW**	2.2.0
Units	[-]		
Comm object	19832	**Related applications**	MINT, MPTM
Description			
This value represents actual load character of the PV inverter 8.			

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Subgroup: PV 9

PV 9 Actual P

Value group	PV	**Related FW**	2.2.0
Units	kW		
Comm object	19830	**Related applications**	MINT, MPTM
Description			
Actual active power produced by PV inverter 9.			

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PV 9 Nominal P

Value group	PV	**Related FW**	2.2.0
Units	kW		
Comm object	19831	**Related applications**	MINT, MPTM
Description			
This value shows nominal power of PV inverter 9.			

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PV 9 Actual Q

Value group	PV	**Related FW**	2.2.0
Units	kVAr		
Comm object	19829	**Related applications**	MINT, MPTM
Description			
Actual reactive power produced by PV inverter 9.			

back to List of values

PV 9 Actual S

Value group	PV	**Related FW**	2.2.0
Units	kVA		
Comm object	19828	**Related applications**	MINT, MPTM
Description			
Actual apparent power produced by PV inverter 9.			

back to List of values

PV 9 Actual Power Factor

Value group	PV	**Related FW**	2.2.0
Units	[-]		
Comm object	19827	**Related applications**	MINT, MPTM
Description			
This value represents the actual power factor of PV inverter 9.			

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PV 9 Actual Load Character

Value group	PV	**Related FW**	2.2.0
Units	[-]		
Comm object	19826	**Related applications**	MINT, MPTM
Description			
This value represents actual load character of the PV inverter 9.			

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Subgroup: PV 10

PV 10 Nominal P

Value group	PV	**Related FW**	2.2.0
Units	kW		
Comm object	19825	**Related applications**	MINT, MPTM
Description			
This value shows nominal power of PV inverter 10.			

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PV 10 Actual P

Value group	PV	**Related FW**	2.2.0
Units	kW		
Comm object	19824	**Related applications**	MINT, MPTM
Description			
Actual active power produced by PV inverter 10.			

back to List of values

PV 10 Actual Q

Value group	PV	**Related FW**	2.2.0
Units	kVAr		
Comm object	19823	**Related applications**	MINT, MPTM
Description			
Actual reactive power produced by PV inverter 10.			

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PV 10 Actual S

Value group	PV	**Related FW**	2.2.0
Units	kVA		
Comm object	19822	**Related applications**	MINT, MPTM
Description			
Actual apparent power produced by PV inverter 10.			

back to List of values

PV 10 Actual Power Factor

Value group	PV	**Related FW**	2.2.0
Units	[-]		
Comm object	19821	**Related applications**	MINT, MPTM
Description			
This value represents the actual power factor of PV inverter 10.			

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PV 10 Actual Load Character

Value group	PV	**Related FW**	2.2.0
Units	[-]		
Comm object	19820	**Related applications**	MINT, MPTM
Description			
This value represents actual load character of the PV inverter 10.			

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Subgroup: PV 11

PV 11 Nominal P

Value group	PV	**Related FW**	2.2.0
Units	kW		
Comm object	19819	**Related applications**	MINT, MPTM
Description			
This value shows nominal power of PV inverter 11.			

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PV 11 Actual P

Value group	PV	**Related FW**	2.2.0
Units	kW		
Comm object	19818	**Related applications**	MINT, MPTM
Description			
Actual active power produced by PV inverter 11.			

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PV 11 Actual Q

Value group	PV	**Related FW**	2.2.0
Units	kVAr		
Comm object	19817	**Related applications**	MINT, MPTM
Description			
Actual reactive power produced by PV inverter 11.			

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PV 11 Actual S

Value group	PV	**Related FW**	2.2.0
Units	kVA		
Comm object	19816	**Related applications**	MINT, MPTM
Description			
Actual apparent power produced by PV inverter 11.			

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PV 11 Actual Power Factor

Value group	PV	**Related FW**	2.2.0
Units	[-]		
Comm object	19815	**Related applications**	MINT, MPTM
Description			
This value represents the actual power factor of PV inverter 11.			

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PV 11 Actual Load Character

Value group	PV	**Related FW**	2.2.0
Units	[-]		
Comm object	19814	**Related applications**	MINT, MPTM
Description			
This value represents actual load character of the PV inverter 11.			

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Subgroup: PV 12

PV 12 Nominal P

Value group	PV	**Related FW**	2.2.0
Units	kW		
Comm object	19813	**Related applications**	MINT, MPTM
Description			
This value shows nominal power of PV inverter 12.			

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PV 12 Actual P

Value group	PV	**Related FW**	2.2.0
Units	kW		
Comm object	19812	**Related applications**	MINT, MPTM
Description			
Actual active power produced by PV inverter 12.			

back to List of values

PV 12 Actual Q

Value group	PV	**Related FW**	2.2.0
Units	kVAr		
Comm object	19811	**Related applications**	MINT, MPTM
Description			
Actual reactive power produced by PV inverter 12.			

back to List of values

PV 12 Actual S

Value group	PV	**Related FW**	2.2.0
Units	kVA		
Comm object	19810	**Related applications**	MINT, MPTM
Description			
Actual apparent power produced by PV inverter 12.			

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PV 12 Actual Power Factor

Value group	PV	**Related FW**	2.2.0
Units	[-]		
Comm object	19809	**Related applications**	MINT, MPTM
Description			
This value represents the actual power factor of PV inverter 12.			

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PV 12 Actual Load Character

Value group	PV	**Related FW**	2.2.0
Units	[-]		
Comm object	19808	**Related applications**	MINT, MPTM
Description			
This value represents actual load character of the PV inverter 12.			

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Subgroup: PV 13

PV 13 Nominal P

Value group	PV	**Related FW**	2.2.0
Units	kW		
Comm object	19807	**Related applications**	MINT, MPTM
Description			
This value shows nominal power of PV inverter 13.			

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PV 13 Actual P

Value group	PV	**Related FW**	2.2.0
Units	kW		
Comm object	19806	**Related applications**	MINT, MPTM
Description			
Actual active power produced by PV inverter 13.			

back to List of values

PV 13 Actual Q

Value group	PV	**Related FW**	2.2.0
Units	kVAr		
Comm object	19805	**Related applications**	MINT, MPTM
Description			
Actual reactive power produced by PV inverter 13.			

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PV 13 Actual S

Value group	PV	**Related FW**	2.2.0
Units	kVA		
Comm object	19804	**Related applications**	MINT, MPTM
Description			
Actual apparent power produced by PV inverter 13.			

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PV 13 Actual Power Factor

Value group	PV	**Related FW**	2.2.0
Units	[-]		
Comm object	19803	**Related applications**	MINT, MPTM
Description			
This value represents the actual power factor of PV inverter 13.			

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PV 13 Actual Load Character

Value group	PV	**Related FW**	2.2.0
Units	[-]		
Comm object	19802	**Related applications**	MINT, MPTM
Description			
This value represents actual load character of the PV inverter 13.			

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Subgroup: PV 14

PV 14 Nominal P

Value group	PV	**Related FW**	2.2.0
Units	kW		
Comm object	19801	**Related applications**	MINT, MPTM
Description			
This value shows nominal power of PV inverter 14.			

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PV 14 Actual P

Value group	PV	**Related FW**	2.2.0
Units	kW		
Comm object	19800	**Related applications**	MINT, MPTM
Description			
Actual active power produced by PV inverter 14.			

back to List of values

PV 14 Actual Q

Value group	PV	**Related FW**	2.2.0
Units	kVAr		
Comm object	19799	**Related applications**	MINT, MPTM
Description			
Actual reactive power produced by PV inverter 14.			

back to List of values

PV 14 Actual S

Value group	PV	**Related FW**	2.2.0
Units	kVA		
Comm object	19798	**Related applications**	MINT, MPTM
Description			
Actual apparent power produced by PV inverter 14.			

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PV 14 Actual Power Factor

Value group	PV	**Related FW**	2.2.0
Units	[-]		
Comm object	19797	**Related applications**	MINT, MPTM
Description			
This value represents the actual power factor of PV inverter 14.			

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PV 14 Actual Load Character

Value group	PV	**Related FW**	2.2.0
Units	[-]		
Comm object	19796	**Related applications**	MINT, MPTM
Description			
This value represents actual load character of the PV inverter 14.			

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Subgroup: PV 15

PV 15 Nominal P

Value group	PV	**Related FW**	2.2.0
Units	kW		
Comm object	19795	**Related applications**	MINT, MPTM
Description			
This value shows nominal power of PV inverter 15.			

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PV 15 Actual P

Value group	PV	**Related FW**	2.2.0
Units	kW		
Comm object	19794	**Related applications**	MINT, MPTM
Description			
Actual active power produced by PV inverter 15.			

back to List of values

PV 15 Actual Q

Value group	PV	**Related FW**	2.2.0
Units	kVAr		
Comm object	19793	**Related applications**	MINT, MPTM
Description			
Actual reactive power produced by PV inverter 15.			

back to List of values

PV 15 Actual S

Value group	PV	**Related FW**	2.2.0
Units	kVA		
Comm object	19792	**Related applications**	MINT, MPTM
Description			
Actual apparent power produced by PV inverter 15.			

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PV 15 Actual Power Factor

Value group	PV	**Related FW**	2.2.0
Units	[-]		
Comm object	19791	**Related applications**	MINT, MPTM
Description			
This value represents the actual power factor of PV inverter 15.			

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PV 15 Actual Load Character

Value group	PV	**Related FW**	2.2.0
Units	[-]		
Comm object	19790	**Related applications**	MINT, MPTM
Description			
This value represents actual load character of the PV inverter 15.			

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Subgroup: PV 16

PV 16 Nominal P

Value group	PV	**Related FW**	2.2.0
Units	kW		
Comm object	19789	**Related applications**	MINT, MPTM
Description			
This value shows nominal power of PV inverter 16.			

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PV 16 Actual P

Value group	PV	**Related FW**	2.2.0
Units	kW		
Comm object	19788	**Related applications**	MINT, MPTM
Description			
Actual active power produced by PV inverter 16.			

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PV 16 Actual Q

Value group	PV	**Related FW**	2.2.0
Units	kVAr		
Comm object	19787	**Related applications**	MINT, MPTM
Description			
Actual reactive power produced by PV inverter 16.			

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PV 16 Actual S

Value group	PV	**Related FW**	2.2.0
Units	kVA		
Comm object	19786	**Related applications**	MINT, MPTM
Description			
Actual apparent power produced by PV inverter 16.			

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PV 16 Actual Power Factor

Value group	PV	**Related FW**	2.2.0
Units	[-]		
Comm object	19785	**Related applications**	MINT, MPTM
Description			
This value represents the actual power factor of PV inverter 16.			

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PV 16 Actual Load Character

Value group	PV	**Related FW**	2.2.0
Units	[-]		
Comm object	19784	**Related applications**	MINT, MPTM
Description			
This value represents actual load character of the PV inverter 16.			

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Subgroup: PV 17

PV 17 Nominal P

Value group	PV	**Related FW**	2.2.0
Units	kW		
Comm object	18591	**Related applications**	MINT, MPTM
Description			
This value shows nominal power of PV inverter 17.			

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PV 17 Actual P

Value group	PV	**Related FW**	2.2.0
Units	kW		
Comm object	18596	**Related applications**	MINT, MPTM
Description			
Actual active power produced by PV inverter 17.			

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PV 17 Actual Q

Value group	PV	**Related FW**	2.2.0
Units	kVAr		
Comm object	18595	**Related applications**	MINT, MPTM
Description			
Actual reactive power produced by PV inverter 17.			

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PV 17 Actual S

Value group	PV	**Related FW**	2.2.0
Units	kVA		
Comm object	18594	**Related applications**	MINT, MPTM
Description			
Actual apparent power produced by PV inverter 17.			

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PV 17 Actual Power Factor

Value group	PV	**Related FW**	2.2.0
Units	[-]		
Comm object	18593	**Related applications**	MINT, MPTM
Description			
This value represents the actual power factor of PV inverter 17.			

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PV 17 Actual Load Character

Value group	PV	**Related FW**	2.2.0
Units	[-]		
Comm object	18592	**Related applications**	MINT, MPTM
Description			
This value represents actual load character of the PV inverter 17.			

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Subgroup: PV 18

PV 18 Nominal P

Value group	PV	**Related FW**	2.2.0
Units	kW		
Comm object	18597	**Related applications**	MINT, MPTM
Description			
This value shows nominal power of PV inverter 18.			

back to List of values

PV 18 Actual P

Value group	PV	**Related FW**	2.2.0
Units	kW		
Comm object	18602	**Related applications**	MINT, MPTM
Description			
Actual active power produced by PV inverter 18.			

back to List of values

PV 18 Actual Q

Value group	PV	**Related FW**	2.2.0
Units	kVAr		
Comm object	18601	**Related applications**	MINT, MPTM
Description			
Actual reactive power produced by PV inverter 18.			

back to List of values

PV 18 Actual S

Value group	PV	**Related FW**	2.2.0
Units	kVA		
Comm object	18600	**Related applications**	MINT, MPTM
Description			
Actual apparent power produced by PV inverter 18.			

back to List of values

PV 18 Actual Power Factor

Value group	PV	**Related FW**	2.2.0
Units	[-]		
Comm object	18599	**Related applications**	MINT, MPTM
Description			
This value represents the actual power factor of PV inverter 18.			

back to List of values

PV 18 Actual Load Character

Value group	PV	**Related FW**	2.2.0
Units	[-]		
Comm object	18598	**Related applications**	MINT, MPTM
Description			
This value represents actual load character of the PV inverter 18.			

back to List of values

Subgroup: PV 19

PV 19 Nominal P

Value group	PV	**Related FW**	2.2.0
Units	kW		
Comm object	18603	**Related applications**	MINT, MPTM
Description			
This value shows nominal power of PV inverter 19.			

back to List of values

PV 19 Actual P

Value group	PV	**Related FW**	2.2.0
Units	kW		
Comm object	18608	**Related applications**	MINT, MPTM
Description			
Actual active power produced by PV inverter 19.			

back to List of values

PV 19 Actual Q

Value group	PV	**Related FW**	2.2.0
Units	kVAr		
Comm object	18607	**Related applications**	MINT, MPTM
Description			
Actual reactive power produced by PV inverter 19.			

back to List of values

PV 19 Actual S

Value group	PV	**Related FW**	2.2.0
Units	kVA		
Comm object	18606	**Related applications**	MINT, MPTM
Description			
Actual apparent power produced by PV inverter 19.			

back to List of values

PV 19 Actual Power Factor

Value group	PV	**Related FW**	2.2.0
Units	[-]		
Comm object	18605	**Related applications**	MINT, MPTM
Description			
This value represents the actual power factor of PV inverter 19.			

back to List of values

PV 19 Actual Load Character

Value group	PV	**Related FW**	2.2.0
Units	[-]		
Comm object	18604	**Related applications**	MINT, MPTM
Description			
This value represents actual load character of the PV inverter 19.			

back to List of values

Subgroup: PV 20

PV 20 Nominal P

Value group	PV	**Related FW**	2.2.0
Units	kW		
Comm object	18609	**Related applications**	MINT, MPTM
Description			
This value shows nominal power of PV inverter 20.			

back to List of values

PV 20 Actual P

Value group	PV	**Related FW**	2.2.0
Units	kW		
Comm object	18614	**Related applications**	MINT, MPTM
Description			
Actual active power produced by PV inverter 20.			

back to List of values

PV 20 Actual Q

Value group	PV	**Related FW**	2.2.0
Units	kVAr		
Comm object	18613	**Related applications**	MINT, MPTM
Description			
Actual reactive power produced by PV inverter 20.			

back to List of values

PV 20 Actual S

Value group	PV	**Related FW**	2.2.0
Units	kVA		
Comm object	18612	**Related applications**	MINT, MPTM
Description			
Actual apparent power produced by PV inverter 20.			

back to List of values

PV 20 Actual Power Factor

Value group	PV	**Related FW**	2.2.0
Units	[-]		
Comm object	18611	**Related applications**	MINT, MPTM
Description			
This value represents the actual power factor of PV inverter 20.			

back to List of values

PV 20 Actual Load Character

Value group	PV	**Related FW**	2.2.0
Units	[-]		
Comm object	18610	**Related applications**	MINT, MPTM
Description			
This value represents actual load character of the PV inverter 20.			

back to List of values

Subgroup: PV 21

PV 21 Nominal P

Value group	PV	**Related FW**	2.2.0
Units	kW		
Comm object	18615	**Related applications**	MINT, MPTM
Description			
This value shows nominal power of PV inverter 21.			

back to List of values

PV 21 Actual P

Value group	PV	**Related FW**	2.2.0
Units	kW		
Comm object	18620	**Related applications**	MINT, MPTM
Description			
Actual active power produced by PV inverter 21.			

back to List of values

PV 21 Actual Q

Value group	PV	**Related FW**	2.2.0
Units	kVAr		
Comm object	18619	**Related applications**	MINT, MPTM
Description			
Actual reactive power produced by PV inverter 21.			

back to List of values

PV 21 Actual S

Value group	PV	**Related FW**	2.2.0
Units	kVA		
Comm object	18618	**Related applications**	MINT, MPTM
Description			
Actual apparent power produced by PV inverter 21.			

back to List of values

PV 21 Actual Power Factor

Value group	PV	**Related FW**	2.2.0
Units	[-]		
Comm object	18617	**Related applications**	MINT, MPTM
Description			
This value represents the actual power factor of PV inverter 21.			

back to List of values

PV 21 Actual Load Character

Value group	PV	**Related FW**	2.2.0
Units	[-]		
Comm object	18616	**Related applications**	MINT, MPTM
Description			
This value represents actual load character of the PV inverter 21.			

back to List of values

Subgroup: PV 22

PV 22 Nominal P

Value group	PV	**Related FW**	2.2.0
Units	kW		
Comm object	18621	**Related applications**	MINT, MPTM
Description			
This value shows nominal power of PV inverter 22.			

back to List of values

PV 22 Actual P

Value group	PV	**Related FW**	2.2.0
Units	kW		
Comm object	18626	**Related applications**	MINT, MPTM
Description			
Actual active power produced by PV inverter 22.			

back to List of values

PV 22 Actual Q

Value group	PV	**Related FW**	2.2.0
Units	kVAr		
Comm object	18625	**Related applications**	MINT, MPTM
Description			
Actual reactive power produced by PV inverter 22.			

back to List of values

PV 22 Actual S

Value group	PV	**Related FW**	2.2.0
Units	kVA		
Comm object	18624	**Related applications**	MINT, MPTM
Description			
Actual apparent power produced by PV inverter 22.			

back to List of values

PV 22 Actual Power Factor

Value group	PV	**Related FW**	2.2.0
Units	[-]		
Comm object	18623	**Related applications**	MINT, MPTM
Description			
This value represents the actual power factor of PV inverter 22.			

back to List of values

PV 22 Actual Load Character

Value group	PV	**Related FW**	2.2.0
Units	[-]		
Comm object	18622	**Related applications**	MINT, MPTM
Description			
This value represents actual load character of the PV inverter 22.			

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Subgroup: PV 23

PV 23 Nominal P

Value group	PV	**Related FW**	2.2.0
Units	kW		
Comm object	18627	**Related applications**	MINT, MPTM
Description			
This value shows nominal power of PV inverter 23.			

back to List of values

PV 23 Actual P

Value group	PV	**Related FW**	2.2.0
Units	kW		
Comm object	18632	**Related applications**	MINT, MPTM
Description			
Actual active power produced by PV inverter 23.			

back to List of values

PV 23 Actual Q

Value group	PV	**Related FW**	2.2.0
Units	kVAr		
Comm object	18631	**Related applications**	MINT, MPTM
Description			
Actual reactive power produced by PV inverter 23.			

back to List of values

PV 23 Actual S

Value group	PV	**Related FW**	2.2.0
Units	kVA		
Comm object	18630	**Related applications**	MINT, MPTM
Description			
Actual apparent power produced by PV inverter 23.			

back to List of values

PV 23 Actual Power Factor

Value group	PV	**Related FW**	2.2.0
Units	[-]		
Comm object	18629	**Related applications**	MINT, MPTM
Description			
This value represents the actual power factor of PV inverter 23.			

back to List of values

PV 23 Actual Load Character

Value group	PV	**Related FW**	2.2.0
Units	[-]		
Comm object	18628	**Related applications**	MINT, MPTM
Description			
This value represents actual load character of the PV inverter 23.			

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Subgroup: PV 24

PV 24 Nominal P

Value group	PV	**Related FW**	2.2.0
Units	kW		
Comm object	18633	**Related applications**	MINT, MPTM
Description			
This value shows nominal power of PV inverter 24.			

back to List of values

PV 24 Actual P

Value group	PV	**Related FW**	2.2.0
Units	kW		
Comm object	18638	**Related applications**	MINT, MPTM
Description			
Actual active power produced by PV inverter 24.			

back to List of values

PV 24 Actual Q

Value group	PV	**Related FW**	2.2.0
Units	kVAr		
Comm object	18637	**Related applications**	MINT, MPTM
Description			
Actual reactive power produced by PV inverter 24.			

back to List of values

PV 24 Actual S

Value group	PV	**Related FW**	2.2.0
Units	kVA		
Comm object	18636	**Related applications**	MINT, MPTM
Description			
Actual apparent power produced by PV inverter 24.			

back to List of values

PV 24 Actual Power Factor

Value group	PV	**Related FW**	2.2.0
Units	[-]		
Comm object	18635	**Related applications**	MINT, MPTM
Description			
This value represents the actual power factor of PV inverter 24.			

back to List of values

PV 24 Actual Load Character

Value group	PV	**Related FW**	2.2.0
Units	[-]		
Comm object	18634	**Related applications**	MINT, MPTM
Description			
This value represents actual load character of the PV inverter 24.			

back to List of values

Subgroup: PV 25

PV 25 Nominal P

Value group	PV	**Related FW**	2.2.0
Units	kW		
Comm object	18639	**Related applications**	MINT, MPTM
Description			
This value shows nominal power of PV inverter 25.			

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PV 25 Actual P

Value group	PV	**Related FW**	2.2.0
Units	kW		
Comm object	18644	**Related applications**	MINT, MPTM
Description			
Actual active power produced by PV inverter 25.			

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PV 25 Actual Q

Value group	PV	**Related FW**	2.2.0
Units	kVAr		
Comm object	18643	**Related applications**	MINT, MPTM
Description			
Actual reactive power produced by PV inverter 25.			

back to List of values

PV 25 Actual S

Value group	PV	**Related FW**	2.2.0
Units	kVA		
Comm object	18642	**Related applications**	MINT, MPTM
Description			
Actual apparent power produced by PV inverter 25.			

back to List of values

PV 25 Actual Power Factor

Value group	PV	**Related FW**	2.2.0
Units	[-]		
Comm object	18641	**Related applications**	MINT, MPTM
Description			
This value represents the actual power factor of PV inverter 25.			

back to List of values

PV 25 Actual Load Character

Value group	PV	**Related FW**	2.2.0
Units	[-]		
Comm object	18640	**Related applications**	MINT, MPTM
Description			
This value represents actual load character of the PV inverter 25.			

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Subgroup: PV 26

PV 26 Nominal P

Value group	PV	**Related FW**	2.2.0
Units	kW		
Comm object	18645	**Related applications**	MINT, MPTM
Description			
This value shows nominal power of PV inverter 26.			

back to List of values

PV 26 Actual P

Value group	PV	**Related FW**	2.2.0
Units	kW		
Comm object	18650	**Related applications**	MINT, MPTM
Description			
Actual active power produced by PV inverter 26.			

back to List of values

PV 26 Actual Q

Value group	PV	**Related FW**	2.2.0
Units	kVAr		
Comm object	18649	**Related applications**	MINT, MPTM
Description			
Actual reactive power produced by PV inverter 26.			

back to List of values

PV 26 Actual S

Value group	PV	**Related FW**	2.2.0
Units	kVA		
Comm object	18648	**Related applications**	MINT, MPTM
Description			
Actual apparent power produced by PV inverter 26.			

back to List of values

PV 26 Actual Power Factor

Value group	PV	**Related FW**	2.2.0
Units	[-]		
Comm object	18647	**Related applications**	MINT, MPTM
Description			
This value represents the actual power factor of PV inverter 26.			

back to List of values

PV 26 Actual Load Character

Value group	PV	**Related FW**	2.2.0
Units	[-]		
Comm object	18646	**Related applications**	MINT, MPTM
Description			
This value represents actual load character of the PV inverter 26.			

back to List of values

Subgroup: PV 27

PV 27 Nominal P

Value group	PV	**Related FW**	2.2.0
Units	kW		
Comm object	18651	**Related applications**	MINT, MPTM
Description			
This value shows nominal power of PV inverter 27.			

back to List of values

PV 27 Actual P

Value group	PV	**Related FW**	2.2.0
Units	kW		
Comm object	18656	**Related applications**	MINT, MPTM
Description			
Actual active power produced by PV inverter 27.			

back to List of values

PV 27 Actual Q

Value group	PV	**Related FW**	2.2.0
Units	kVAr		
Comm object	18655	**Related applications**	MINT, MPTM
Description			
Actual reactive power produced by PV inverter 27.			

back to List of values

PV 27 Actual S

Value group	PV	**Related FW**	2.2.0
Units	kVA		
Comm object	18654	**Related applications**	MINT, MPTM
Description			
Actual apparent power produced by PV inverter 27.			

back to List of values

PV 27 Actual Power Factor

Value group	PV	**Related FW**	2.2.0
Units	[-]		
Comm object	18653	**Related applications**	MINT, MPTM
Description			
This value represents the actual power factor of PV inverter 27.			

back to List of values

PV 27 Actual Load Character

Value group	PV	**Related FW**	2.2.0
Units	[-]		
Comm object	18652	**Related applications**	MINT, MPTM
Description			
This value represents actual load character of the PV inverter 27.			

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Subgroup: PV 28

PV 28 Nominal P

Value group	PV	**Related FW**	2.2.0
Units	kW		
Comm object	18657	**Related applications**	MINT, MPTM
Description			
This value shows nominal power of PV inverter 28.			

back to List of values

PV 28 Actual P

Value group	PV	**Related FW**	2.2.0
Units	kW		
Comm object	18662	**Related applications**	MINT, MPTM
Description			
Actual active power produced by PV inverter 28.			

back to List of values

PV 28 Actual Q

Value group	PV	**Related FW**	2.2.0
Units	kVAr		
Comm object	18661	**Related applications**	MINT, MPTM
Description			
Actual reactive power produced by PV inverter 28.			

back to List of values

PV 28 Actual S

Value group	PV	**Related FW**	2.2.0
Units	kVA		
Comm object	18660	**Related applications**	MINT, MPTM
Description			
Actual apparent power produced by PV inverter 28.			

back to List of values

PV 28 Actual Power Factor

Value group	PV	**Related FW**	2.2.0
Units	[-]		
Comm object	18659	**Related applications**	MINT, MPTM
Description			
This value represents the actual power factor of PV inverter 28.			

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PV 28 Actual Load Character

Value group	PV	**Related FW**	2.2.0
Units	[-]		
Comm object	18658	**Related applications**	MINT, MPTM
Description			
This value represents actual load character of the PV inverter 28.			

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Subgroup: PV 29

PV 29 Nominal P

Value group	PV	**Related FW**	2.2.0
Units	kW		
Comm object	18663	**Related applications**	MINT, MPTM
Description			
This value shows nominal power of PV inverter 29.			

back to List of values

PV 29 Actual P

Value group	PV	**Related FW**	2.2.0
Units	kW		
Comm object	18668	**Related applications**	MINT, MPTM
Description			
Actual active power produced by PV inverter 29.			

back to List of values

PV 29 Actual Q

Value group	PV	**Related FW**	2.2.0
Units	kVAr		
Comm object	18667	**Related applications**	MINT, MPTM
Description			
Actual reactive power produced by PV inverter 29.			

back to List of values

PV 29 Actual S

Value group	PV	**Related FW**	2.2.0
Units	kVA		
Comm object	18666	**Related applications**	MINT, MPTM
Description			
Actual apparent power produced by PV inverter 29.			

back to List of values

PV 29 Actual Power Factor

Value group	PV	**Related FW**	2.2.0
Units	[-]		
Comm object	18665	**Related applications**	MINT, MPTM
Description			
This value represents the actual power factor of PV inverter 29.			

back to List of values

PV 29 Actual Load Character

Value group	PV	**Related FW**	2.2.0
Units	[-]		
Comm object	18664	**Related applications**	MINT, MPTM
Description			
This value represents actual load character of the PV inverter 29.			

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Subgroup: PV 30

PV 30 Nominal P

Value group	PV	**Related FW**	2.2.0
Units	kW		
Comm object	18669	**Related applications**	MINT, MPTM
Description			
This value shows nominal power of PV inverter 30.			

back to List of values

PV 30 Actual P

Value group	PV	**Related FW**	2.2.0
Units	kW		
Comm object	18674	**Related applications**	MINT, MPTM
Description			
Actual active power produced by PV inverter 30.			

back to List of values

PV 30 Actual Q

Value group	PV	**Related FW**	2.2.0
Units	kVAr		
Comm object	18673	**Related applications**	MINT, MPTM
Description			
Actual reactive power produced by PV inverter 30.			

back to List of values

PV 30 Actual S

Value group	PV	**Related FW**	2.2.0
Units	kVA		
Comm object	18672	**Related applications**	MINT, MPTM
Description			
Actual apparent power produced by PV inverter 30.			

back to List of values

PV 30 Actual Power Factor

Value group	PV	**Related FW**	2.2.0
Units	[-]		
Comm object	18671	**Related applications**	MINT, MPTM
Description			
This value represents the actual power factor of PV inverter 30.			

back to List of values

PV 30 Actual Load Character

Value group	PV	**Related FW**	2.2.0
Units	[-]		
Comm object	18670	**Related applications**	MINT, MPTM
Description			
This value represents actual load character of the PV inverter 30.			

back to List of values

Subgroup: PV 31

PV 31 Nominal P

Value group	PV	**Related FW**	2.2.0
Units	kW		
Comm object	18675	**Related applications**	MINT, MPTM
Description			
This value shows nominal power of PV inverter 31.			

back to List of values

PV 31 Actual P

Value group	PV	**Related FW**	2.2.0
Units	kW		
Comm object	18680	**Related applications**	MINT, MPTM
Description			
Actual active power produced by PV inverter 31.			

back to List of values

PV 31 Actual Q

Value group	PV	**Related FW**	2.2.0
Units	kVAr		
Comm object	18679	**Related applications**	MINT, MPTM
Description			
Actual reactive power produced by PV inverter 31.			

back to List of values

PV 31 Actual S

Value group	PV	**Related FW**	2.2.0
Units	kVA		
Comm object	18678	**Related applications**	MINT, MPTM
Description			
Actual apparent power produced by PV inverter 31.			

back to List of values

PV 31 Actual Power Factor

Value group	PV	**Related FW**	2.2.0
Units	[-]		
Comm object	18677	**Related applications**	MINT, MPTM
Description			
This value represents the actual power factor of PV inverter 31.			

back to List of values

PV 31 Actual Load Character

Value group	PV	**Related FW**	2.2.0
Units	[-]		
Comm object	18676	**Related applications**	MINT, MPTM
Description			
This value represents actual load character of the PV inverter 31.			

back to List of values

Subgroup: PV 32

PV 32 Nominal P

Value group	PV	**Related FW**	2.2.0
Units	kW		
Comm object	18681	**Related applications**	MINT, MPTM
Description			
This value shows nominal power of PV inverter 32.			

back to List of values

PV 32 Actual P

Value group	PV	**Related FW**	2.2.0
Units	kW		
Comm object	18686	**Related applications**	MINT, MPTM
Description			
Actual active power produced by PV inverter 32.			

back to List of values

PV 32 Actual Q

Value group	PV	**Related FW**	2.2.0
Units	kVAr		
Comm object	18685	**Related applications**	MINT, MPTM
Description			
Actual reactive power produced by PV inverter 32.			

back to List of values

PV 32 Actual S

Value group	PV	**Related FW**	2.2.0
Units	kVA		
Comm object	18684	**Related applications**	MINT, MPTM
Description			
Actual apparent power produced by PV inverter 32.			

back to List of values

PV 32 Actual Power Factor

Value group	PV	**Related FW**	2.2.0
Units	[-]		
Comm object	18683	**Related applications**	MINT, MPTM
Description			
This value represents the actual power factor of PV inverter 32.			

back to List of values

PV 32 Actual Load Character

Value group	PV	**Related FW**	2.2.0
Units	[-]		
Comm object	18682	**Related applications**	MINT, MPTM
Description			
This value represents actual load character of the PV inverter 32.			

back to List of values

Group: WT

Subgroup: WT Aggregated

WT Nominal P

Value group	WT	**Related FW**	2.2.0
Units	kW		
Comm object	19735	**Related applications**	MINT, MPTM
Description			
This value shows nominal power of Wind Turbines.			

back to List of values

WT Actual P

Value group	WT	**Related FW**	2.2.0
Units	kW		
Comm object	19734	**Related applications**	MINT, MPTM
Description			
Actual active power produced by Wind Turbines.			

back to List of values

WT Actual Q

Value group	WT	**Related FW**	2.2.0
Units	kVAr		
Comm object	19733	**Related applications**	MINT, MPTM
Description			
Actual reactive power produced by Wind Turbines.			

back to List of values

WT Actual S

Value group	WT	**Related FW**	2.2.0
Units	[-]		
Comm object	19732	**Related applications**	MINT, MPTM
Description			
Actual apparent power produced by Wind Turbines.			

back to List of values

WT Actual Power Factor

Value group	WT	**Related FW**	2.2.0
Units	[-]		
Comm object	19731	**Related applications**	MINT, MPTM
Description			
This value represents the actual power factor of the Wind Turbines.			

back to List of values

WT Actual Load Character

Value group	WT	**Related FW**	2.2.0
Units	[-]		
Comm object	19730	**Related applications**	MINT, MPTM
Description			
This value represents actual load character of the Wind Turbines.			

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Curtailment Output

Value group	PV	**Related FW**	2.2.0
Units	% of **PV Nominal P**		
Comm object	14364	**Related applications**	MINT, MPTM
Description			
This value shows maximal percentage power which can be provided by the output of the PV inverter in case the **PV Output control** function is used.			

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Subgroup: WT 1

WT 1 Nominal P

Value group	WT	**Related FW**	2.2.0
Units	kW		
Comm object	19783	**Related applications**	MINT, MPTM
Description			
This value shows nominal power of WT 1.			

back to List of values

WT 1 Actual P

Value group	WT	**Related FW**	2.2.0
Units	kW		
Comm object	19782	**Related applications**	MINT, MPTM
Description			
Actual active power produced by WT 1.			

back to List of values

WT 1 Actual Q

Value group	WT	**Related FW**	2.2.0
Units	kVAr		
Comm object	19781	**Related applications**	MINT, MPTM
Description			
Actual reactive power produced by WT 1.			

back to List of values

WT 1 Actual S

Value group	WT	**Related FW**	2.2.0
Units	kVA		
Comm object	19780	**Related applications**	MINT, MPTM
Description			
Actual apparent power produced by WT 1.			

back to List of values

WT 1 Actual Power Factor

Value group	WT	**Related FW**	2.2.0
Units	[-]		
Comm object	19779	**Related applications**	MINT, MPTM
Description			
This value represents the actual power factor of the WT 1.			

back to List of values

WT 1 Actual Load Character

Value group	WT	**Related FW**	2.2.0
Units	[-]		
Comm object	19778	**Related applications**	MINT, MPTM
Description			
This value represents actual load character of the WT 1.			

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Subgroup: WT 2

WT 2 Nominal P

Value group	WT	**Related FW**	2.2.0
Units	kW		
Comm object	19777	**Related applications**	MINT, MPTM
Description			
This value shows nominal power of WT 2.			

back to List of values

WT 2 Actual P

Value group	WT	**Related FW**	2.2.0
Units	kW		
Comm object	19776	**Related applications**	MINT, MPTM
Description			
Actual active power produced by WT 2.			

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WT 2 Actual Q

Value group	WT	**Related FW**	2.2.0
Units	kVAr		
Comm object	19775	**Related applications**	MINT, MPTM
Description			
Actual reactive power produced by WT 2.			

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WT 2 Actual S

Value group	WT	**Related FW**	2.2.0
Units	kVA		
Comm object	19774	**Related applications**	MINT, MPTM
Description			
Actual apparent power produced by WT 2.			

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WT 2 Actual Power Factor

Value group	WT	**Related FW**	2.2.0
Units	[-]		
Comm object	19773	**Related applications**	MINT, MPTM
Description			
This value represents the actual power factor of the WT 2.			

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WT 2 Actual Load Character

Value group	WT	**Related FW**	2.2.0
Units	[-]		
Comm object	19772	**Related applications**	MINT, MPTM
Description			
This value represents actual load character of the WT 2.			

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Subgroup: WT 3

WT 3 Nominal P

Value group	WT	**Related FW**	2.2.0
Units	kW		
Comm object	19771	**Related applications**	MINT, MPTM
Description			
This value shows nominal power of WT 3.			

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WT 3 Actual P

Value group	WT	**Related FW**	2.2.0
Units	kW		
Comm object	19770	**Related applications**	MINT, MPTM
Description			
Actual active power produced by WT 3.			

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WT 3 Actual Q

Value group	WT	**Related FW**	2.2.0
Units	kVAr		
Comm object	19769	**Related applications**	MINT, MPTM
Description			
Actual reactive power produced by WT 3.			

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WT 3 Actual S

Value group	WT	**Related FW**	2.2.0
Units	kVA		
Comm object	19768	**Related applications**	MINT, MPTM
Description			
Actual apparent power produced by WT 3.			

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WT 3 Actual Power Factor

Value group	WT	**Related FW**	2.2.0
Units	[-]		
Comm object	19767	**Related applications**	MINT, MPTM
Description			
This value represents the actual power factor of the WT 3.			

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WT 3 Actual Load Character

Value group	WT	**Related FW**	2.2.0
Units	[-]		
Comm object	19766	**Related applications**	MINT, MPTM
Description			
This value represents actual load character of the WT 3.			

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Subgroup: WT 4

WT 4 Nominal P

Value group	WT	**Related FW**	2.2.0
Units	kW		
Comm object	19765	**Related applications**	MINT, MPTM
Description			
This value shows nominal power of WT 4.			

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WT 4 Actual P

Value group	WT	**Related FW**	2.2.0
Units	kW		
Comm object	19764	**Related applications**	MINT, MPTM
Description			
Actual active power produced by WT 4.			

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WT 4 Actual Q

Value group	WT	**Related FW**	2.2.0
Units	kVAr		
Comm object	19763	**Related applications**	MINT, MPTM
Description			
Actual reactive power produced by WT 4.			

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WT 4 Actual S

Value group	WT	**Related FW**	2.2.0
Units	kVA		
Comm object	19762	**Related applications**	MINT, MPTM
Description			
Actual apparent power produced by WT 4.			

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WT 4 Actual Power Factor

Value group	WT	**Related FW**	2.2.0
Units	[-]		
Comm object	19761	**Related applications**	MINT, MPTM
Description			
This value represents the actual power factor of the WT 4.			

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WT 4 Actual Load Character

Value group	WT	**Related FW**	2.2.0
Units	[-]		
Comm object	19760	**Related applications**	MINT, MPTM
Description			
This value represents actual load character of the WT 4.			

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Subgroup: WT 5

WT 5 Nominal P

Value group	WT	**Related FW**	2.2.0
Units	kW		
Comm object	19759	**Related applications**	MINT, MPTM
Description			
This value shows nominal power of WT 5.			

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WT 5 Actual P

Value group	WT	**Related FW**	2.2.0
Units	kW		
Comm object	19758	**Related applications**	MINT, MPTM
Description			
Actual active power produced by WT 5.			

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WT 5 Actual Q

Value group	WT	**Related FW**	2.2.0
Units	kVAr		
Comm object	19757	**Related applications**	MINT, MPTM
Description			
Actual reactive power produced by WT 5.			

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WT 5 Actual S

Value group	WT	**Related FW**	2.2.0
Units	kVA		
Comm object	19756	**Related applications**	MINT, MPTM
Description			
Actual apparent power produced by WT 5.			

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WT 5 Actual Power Factor

Value group	WT	**Related FW**	2.2.0
Units	[-]		
Comm object	19755	**Related applications**	MINT, MPTM
Description			
This value represents the actual power factor of the WT 5.			

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WT 5 Actual Load Character

Value group	WT	**Related FW**	2.2.0
Units	[-]		
Comm object	19754	**Related applications**	MINT, MPTM
Description			
This value represents actual load character of the WT 5.			

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Subgroup: WT 6

WT 6 Nominal P

Value group	WT	**Related FW**	2.2.0
Units	kW		
Comm object	19753	**Related applications**	MINT, MPTM
Description			
This value shows nominal power of WT 6.			

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WT 6 Actual P

Value group	WT	**Related FW**	2.2.0
Units	kW		
Comm object	19752	**Related applications**	MINT, MPTM
Description			
Actual active power produced by WT 6.			

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WT 6 Actual Q

Value group	WT	**Related FW**	2.2.0
Units	kVAr		
Comm object	19751	**Related applications**	MINT, MPTM
Description			
Actual reactive power produced by WT 6.			

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WT 6 Actual S

Value group	WT	**Related FW**	2.2.0
Units	kVA		
Comm object	19750	**Related applications**	MINT, MPTM
Description			
Actual apparent power produced by WT 6.			

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WT 6 Actual Power Factor

Value group	WT	**Related FW**	2.2.0
Units	[-]		
Comm object	19749	**Related applications**	MINT, MPTM
Description			
This value represents the actual power factor of the WT 6.			

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WT 6 Actual Load Character

Value group	WT	**Related FW**	2.2.0
Units	[-]		
Comm object	19748	**Related applications**	MINT, MPTM
Description			
This value represents actual load character of the WT 6.			

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Subgroup: WT 7

WT 7 Nominal P

Value group	WT	**Related FW**	2.2.0
Units	kW		
Comm object	19747	**Related applications**	MINT, MPTM
Description			
This value shows nominal power of WT 7.			

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WT 7 Actual P

Value group	WT	**Related FW**	2.2.0
Units	kW		
Comm object	19746	**Related applications**	MINT, MPTM
Description			
Actual active power produced by WT 7.			

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WT 7 Actual Q

Value group	WT	**Related FW**	2.2.0
Units	kVAr		
Comm object	19745	**Related applications**	MINT, MPTM
Description			
Actual reactive power produced by WT 7.			

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WT 7 Actual S

Value group	WT	**Related FW**	2.2.0
Units	kVA		
Comm object	19744	**Related applications**	MINT, MPTM
Description			
Actual apparent power produced by WT 7.			

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WT 7 Actual Power Factor

Value group	WT	**Related FW**	2.2.0
Units	[-]		
Comm object	19743	**Related applications**	MINT, MPTM
Description			
This value represents the actual power factor of the WT 7.			

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WT 7 Actual Load Character

Value group	WT	**Related FW**	2.2.0
Units	[-]		
Comm object	19742	**Related applications**	MINT, MPTM
Description			
This value represents actual load character of the WT 7.			

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Subgroup: WT 8

WT 8 Nominal P

Value group	WT	**Related FW**	2.2.0
Units	kW		
Comm object	19741	**Related applications**	MINT, MPTM
Description			
This value shows nominal power of WT 8.			

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WT 8 Actual P

Value group	WT	**Related FW**	2.2.0
Units	kW		
Comm object	19740	**Related applications**	MINT, MPTM
Description			
Actual active power produced by WT 8.			

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WT 8 Actual Q

Value group	WT	**Related FW**	2.2.0
Units	kVAr		
Comm object	19739	**Related applications**	MINT, MPTM
Description			
Actual reactive power produced by WT 8.			

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WT 8 Actual S

Value group	WT	**Related FW**	2.2.0
Units	kVA		
Comm object	19738	**Related applications**	MINT, MPTM
Description			
Actual apparent power produced by WT 8.			

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WT 8 Actual Power Factor

Value group	WT	**Related FW**	2.2.0
Units	[-]		
Comm object	19737	**Related applications**	MINT, MPTM
Description			
This value represents the actual power factor of the WT 8.			

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WT 8 Actual Load Character

Value group	WT	**Related FW**	2.2.0
Units	[-]		
Comm object	19736	**Related applications**	MINT, MPTM
Description			
This value represents actual load character of the WT 8.			

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Group: Universal Gensets

Subgroup: Universal Genset Aggregated

Uni Gen Nominal P

Value group	Universal Gensets	**Related FW**	2.2.0
Units	[-]		
Comm object	18919	**Related applications**	MINT, MPTM
Description			
This Value is aggregated as sum of Nominal Power values of all Uni Gens connected to the bus (with GCB closed).			

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Uni Gen Actual P

Value group	Universal Gensets	**Related FW**	2.2.0
Units	[-]		
Comm object	18918	**Related applications**	MINT, MPTM
Description			
This Value is aggregated as sum of Actual Active Power values of all Uni Gens.			

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Uni Gen Actual Q

Value group	Universal Gensets	**Related FW**	2.2.0
Units	[-]		
Comm object	18917	**Related applications**	MINT, MPTM
Description			
This Value is aggregated as sum of Actual Reactive Power values of all Uni Gens.			

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Uni Gen Actual S

Value group	Universal Gensets	**Related FW**	2.2.0
Units	[-]		
Comm object	18916	**Related applications**	MINT, MPTM
Description			
This Value is aggregated Actual Apparent Power values of all Uni Gens.			

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Uni Gen Actual Power Factor

Value group	Universal Gensets	**Related FW**	2.2.0
Units	[-]		
Comm object	18915	**Related applications**	MINT, MPTM
Description			
This Value specify the actual Power Factor of the group of all UGs and is calculated as Uni Gen Actual P/ Uni Gen Actual S.			

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Uni Gen Actual Load Character

Value group	Universal Gensets	**Related FW**	2.2.0
Units	[-]		
Comm object	18914	**Related applications**	MINT, MPTM
Description			
This Value specify the character of the load from perspective of the group of Uni Gens.			

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Uni Gen Requested P

Value group	Universal Gensets	**Related FW**	2.2.0
Units	[-]		
Comm object	18865	**Related applications**	MINT, MPTM
Description			
This Value is intended for direct Active Power control of the group of Uni Gens in on-grid application (Mains parallel operation). Uni Gens should be able to accept this value as a Baseload for the whole group and distribute the power request among all the units in the system equally.			

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Uni Gen Requested Q

Value group	Universal Gensets	**Related FW**	2.2.0
Units	[-]		
Comm object	18954	**Related applications**	MINT, MPTM
Description			
This Value is intended for direct Reactive Power control of the group of Uni Gens in on-grid application (Mains parallel operation). Uni Gens should be able to accept this value as a Base Q for the whole group and distribute the power request among all the units in the system equally.			

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Uni Gen Relative Requested P

Value group	Universal Gensets	**Related FW**	2.2.0
Units	[-]		
Comm object	18953	**Related applications**	MINT, MPTM
Description			
This Value is intended for direct Active Power control of the group of Uni Gens in on-grid application (Mains parallel operation) and it is calculated accordingly to the Uni Gen Nominal P an Uni Gen Requested P. Uni Gens should be able to accept the relative request for the active power and this value can be sent directly to each particular Uni Gen.			

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Uni Gen Relative Requested Q

Value group	Universal Gensets	**Related FW**	2.2.0
Units	[-]		
Comm object	18952	**Related applications**	MINT, MPTM
Description			
This Value is intended for direct Reactive Power control of the group of Uni Gens in on-grid application (Mains parallel operation) and it is calculated accordingly to the Uni Gen Nominal P (Nominal P is taken in account instead of Nominal S) an Uni Gen Requested Q. Uni Gens should be able to accept the relative request for the reactive power and this value can be sent directly to each particular Uni Gen.			

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Subgroup: Uni Gen 1

Uni Gen 1 Nominal P

Value group	Universal Gensets	**Related FW**	2.2.0
Units	[-]		
Comm object	18955	**Related applications**	MINT, MPTM
Description			
This Value is a product of reading via LAI Uni **Uni Gen 01 Nominal P**.			

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Uni Gen 1 Actual P

Value group	Universal Gensets	**Related FW**	2.2.0
Units	[-]		
Comm object	18849	**Related applications**	MINT, MPTM
Description			
This Value is a product of reading via LAI **Uni Gen 01 Actual P**.			

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Uni Gen 1 Actual Q

Value group	Universal Gensets	**Related FW**	2.2.0
Units	[-]		
Comm object	18833	**Related applications**	MINT, MPTM
Description			
This Value is a product of reading via LAI **Uni Gen 01 Actual Q**.			

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Uni Gen 1 Actual S

Value group	Universal Gensets	**Related FW**	2.2.0
Units	[-]		
Comm object	18817	**Related applications**	MINT, MPTM
Description			
This Value is calculated internally from **Uni Gen 1 Actual P** and **Uni Gen 1 Actual Q**.			

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Uni Gen 1 Actual Power Factor

Value group	Universal Gensets	**Related FW**	2.2.0
Units	[-]		
Comm object	18936	**Related applications**	MINT, MPTM
Description			
This Value is calculated internally from **Uni Gen 1 Actual P** and **Uni Gen 1 Actual S**.			

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Uni Gen 1 Actual Load Character

Value group	Universal Gensets	**Related FW**	2.2.0
Units	[-]		
Comm object	18920	**Related applications**	MINT, MPTM
Description			
This Value is calculated internally from **Uni Gen 1 Actual P** and **Uni Gen 1 Actual Q**.			

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Uni Gen 1 Requested P

Value group	Universal Gensets	**Related FW**	2.2.0
Units	[-]		
Comm object	18882	**Related applications**	MINT, MPTM
Description			
This Value is intended for direct Active Power control of the one specific Uni Gen in on-grid application (Mains parallel operation).			

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Uni Gen 1 Requested Q

Value group	Universal Gensets	**Related FW**	2.2.0
Units	[-]		
Comm object	18866	**Related applications**	MINT, MPTM
Description			
This Value is intended for direct Reactive Power control of the one specific UG in on-grid application (Mains parallel operation).			

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Uni Gen 1 Binary Outputs

Value group	Universal Gensets	**Related FW**	2.2.0
Units	[-]		
Comm object	18898	**Related applications**	MINT, MPTM
Description			
This is the binary value included two specific binary outputs. **Uni Gen 1 Run Request** and **Uni Gen 1 Stop GCB Closing**. **Uni Gen 1 Run Request**: This signal is associated with the LBI UNIVERSAL GENSET START/STOP. This LBI is used to put the Uni Gens in operation. It is accepted in MAN and in AUT mode. The Uni Gen Run Request is influence by Power Management (Load demand Start/Stop) in AUT mode and is issued only if the system needs to start Uni Gens to cover the requested load reserve. In the Uni Gen it should be connected to the Genset Run Request signal. **Uni Gen 1 Stop GCB Closing**: This signal is crucial for safe operation in case that Uni Gen is enabled to closed it's GCB to the dead bus and make it energized. The InteliNeo generates 200 ms long pulse anytime when any controller in the system is about to close the CB to the dead bus. This information has to be used in Uni Gen to prevent the closing the GCB to the dead bus. It is strongly recommended to use the hard wiring of this signal between InteliNeo and Uni Gen. In the Uni Gen it should be connected to input GCB closing Block.			

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Subgroup: Uni Gen 2

Uni Gen 2 Nominal P

Value group	Universal Gensets	**Related FW**	2.2.0
Units	[-]		
Comm object	18956	**Related applications**	MINT, MPTM
Description			
This Value is a product of reading via LAI **UNI GEN 02 NOM P**.			

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Uni Gen 2 Actual P

Value group	Universal Gensets	**Related FW**	2.2.0
Units	[-]		
Comm object	18850	**Related applications**	MINT, MPTM
Description			
This Value is a product of reading via LAI **Uni Gen 02 Actual P**.			

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Uni Gen 2 Actual Q

Value group	Universal Gensets	**Related FW**	2.2.0
Units	[-]		
Comm object	18834	**Related applications**	MINT, MPTM
Description			
This Value is a product of reading via LAI **Uni Gen 02 Actual Q**.			

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Uni Gen 2 Actual S

Value group	Universal Gensets	**Related FW**	2.2.0
Units	[-]		
Comm object	18818	**Related applications**	MINT, MPTM
Description			
This Value is calculated internally from **Uni Gen 2 Actual P** and **Uni Gen 2 Actual Q**.			

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Uni Gen 2 Actual Power Factor

Value group	Universal Gensets	**Related FW**	2.2.0
Units	[-]		
Comm object	18937	**Related applications**	MINT, MPTM
Description			
This Value is calculated internally from **Uni Gen 2 Actual P** and **Uni Gen 2 Actual S**.			

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Uni Gen 2 Actual Load Character

Value group	Universal Gensets	**Related FW**	2.2.0
Units	[-]		
Comm object	18921	**Related applications**	MINT, MPTM
Description			
This Value is calculated internally from **Uni Gen 2 Actual P** and **Uni Gen 2 Actual Q**.			

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Uni Gen 2 Requested P

Value group	Universal Gensets	**Related FW**	2.2.0
Units	[-]		
Comm object	18883	**Related applications**	MINT, MPTM
Description			
This Value is intended for direct Active Power control of the one specific Uni Gen in on-grid application (Mains parallel operation).			

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Uni Gen 2 Requested Q

Value group	Universal Gensets	**Related FW**	2.2.0
Units	[-]		
Comm object	18867	**Related applications**	MINT, MPTM
Description			
This Value is intended for direct Reactive Power control of the one specific UG in on-grid application (Mains parallel operation).			

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Uni Gen 2 Binary Outputs

Value group	Universal Gensets	Related FW	2.2.0
Units	[-]		
Comm object	18899	Related applications	MINT, MPTM
Description			
This is the binary value included two specific binary outputs. **Uni Gen 2 Run Request** and **Uni Gen 2 Stop GCB Closing**. **Uni Gen 2 Run Request**: This signal is associated with the LBI UNIVERSAL GENSET START/STOP. This LBI is used to put the Uni Gens in operation. It is accepted in MAN and in AUT mode. The Uni Gen Run Request is influence by Power Management (Load demand Start/Stop) in AUT mode and is issued only if the system needs to start Uni Gens to cover the requested load reserve. In the Uni Gen it should be connected to the Genset Run Request signal. **Uni Gen 2 Stop GCB Closing**: This signal is crucial for safe operation in case that Uni Gen is enabled to closed it's GCB to the dead bus and make it energized. The InteliNeo generates 200 ms long pulse anytime when any controller in the system is about to close the CB to the dead bus. This information has to be used in Uni Gen to prevent the closing the GCB to the dead bus. It is strongly recommended to use the hard wiring of this signal between InteliNeo and Uni Gen. In the Uni Gen it should be connected to input GCB closing Block.			

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Subgroup: Uni Gen 3

Uni Gen 3 Nominal P

Value group	Universal Gensets	Related FW	2.2.0
Units	[-]		
Comm object	18957	Related applications	MINT, MPTM
Description			
This Value is a product of reading via LAI UNI GEN 03 NOM P.			

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Uni Gen 3 Actual P

Value group	Universal Gensets	Related FW	2.2.0
Units	[-]		
Comm object	18851	Related applications	MINT, MPTM
Description			
This Value is a product of reading via LAI UNI GEN 03 ACTUAL P.			

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Uni Gen 3 Actual Q

Value group	Universal Gensets	**Related FW**	2.2.0
Units	[-]		
Comm object	18835	**Related applications**	MINT, MPTM
Description			
This Value is a product of reading via LAI **Uni Gen 03 Actual Q**.			

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Uni Gen 3 Actual S

Value group	Universal Gensets	**Related FW**	2.2.0
Units	[-]		
Comm object	18819	**Related applications**	MINT, MPTM
Description			
This Value is calculated internally from **Uni Gen 3 Actual P** and **Uni Gen 3 Actual Q**.			

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Uni Gen 3 Actual Power Factor

Value group	Universal Gensets	**Related FW**	2.2.0
Units	[-]		
Comm object	18938	**Related applications**	MINT, MPTM
Description			
This Value is calculated internally from **Uni Gen 3 Actual P** and **Uni Gen 3 Actual S**.			

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Uni Gen 3 Actual Load Character

Value group	Universal Gensets	**Related FW**	2.2.0
Units	[-]		
Comm object	18922	**Related applications**	MINT, MPTM
Description			
This Value is calculated internally from **Uni Gen 3 Actual P** and **Uni Gen 3 Actual Q**.			

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Uni Gen 3 Requested Q

Value group	Universal Gensets	**Related FW**	2.2.0
Units	[-]		
Comm object	18868	**Related applications**	MINT, MPTM
Description			
This Value is intended for direct Reactive Power control of the one specific UG in on-grid application (Mains parallel operation).			

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Uni Gen 3 Requested P

Value group	Universal Gensets	**Related FW**	2.2.0
Units	[-]		
Comm object	18884	**Related applications**	MINT, MPTM
Description			
This Value is intended for direct Active Power control of the one specific Uni Gen in on-grid application (Mains parallel operation).			

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Uni Gen 3 Binary Outputs

Value group	Universal Gensets	**Related FW**	2.2.0
Units	[-]		
Comm object	18900	**Related applications**	MINT, MPTM
Description			

This is the binary value included two specific binary outputs. **Uni Gen 3 Run Request** and **Uni Gen 3 Stop GCB Closing**.

Uni Gen 3 Run Request: This signal is associated with the LBI UNIVERSAL GENSET START/STOP. This LBI is used to put the Uni Gens in operation. It is accepted in MAN and in AUT mode. The Uni Gen Run Request is influence by Power Management (Load demand Start/Stop) in AUT mode and is issued only if the system needs to start Uni Gens to cover the requested load reserve. In the Uni Gen it should be connected to the Genset Run Request signal.

Uni Gen 3 Stop GCB Closing: This signal is crucial for safe operation in case that Uni Gen is enabled to closed it's GCB to the dead bus and make it energized. The InteliNeo generates 200 ms long pulse anytime when any controller in the system is about to close the CB to the dead bus. This information has to be used in Uni Gen to prevent the closing the GCB to the dead bus. It is strongly recommended to use the hard wiring of this signal between InteliNeo and Uni Gen. In the Uni Gen it should be connected to input GCB closing Block.

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Subgroup: Uni Gen 4

Uni Gen 4 Nominal P

Value group	Universal Gensets	**Related FW**	2.2.0
Units	[-]		
Comm object	18958	**Related applications**	MINT, MPTM
Description			
This Value is a product of reading via LAI **Uni Gen 04 Nom P**.			

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Uni Gen 4 Actual P

Value group	Universal Gensets	**Related FW**	2.2.0
Units	[-]		
Comm object	18852	**Related applications**	MINT, MPTM
Description			
This Value is a product of reading via LAI **Uni Gen 04 Actual P**.			

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Uni Gen 4 Actual Q

Value group	Universal Gensets	**Related FW**	2.2.0
Units	[-]		
Comm object	18836	**Related applications**	MINT, MPTM
Description			
This Value is a product of reading via LAI **Uni Gen 04 Actual Q**.			

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Uni Gen 4 Actual S

Value group	Universal Gensets	**Related FW**	2.2.0
Units	[-]		
Comm object	18820	**Related applications**	MINT, MPTM
Description			
This Value is calculated internally from **Uni Gen 4 Actual P** and **Uni Gen 4 Actual Q**.			

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Uni Gen 4 Actual Power Factor

Value group	Universal Gensets	**Related FW**	2.2.0
Units	[-]		
Comm object	18939	**Related applications**	MINT, MPTM
Description			
This Value is calculated internally from **Uni Gen 4 Actual P** and **Uni Gen 4 Actual S**.			

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Uni Gen 4 Actual Load Character

Value group	Universal Gensets	**Related FW**	2.2.0
Units	[-]		
Comm object	18923	**Related applications**	MINT, MPTM
Description			
This Value is calculated internally from **Uni Gen 4 Actual P** and **Uni Gen 4 Actual Q**.			

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Uni Gen 4 Requested P

Value group	Universal Gensets	**Related FW**	2.2.0
Units	[-]		
Comm object	18885	**Related applications**	MINT, MPTM
Description			
This Value is intended for direct Active Power control of the one specific Uni Gen in on-grid application (Mains parallel operation).			

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Uni Gen 4 Requested Q

Value group	Universal Gensets	**Related FW**	2.2.0
Units	[-]		
Comm object	18869	**Related applications**	MINT, MPTM
Description			
This Value is intended for direct Reactive Power control of the one specific UG in on-grid application (Mains parallel operation).			

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Uni Gen 4 Binary Outputs

Value group	Universal Gensets	**Related FW**	2.2.0
Units	[-]		
Comm object	18901	**Related applications**	MINT, MPTM
Description			
This is the binary value included two specific binary outputs. **Uni Gen 4 Run Request** and **Uni Gen 4 Stop GCB Closing**. **Uni Gen 4 Run Request**: This signal is associated with the LBI **Universal Genset Start/Stop**. This LBI is used to put the Uni Gens in operation. It is accepted in MAN and in AUT mode. The Uni Gen Run Request is influence by Power Management (Load demand Start/Stop) in AUT mode and is issued only if the system needs to start Uni Gens to cover the requested load reserve. In the Uni Gen it should be connected to the Genset Run Request signal. **Uni Gen 4 Stop GCB Closing**: This signal is crucial for safe operation in case that Uni Gen is enabled to closed it's GCB to the dead bus and make it energized. The InteliNeo generates 200 ms long pulse anytime when any controller in the system is about to close the CB to the dead bus. This information has to be used in Uni Gen to prevent the closing the GCB to the dead bus. It is strongly recommended to use the hard wiring of this signal between InteliNeo and Uni Gen. In the Uni Gen it should be connected to input GCB closing Block.			

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Subgroup: Uni Gen 5

Uni Gen 5 Nominal P

Value group	Universal Gensets	**Related FW**	2.2.0
Units	[-]		
Comm object	18959	**Related applications**	MINT, MPTM
Description			
This Value is a product of reading via LAI **Uni Gen 05 Nom P**.			

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Uni Gen 5 Actual P

Value group	Universal Gensets	**Related FW**	2.2.0
Units	[-]		
Comm object	18853	**Related applications**	MINT, MPTM
Description			
This Value is a product of reading via LAI **Uni Gen 05 Actual P**.			

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Uni Gen 5 Actual Q

Value group	Universal Gensets	**Related FW**	2.2.0
Units	[-]		
Comm object	18837	**Related applications**	MINT, MPTM
Description			
This Value is a product of reading via LAI **Uni Gen 05 Actual Q**.			

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Uni Gen 5 Actual S

Value group	Universal Gensets	**Related FW**	2.2.0
Units	[-]		
Comm object	18821	**Related applications**	MINT, MPTM
Description			
This Value is calculated internally from **Uni Gen 5 Actual P** and **Uni Gen 5 Actual Q**.			

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Uni Gen 5 Actual Power Factor

Value group	Universal Gensets	**Related FW**	2.2.0
Units	[-]		
Comm object	18940	**Related applications**	MINT, MPTM
Description			
This Value is calculated internally from **Uni Gen 5 Actual P** and **Uni Gen 5 Actual S**.			

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Uni Gen 5 Actual Load Character

Value group	Universal Gensets	**Related FW**	2.2.0
Units	[-]		
Comm object	18924	**Related applications**	MINT, MPTM
Description			
This Value is calculated internally from **Uni Gen 5 Actual P** and **Uni Gen 5 Actual Q**.			

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Uni Gen 5 Requested P

Value group	Universal Gensets	**Related FW**	2.2.0
Units	[-]		
Comm object	18886	**Related applications**	MINT, MPTM
Description			
This Value is intended for direct Active Power control of the one specific Uni Gen in on-grid application (Mains parallel operation).			

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Uni Gen 5 Requested Q

Value group	Universal Gensets	**Related FW**	2.2.0
Units	[-]		
Comm object	18870	**Related applications**	MINT, MPTM
Description			
This Value is intended for direct Reactive Power control of the one specific UG in on-grid application (Mains parallel operation).			

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Uni Gen 5 Binary Outputs

Value group	Universal Gensets	**Related FW**	2.2.0
Units	[-]		
Comm object	18902	**Related applications**	MINT, MPTM
Description			

This is the binary value included two specific binary outputs. **Uni Gen 5 Run Request** and **Uni Gen 5 Stop GCB Closing**.

Uni Gen 5 Run Request: This signal is associated with the LBI UNIVERSAL GENSET START/STOP. This LBI is used to put the Uni Gens in operation. It is accepted in MAN and in AUT mode. The Uni Gen Run Request is influence by Power Management (Load demand Start/Stop) in AUT mode and is issued only if the system needs to start Uni Gens to cover the requested load reserve. In the Uni Gen it should be connected to the Genset Run Request signal.

Uni Gen 5 Stop GCB Closing: This signal is crucial for safe operation in case that Uni Gen is enabled to closed it's GCB to the dead bus and make it energized. The InteliNeo generates 200 ms long pulse anytime when any controller in the system is about to close the CB to the dead bus. This information has to be used in Uni Gen to prevent the closing the GCB to the dead bus. It is strongly recommended to use the hard wiring of this signal between InteliNeo and Uni Gen. In the Uni Gen it should be connected to input GCB closing Block.

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Subgroup: Uni Gen 6

Uni Gen 6 Nominal P

Value group	Universal Gensets	**Related FW**	2.2.0
Units	[-]		
Comm object	18960	**Related applications**	MINT, MPTM
Description			
This Value is a product of reading via LAI **Uni Gen 06 Nom P**.			

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Uni Gen 6 Actual P

Value group	Universal Gensets	**Related FW**	2.2.0
Units	[-]		
Comm object	18854	**Related applications**	MINT, MPTM
Description			
This Value is a product of reading via LAI **Uni Gen 06 Actual P**.			

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Uni Gen 6 Actual Q

Value group	Universal Gensets	**Related FW**	2.2.0
Units	[-]		
Comm object	18838	**Related applications**	MINT, MPTM
Description			
This Value is a product of reading via LAI **Uni Gen 06 Actual Q**.			

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Uni Gen 6 Actual S

Value group	Universal Gensets	**Related FW**	2.2.0
Units	[-]		
Comm object	18822	**Related applications**	MINT, MPTM
Description			
This Value is calculated internally from **Uni Gen 6 Actual P** and **Uni Gen 6 Actual Q**.			

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Uni Gen 6 Actual Power Factor

Value group	Universal Gensets	**Related FW**	2.2.0
Units	[-]		
Comm object	18941	**Related applications**	MINT, MPTM
Description			
This Value is calculated internally from **Uni Gen 6 Actual P** and **Uni Gen 6 Actual S**.			

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Uni Gen 6 Actual Load Character

Value group	Universal Gensets	**Related FW**	2.2.0
Units	[-]		
Comm object	18925	**Related applications**	MINT, MPTM
Description			
This Value is calculated internally from **Uni Gen 6 Actual P** and **Uni Gen 6 Actual Q**.			

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Uni Gen 6 Requested P

Value group	Universal Gensets	**Related FW**	2.2.0
Units	[-]		
Comm object	18887	**Related applications**	MINT, MPTM
Description			
This Value is intended for direct Active Power control of the one specific Uni Gen in on-grid application (Mains parallel operation).			

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Uni Gen 6 Requested Q

Value group	Universal Gensets	**Related FW**	2.2.0
Units	[-]		
Comm object	18871	**Related applications**	MINT, MPTM
Description			
This Value is intended for direct Reactive Power control of the one specific UG in on-grid application (Mains parallel operation).			

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Uni Gen 6 Binary Outputs

Value group	Universal Gensets	**Related FW**	2.2.0
Units	[-]		
Comm object	18903	**Related applications**	MINT, MPTM
Description			
This is the binary value included two specific binary outputs. **Uni Gen 6 Run Request** and **Uni Gen 6 Stop GCB Closing**. **Uni Gen 6 Run Request**: This signal is associated with the LBI **Universal Genset Start/Stop**. This LBI is used to put the Uni Gens in operation. It is accepted in MAN and in AUT mode. The Uni Gen Run Request is influence by Power Management (Load demand Start/Stop) in AUT mode and is issued only if the system needs to start Uni Gens to cover the requested load reserve. In the Uni Gen it should be connected to the Genset Run Request signal. **Uni Gen 6 Stop GCB Closing**: This signal is crucial for safe operation in case that Uni Gen is enabled to closed it's GCB to the dead bus and make it energized. The InteliNeo generates 200 ms long pulse anytime when any controller in the system is about to close the CB to the dead bus. This information has to be used in Uni Gen to prevent the closing the GCB to the dead bus. It is strongly recommended to use the hard wiring of this signal between InteliNeo and Uni Gen. In the Uni Gen it should be connected to input GCB closing Block.			

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Subgroup: Uni Gen 7

Uni Gen 7 Nominal P

Value group	Universal Gensets	**Related FW**	2.2.0
Units	[-]		
Comm object	18961	**Related applications**	MINT, MPTM
Description			
This Value is a product of reading via LAI **Uni Gen 07 Nom P**.			

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Uni Gen 7 Actual P

Value group	Universal Gensets	**Related FW**	2.2.0
Units	[-]		
Comm object	18855	**Related applications**	MINT, MPTM
Description			
This Value is a product of reading via LAI **Uni Gen 07 Actual P**.			

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Uni Gen 7 Actual Q

Value group	Universal Gensets	**Related FW**	2.2.0
Units	[-]		
Comm object	18839	**Related applications**	MINT, MPTM
Description			
This Value is a product of reading via LAI **Uni Gen 07 Actual Q**.			

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Uni Gen 7 Actual S

Value group	Universal Gensets	**Related FW**	2.2.0
Units	[-]		
Comm object	18823	**Related applications**	MINT, MPTM
Description			
This Value is calculated internally from **Uni Gen 7 Actual P** and **Uni Gen 7 Actual Q**.			

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Uni Gen 7 Actual Power Factor

Value group	Universal Gensets	**Related FW**	2.2.0
Units	[-]		
Comm object	18942	**Related applications**	MINT, MPTM
Description			
This Value is calculated internally from **Uni Gen 7 Actual P** and **Uni Gen 7 Actual S**.			

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Uni Gen 7 Actual Load Character

Value group	Universal Gensets	**Related FW**	2.2.0
Units	[-]		
Comm object	18926	**Related applications**	MINT, MPTM
Description			
This Value is calculated internally from **Uni Gen 7 Actual P** and **Uni Gen 7 Actual Q**.			

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Uni Gen 7 Requested P

Value group	Universal Gensets	**Related FW**	2.2.0
Units	[-]		
Comm object	18888	**Related applications**	MINT, MPTM
Description			
This Value is intended for direct Active Power control of the one specific Uni Gen in on-grid application (Mains parallel operation).			

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Uni Gen 7 Requested Q

Value group	Universal Gensets	**Related FW**	2.2.0
Units	[-]		
Comm object	18872	**Related applications**	MINT, MPTM
Description			
This Value is intended for direct Reactive Power control of the one specific UG in on-grid application (Mains parallel operation).			

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Uni Gen 7 Binary Outputs

Value group	Universal Gensets	**Related FW**	2.2.0
Units	[-]		
Comm object	18904	**Related applications**	MINT, MPTM
Description			
This is the binary value included two specific binary outputs. **Uni Gen 7 Run Request** and **Uni Gen 7 Stop GCB Closing**. **Uni Gen 7 Run Request**: This signal is associated with the LBI UNIVERSAL GENSET START/STOP. This LBI is used to put the Uni Gens in operation. It is accepted in MAN and in AUT mode. The Uni Gen Run Request is influence by Power Management (Load demand Start/Stop) in AUT mode and is issued only if the system needs to start Uni Gens to cover the requested load reserve. In the Uni Gen it should be connected to the Genset Run Request signal. **Uni Gen 7 Stop GCB Closing**: This signal is crucial for safe operation in case that Uni Gen is enabled to closed it's GCB to the dead bus and make it energized. The InteliNeo generates 200 ms long pulse anytime when any controller in the system is about to close the CB to the dead bus. This information has to be used in Uni Gen to prevent the closing the GCB to the dead bus. It is strongly recommended to use the hard wiring of this signal between InteliNeo and Uni Gen. In the Uni Gen it should be connected to input GCB closing Block.			

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Subgroup: Uni Gen 8

Uni Gen 8 Nominal P

Value group	Universal Gensets	**Related FW**	2.2.0
Units	[-]		
Comm object	18962	**Related applications**	MINT, MPTM
Description			
This Value is a product of reading via LAI **Uni Gen 08 Nom P**.			

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Uni Gen 8 Actual P

Value group	Universal Gensets	**Related FW**	2.2.0
Units	[-]		
Comm object	18856	**Related applications**	MINT, MPTM
Description			
This Value is a product of reading via LAI **Uni Gen 09 Actual P**.			

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Uni Gen 8 Actual Q

Value group	Universal Gensets	**Related FW**	2.2.0
Units	[-]		
Comm object	18840	**Related applications**	MINT, MPTM
Description			
This Value is a product of reading via LAI **Uni Gen 08 Actual Q**.			

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Uni Gen 8 Actual S

Value group	Universal Gensets	**Related FW**	2.2.0
Units	[-]		
Comm object	18824	**Related applications**	MINT, MPTM
Description			
This Value is calculated internally from **Uni Gen 8 Actual P** and **Uni Gen 8 Actual Q**.			

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Uni Gen 8 Actual Power Factor

Value group	Universal Gensets	**Related FW**	2.2.0
Units	[-]		
Comm object	18943	**Related applications**	MINT, MPTM
Description			
This Value is calculated internally from **Uni Gen 8 Actual P** and **Uni Gen 8 Actual S**.			

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Uni Gen 8 Actual Load Character

Value group	Universal Gensets	**Related FW**	2.2.0
Units	[-]		
Comm object	18927	**Related applications**	MINT, MPTM
Description			
This Value is calculated internally from **Uni Gen 8 Actual P** and **Uni Gen 8 Actual Q**.			

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Uni Gen 8 Requested P

Value group	Universal Gensets	**Related FW**	2.2.0
Units	[-]		
Comm object	18889	**Related applications**	MINT, MPTM
Description			
This Value is intended for direct Active Power control of the one specific Uni Gen in on-grid application (Mains parallel operation).			

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Uni Gen 8 Requested Q

Value group	Universal Gensets	**Related FW**	2.2.0
Units	[-]		
Comm object	18873	**Related applications**	MINT, MPTM
Description			
This Value is intended for direct Reactive Power control of the one specific UG in on-grid application (Mains parallel operation).			

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Uni Gen 8 Binary Outputs

Value group	Universal Gensets	**Related FW**	2.2.0
Units	[-]		
Comm object	18905	**Related applications**	MINT, MPTM
Description			
This is the binary value included two specific binary outputs. **Uni Gen 7 Run Request** and **Uni Gen 7 Stop GCB Closing**. **Uni Gen 7 Run Request**: This signal is associated with the LBI **Universal Genset Start/Stop**. This LBI is used to put the Uni Gens in operation. It is accepted in MAN and in AUT mode. The Uni Gen Run Request is influence by Power Management (Load demand Start/Stop) in AUT mode and is issued only if the system needs to start Uni Gens to cover the requested load reserve. In the Uni Gen it should be connected to the Genset Run Request signal. **Uni Gen 7 Stop GCB Closing**: This signal is crucial for safe operation in case that Uni Gen is enabled to closed it's GCB to the dead bus and make it energized. The InteliNeo generates 200 ms long pulse anytime when any controller in the system is about to close the CB to the dead bus. This information has to be used in Uni Gen to prevent the closing the GCB to the dead bus. It is strongly recommended to use the hard wiring of this signal between InteliNeo and Uni Gen. In the Uni Gen it should be connected to input GCB closing Block.			

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Subgroup: Uni Gen 9

Uni Gen 9 Nominal P

Value group	Universal Gensets	**Related FW**	2.2.0
Units	[-]		
Comm object	18963	**Related applications**	MINT, MPTM
Description			
This Value is a product of reading via LAI **Uni Gen 09 Nom P**.			

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Uni Gen 9 Actual P

Value group	Universal Gensets	**Related FW**	2.2.0
Units	[-]		
Comm object	18857	**Related applications**	MINT, MPTM
Description			
This Value is a product of reading via LAI **Uni Gen 09 Actual P**.			

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Uni Gen 9 Actual Q

Value group	Universal Gensets	**Related FW**	2.2.0
Units	[-]		
Comm object	18841	**Related applications**	MINT, MPTM
Description			
This Value is a product of reading via LAI **Uni Gen 09 Actual Q**.			

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Uni Gen 9 Actual S

Value group	Universal Gensets	**Related FW**	2.2.0
Units	[-]		
Comm object	18825	**Related applications**	MINT, MPTM
Description			
This Value is calculated internally from **Uni Gen 9 Actual P** and **Uni Gen 9 Actual Q**.			

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Uni Gen 9 Actual Power Factor

Value group	Universal Gensets	**Related FW**	2.2.0
Units	[-]		
Comm object	18944	**Related applications**	MINT, MPTM
Description			
This Value is calculated internally from **Uni Gen 9 Actual P** and **Uni Gen 9 Actual S**.			

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Uni Gen 9 Actual Load Character

Value group	Universal Gensets	**Related FW**	2.2.0
Units	[-]		
Comm object	18928	**Related applications**	MINT, MPTM
Description			
This Value is calculated internally from **Uni Gen 9 Actual P** and **Uni Gen 9 Actual Q**.			

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Uni Gen 9 Requested P

Value group	Universal Gensets	**Related FW**	2.2.0
Units	[-]		
Comm object	18890	**Related applications**	MINT, MPTM
Description			
This Value is intended for direct Active Power control of the one specific Uni Gen in on-grid application (Mains parallel operation).			

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Uni Gen 9 Requested Q

Value group	Universal Gensets	**Related FW**	2.2.0
Units	[-]		
Comm object	18874	**Related applications**	MINT, MPTM
Description			
This Value is intended for direct Reactive Power control of the one specific UG in on-grid application (Mains parallel operation).			

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Uni Gen 9 Binary Outputs

Value group	Universal Gensets	**Related FW**	2.2.0
Units	[-]		
Comm object	18906	**Related applications**	MINT, MPTM
Description			

This is the binary value included two specific binary outputs. **Uni Gen 9 Run Request** and **Uni Gen 9 Stop GCB Closing**.

Uni Gen 9 Run Request: This signal is associated with the LBI UNIVERSAL GENSET START/STOP. This LBI is used to put the Uni Gens in operation. It is accepted in MAN and in AUT mode. The Uni Gen Run Request is influence by Power Management (Load demand Start/Stop) in AUT mode and is issued only if the system needs to start Uni Gens to cover the requested load reserve. In the Uni Gen it should be connected to the Genset Run Request signal.

Uni Gen 9 Stop GCB Closing: This signal is crucial for safe operation in case that Uni Gen is enabled to closed it's GCB to the dead bus and make it energized. The InteliNeo generates 200 ms long pulse anytime when any controller in the system is about to close the CB to the dead bus. This information has to be used in Uni Gen to prevent the closing the GCB to the dead bus. It is strongly recommended to use the hard wiring of this signal between InteliNeo and Uni Gen. In the Uni Gen it should be connected to input GCB closing Block.

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Subgroup: Uni Gen 10

Uni Gen 10 Nominal P

Value group	Universal Gensets	**Related FW**	2.2.0
Units	[-]		
Comm object	18964	**Related applications**	MINT, MPTM
Description			
This Value is a product of reading via LAI **Uni Gen 10 Nom P**.			

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Uni Gen 10 Actual P

Value group	Universal Gensets	**Related FW**	2.2.0
Units	[-]		
Comm object	18858	**Related applications**	MINT, MPTM
Description			
This Value is a product of reading via LAI **Uni Gen 10 Actual P**.			

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Uni Gen 10 Actual Q

Value group	Universal Gensets	**Related FW**	2.2.0
Units	[-]		
Comm object	18842	**Related applications**	MINT, MPTM
Description			
This Value is a product of reading via LAI **Uni Gen 10 Actual Q**.			

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Uni Gen 10 Actual S

Value group	Universal Gensets	**Related FW**	2.2.0
Units	[-]		
Comm object	18826	**Related applications**	MINT, MPTM
Description			
This Value is calculated internally from **Uni Gen 10 Actual P** and **Uni Gen 10 Actual Q**.			

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Uni Gen 10 Actual Power Factor

Value group	Universal Gensets	**Related FW**	2.2.0
Units	[-]		
Comm object	18945	**Related applications**	MINT, MPTM
Description			
This Value is calculated internally from **Uni Gen 10 Actual P** and **Uni Gen 10 Actual S**.			

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Uni Gen 10 Actual Load Character

Value group	Universal Gensets	**Related FW**	2.2.0
Units	[-]		
Comm object	18929	**Related applications**	MINT, MPTM
Description			
This Value is calculated internally from **Uni Gen 10 Actual P** and **Uni Gen 10 Actual Q**.			

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Uni Gen 10 Requested P

Value group	Universal Gensets	**Related FW**	2.2.0
Units	[-]		
Comm object	18891	**Related applications**	MINT, MPTM
Description			
This Value is intended for direct Active Power control of the one specific Uni Gen in on-grid application (Mains parallel operation).			

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Uni Gen 10 Requested Q

Value group	Universal Gensets	**Related FW**	2.2.0
Units	[-]		
Comm object	18875	**Related applications**	MINT, MPTM
Description			
This Value is intended for direct Reactive Power control of the one specific UG in on-grid application (Mains parallel operation).			

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Uni Gen 10 Binary Outputs

Value group	Universal Gensets	**Related FW**	2.2.0
Units	[-]		
Comm object	18907	**Related applications**	MINT, MPTM
Description			
This is the binary value included two specific binary outputs. **Uni Gen 10 Run Request** and **Uni Gen 10 Stop GCB Closing**. **Uni Gen 10 Run Request**: This signal is associated with the LBI UNIVERSAL GENSET START/STOP. This LBI is used to put the Uni Gens in operation. It is accepted in MAN and in AUT mode. The Uni Gen Run Request is influence by Power Management (Load demand Start/Stop) in AUT mode and is issued only if the system needs to start Uni Gens to cover the requested load reserve. In the Uni Gen it should be connected to the Genset Run Request signal. **Uni Gen 10 Stop GCB Closing**: This signal is crucial for safe operation in case that Uni Gen is enabled to closed it's GCB to the dead bus and make it energized. The InteliNeo generates 200 ms long pulse anytime when any controller in the system is about to close the CB to the dead bus. This information has to be used in Uni Gen to prevent the closing the GCB to the dead bus. It is strongly recommended to use the hard wiring of this signal between InteliNeo and Uni Gen. In the Uni Gen it should be connected to input GCB closing Block.			

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Subgroup: Uni Gen 11

Uni Gen 11 Nominal P

Value group	Universal Gensets	**Related FW**	2.2.0
Units	[-]		
Comm object	18965	**Related applications**	MINT, MPTM
Description			
This Value is a product of reading via LAI UNI GEN 11 NOM P.			

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Uni Gen 11 Actual P

Value group	Universal Gensets	**Related FW**	2.2.0
Units	[-]		
Comm object	18859	**Related applications**	MINT, MPTM
Description			
This Value is a product of reading via LAI UNI GEN 11 ACTUAL P.			

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Uni Gen 11 Actual Q

Value group	Universal Gensets	**Related FW**	2.2.0
Units	[-]		
Comm object	18843	**Related applications**	MINT, MPTM
Description			
This Value is a product of reading via LAI **Uni Gen 11 Actual Q**.			

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Uni Gen 11 Actual S

Value group	Universal Gensets	**Related FW**	2.2.0
Units	[-]		
Comm object	18827	**Related applications**	MINT, MPTM
Description			
This Value is calculated internally from **Uni Gen 11 Actual S** and **Uni Gen 11 Actual Q**.			

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Uni Gen 11 Actual Power Factor

Value group	Universal Gensets	**Related FW**	2.2.0
Units	[-]		
Comm object	18946	**Related applications**	MINT, MPTM
Description			
This Value is calculated internally from **Uni Gen 11 Actual P** and **Uni Gen 11 Actual S**.			

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Uni Gen 11 Actual Load Character

Value group	Universal Gensets	**Related FW**	2.2.0
Units	[-]		
Comm object	18930	**Related applications**	MINT, MPTM
Description			
This Value is calculated internally from **Uni Gen 11 Actual P** and **Uni Gen 11 Actual Q**.			

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Uni Gen 11 Requested P

Value group	Universal Gensets	**Related FW**	2.2.0
Units	[-]		
Comm object	18892	**Related applications**	MINT, MPTM
Description			
This Value is intended for direct Active Power control of the one specific Uni Gen in on-grid application (Mains parallel operation).			

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Uni Gen 11 Requested Q

Value group	Universal Gensets	**Related FW**	2.2.0
Units	[-]		
Comm object	18876	**Related applications**	MINT, MPTM
Description			
This Value is intended for direct Reactive Power control of the one specific UG in on-grid application (Mains parallel operation).			

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Uni Gen 11 Binary Outputs

Value group	Universal Gensets	**Related FW**	2.2.0
Units	[-]		
Comm object	18908	**Related applications**	MINT, MPTM
Description			

This is the binary value included two specific binary outputs. **Uni Gen 11 Run Request** and **Uni Gen 11 Stop GCB Closing**.

Uni Gen 11 Run Request: This signal is associated with the LBI UNIVERSAL GENSET START/STOP. This LBI is used to put the Uni Gens in operation. It is accepted in MAN and in AUT mode. The Uni Gen Run Request is influence by Power Management (Load demand Start/Stop) in AUT mode and is issued only if the system needs to start Uni Gens to cover the requested load reserve. In the Uni Gen it should be connected to the Genset Run Request signal.

Uni Gen 11 Stop GCB Closing: This signal is crucial for safe operation in case that Uni Gen is enabled to closed it's GCB to the dead bus and make it energized. The InteliNeo generates 200 ms long pulse anytime when any controller in the system is about to close the CB to the dead bus. This information has to be used in Uni Gen to prevent the closing the GCB to the dead bus. It is strongly recommended to use the hard wiring of this signal between InteliNeo and Uni Gen. In the Uni Gen it should be connected to input GCB closing Block.

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Subgroup: Uni Gen 12

Uni Gen 12 Nominal P

Value group	Universal Gensets	**Related FW**	2.2.0
Units	[-]		
Comm object	18966	**Related applications**	MINT, MPTM
Description			
This Value is a product of reading via LAI **Uni Gen 12 Nom P**.			

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Uni Gen 12 Actual P

Value group	Universal Gensets	**Related FW**	2.2.0
Units	[-]		
Comm object	18860	**Related applications**	MINT, MPTM
Description			
This Value is a product of reading via LAI **Uni Gen 12 Actual P**.			

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Uni Gen 12 Actual Q

Value group	Universal Gensets	**Related FW**	2.2.0
Units	[-]		
Comm object	18844	**Related applications**	MINT, MPTM
Description			
This Value is a product of reading via LAI **Uni Gen 12 Actual Q**.			

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Uni Gen 12 Actual S

Value group	Universal Gensets	**Related FW**	2.2.0
Units	[-]		
Comm object	18828	**Related applications**	MINT, MPTM
Description			
This Value is calculated internally from **Uni Gen 12 Actual P** and **Uni Gen 12 Actual Q**.			

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Uni Gen 12 Actual Power Factor

Value group	Universal Gensets	**Related FW**	2.2.0
Units	[-]		
Comm object	18947	**Related applications**	MINT, MPTM
Description			
This Value is calculated internally from **Uni Gen 12 Actual P** and **Uni Gen 12 Actual S**.			

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Uni Gen 12 Actual Load Character

Value group	Universal Gensets	**Related FW**	2.2.0
Units	[-]		
Comm object	18931	**Related applications**	MINT, MPTM
Description			
This Value is calculated internally from **Uni Gen 12 Actual P** and **Uni Gen 12 Actual Q**.			

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Uni Gen 12 Requested P

Value group	Universal Gensets	**Related FW**	2.2.0
Units	[-]		
Comm object	18893	**Related applications**	MINT, MPTM
Description			
This Value is intended for direct Active Power control of the one specific Uni Gen in on-grid application (Mains parallel operation).			

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Uni Gen 12 Requested Q

Value group	Universal Gensets	**Related FW**	2.2.0
Units	[-]		
Comm object	18877	**Related applications**	MINT, MPTM
Description			
This Value is intended for direct Reactive Power control of the one specific UG in on-grid application (Mains parallel operation).			

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Uni Gen 12 Binary Outputs

Value group	Universal Gensets	**Related FW**	2.2.0
Units	[-]		
Comm object	18909	**Related applications**	MINT, MPTM
Description			
This is the binary value included two specific binary outputs. **Uni Gen 12 Run Request** and **Uni Gen 12 Stop GCB Closing**. **Uni Gen 12 Run Request**: This signal is associated with the LBI **Universal Genset Start/Stop**. This LBI is used to put the Uni Gens in operation. It is accepted in MAN and in AUT mode. The Uni Gen Run Request is influence by Power Management (Load demand Start/Stop) in AUT mode and is issued only if the system needs to start Uni Gens to cover the requested load reserve. In the Uni Gen it should be connected to the Genset Run Request signal. **Uni Gen 12 Stop GCB Closing**: This signal is crucial for safe operation in case that Uni Gen is enabled to closed it's GCB to the dead bus and make it energized. The InteliNeo generates 200 ms long pulse anytime when any controller in the system is about to close the CB to the dead bus. This information has to be used in Uni Gen to prevent the closing the GCB to the dead bus. It is strongly recommended to use the hard wiring of this signal between InteliNeo and Uni Gen. In the Uni Gen it should be connected to input GCB closing Block.			

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Subgroup: Uni Gen 13

Uni Gen 13 Nominal P

Value group	Universal Gensets	**Related FW**	2.2.0
Units	[-]		
Comm object	18967	**Related applications**	MINT, MPTM
Description			
This Value is a product of reading via LAI **Uni Gen 13 Nom P**.			

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Uni Gen 13 Actual P

Value group	Universal Gensets	**Related FW**	2.2.0
Units	[-]		
Comm object	18861	**Related applications**	MINT, MPTM
Description			
This Value is a product of reading via LAI **Uni Gen 13 Actual P**.			

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Uni Gen 13 Actual Q

Value group	Universal Gensets	**Related FW**	2.2.0
Units	[-]		
Comm object	18845	**Related applications**	MINT, MPTM
Description			
This Value is a product of reading via LAI **Uni Gen 13 Actual Q**.			

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Uni Gen 13 Actual S

Value group	Universal Gensets	**Related FW**	2.2.0
Units	[-]		
Comm object	18829	**Related applications**	MINT, MPTM
Description			
This Value is calculated internally from **Uni Gen 13 Actual P** and **Uni Gen 13 Actual Q**.			

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Uni Gen 13 Actual Power Factor

Value group	Universal Gensets	**Related FW**	2.2.0
Units	[-]		
Comm object	18948	**Related applications**	MINT, MPTM
Description			
This Value is calculated internally from **Uni Gen 13 Actual P** and **Uni Gen 13 Actual S**.			

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Uni Gen 13 Actual Load Character

Value group	Universal Gensets	**Related FW**	2.2.0
Units	[-]		
Comm object	18932	**Related applications**	MINT, MPTM
Description			
This Value is calculated internally from **Uni Gen 13 Actual P** and **Uni Gen 13 Actual Q**.			

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Uni Gen 13 Requested P

Value group	Universal Gensets	**Related FW**	2.2.0
Units	[-]		
Comm object	18894	**Related applications**	MINT, MPTM
Description			
This Value is intended for direct Active Power control of the one specific Uni Gen in on-grid application (Mains parallel operation).			

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Uni Gen 13 Requested Q

Value group	Universal Gensets	**Related FW**	2.2.0
Units	[-]		
Comm object	18878	**Related applications**	MINT, MPTM
Description			
This Value is intended for direct Reactive Power control of the one specific UG in on-grid application (Mains parallel operation).			

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Uni Gen 13 Binary Outputs

Value group	Universal Gensets	**Related FW**	2.2.0
Units	[-]		
Comm object	18910	**Related applications**	MINT, MPTM
Description			

This is the binary value included two specific binary outputs. **Uni Gen 13 Run Request** and **Uni Gen 13 Stop GCB Closing**.

Uni Gen 13 Run Request: This signal is associated with the LBI UNIVERSAL GENSET START/STOP. This LBI is used to put the Uni Gens in operation. It is accepted in MAN and in AUT mode. The Uni Gen Run Request is influence by Power Management (Load demand Start/Stop) in AUT mode and is issued only if the system needs to start Uni Gens to cover the requested load reserve. In the Uni Gen it should be connected to the Genset Run Request signal.

Uni Gen 13 Stop GCB Closing: This signal is crucial for safe operation in case that Uni Gen is enabled to closed it's GCB to the dead bus and make it energized. The InteliNeo generates 200 ms long pulse anytime when any controller in the system is about to close the CB to the dead bus. This information has to be used in Uni Gen to prevent the closing the GCB to the dead bus. It is strongly recommended to use the hard wiring of this signal between InteliNeo and Uni Gen. In the Uni Gen it should be connected to input GCB closing Block.

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Subgroup: Uni Gen 14

Uni Gen 14 Nominal P

Value group	Universal Gensets	**Related FW**	2.2.0
Units	[-]		
Comm object	18968	**Related applications**	MINT, MPTM
Description			
This Value is a product of reading via LAI **Uni Gen 14 Nom P**.			

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Uni Gen 14 Actual P

Value group	Universal Gensets	**Related FW**	2.2.0
Units	[-]		
Comm object	18862	**Related applications**	MINT, MPTM
Description			
This Value is a product of reading via LAI **Uni Gen 14 Actual P**.			

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Uni Gen 14 Actual Q

Value group	Universal Gensets	**Related FW**	2.2.0
Units	[-]		
Comm object	18846	**Related applications**	MINT, MPTM
Description			
This Value is a product of reading via LAI **Uni Gen 14 Actual Q**.			

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Uni Gen 14 Actual S

Value group	Universal Gensets	**Related FW**	2.2.0
Units	[-]		
Comm object	18830	**Related applications**	MINT, MPTM
Description			
This Value is calculated internally from **Uni Gen 14 Actual P** and **Uni Gen 14 Actual Q**.			

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Uni Gen 14 Actual Power Factor

Value group	Universal Gensets	**Related FW**	2.2.0
Units	[-]		
Comm object	18949	**Related applications**	MINT, MPTM
Description			
This Value is calculated internally from **Uni Gen 14 Actual P** and **Uni Gen 14 Actual S**.			

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Uni Gen 14 Actual Load Character

Value group	Universal Gensets	**Related FW**	2.2.0
Units	[-]		
Comm object	18933	**Related applications**	MINT, MPTM
Description			
This Value is calculated internally from **Uni Gen 14 Actual P** and **Uni Gen 14 Actual Q**.			

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Uni Gen 14 Requested P

Value group	Universal Gensets	**Related FW**	2.2.0
Units	[-]		
Comm object	18895	**Related applications**	MINT, MPTM
Description			
This Value is intended for direct Active Power control of the one specific Uni Gen in on-grid application (Mains parallel operation).			

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Uni Gen 14 Requested Q

Value group	Universal Gensets	**Related FW**	2.2.0
Units	[-]		
Comm object	18879	**Related applications**	MINT, MPTM
Description			
This Value is intended for direct Reactive Power control of the one specific UG in on-grid application (Mains parallel operation).			

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Uni Gen 14 Binary Outputs

Value group	Universal Gensets	**Related FW**	2.2.0
Units	[-]		
Comm object	18911	**Related applications**	MINT, MPTM
Description			
This is the binary value included two specific binary outputs. **Uni Gen 14 Run Request** and **Uni Gen 14 Stop GCB Closing**. **Uni Gen 14 Run Request**: This signal is associated with the LBI **Universal Genset Start/Stop**. This LBI is used to put the Uni Gens in operation. It is accepted in MAN and in AUT mode. The Uni Gen Run Request is influence by Power Management (Load demand Start/Stop) in AUT mode and is issued only if the system needs to start Uni Gens to cover the requested load reserve. In the Uni Gen it should be connected to the Genset Run Request signal. **Uni Gen 14 Stop GCB Closing**: This signal is crucial for safe operation in case that Uni Gen is enabled to closed it's GCB to the dead bus and make it energized. The InteliNeo generates 200 ms long pulse anytime when any controller in the system is about to close the CB to the dead bus. This information has to be used in Uni Gen to prevent the closing the GCB to the dead bus. It is strongly recommended to use the hard wiring of this signal between InteliNeo and Uni Gen. In the Uni Gen it should be connected to input GCB closing Block.			

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Subgroup: Uni Gen 15

Uni Gen 15 Nominal P

Value group	Universal Gensets	**Related FW**	2.2.0
Units	[-]		
Comm object	18969	**Related applications**	MINT, MPTM
Description			
This Value is a product of reading via LAI **Uni Gen 15 Nom P**.			

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Uni Gen 15 Actual P

Value group	Universal Gensets	**Related FW**	2.2.0
Units	[-]		
Comm object	18863	**Related applications**	MINT, MPTM
Description			
This Value is a product of reading via LAI **Uni Gen 15 Actual P**.			

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Uni Gen 15 Actual Q

Value group	Universal Gensets	**Related FW**	2.2.0
Units	[-]		
Comm object	18847	**Related applications**	MINT, MPTM
Description			
This Value is a product of reading via LAI **Uni Gen 15 Actual Q**.			

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Uni Gen 15 Actual S

Value group	Universal Gensets	**Related FW**	2.2.0
Units	[-]		
Comm object	18831	**Related applications**	MINT, MPTM
Description			
This Value is calculated internally from **Uni Gen 15 Actual P** and **Uni Gen 15 Actual Q**.			

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Uni Gen 15 Actual Power Factor

Value group	Universal Gensets	**Related FW**	2.2.0
Units	[-]		
Comm object	18950	**Related applications**	MINT, MPTM
Description			
This Value is calculated internally from **Uni Gen 15 Actual P** and **Uni Gen 15 Actual S**.			

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Uni Gen 15 Actual Load Character

Value group	Universal Gensets	**Related FW**	2.2.0
Units	[-]		
Comm object	18934	**Related applications**	MINT, MPTM
Description			
This Value is calculated internally from **Uni Gen 15 Actual P** and **Uni Gen 15 Actual Q**.			

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Uni Gen 15 Requested P

Value group	Universal Gensets	**Related FW**	2.2.0
Units	[-]		
Comm object	18896	**Related applications**	MINT, MPTM
Description			
This Value is intended for direct Active Power control of the one specific Uni Gen in on-grid application (Mains parallel operation).			

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Uni Gen 15 Requested Q

Value group	Universal Gensets	**Related FW**	2.2.0
Units	[-]		
Comm object	18880	**Related applications**	MINT, MPTM
Description			
This Value is intended for direct Reactive Power control of the one specific UG in on-grid application (Mains parallel operation).			

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Uni Gen 15 Binary Outputs

Value group	Universal Gensets	**Related FW**	2.2.0
Units	[-]		
Comm object	18912	**Related applications**	MINT, MPTM
Description			

This is the binary value included two specific binary outputs. **Uni Gen 15 Run Request** and **Uni Gen 15 Stop GCB Closing**.

Uni Gen 15 Run Request: This signal is associated with the LBI UNIVERSAL GENSET START/STOP. This LBI is used to put the Uni Gens in operation. It is accepted in MAN and in AUT mode. The Uni Gen Run Request is influence by Power Management (Load demand Start/Stop) in AUT mode and is issued only if the system needs to start Uni Gens to cover the requested load reserve. In the Uni Gen it should be connected to the Genset Run Request signal.

Uni Gen 15 Stop GCB Closing: This signal is crucial for safe operation in case that Uni Gen is enabled to closed it's GCB to the dead bus and make it energized. The InteliNeo generates 200 ms long pulse anytime when any controller in the system is about to close the CB to the dead bus. This information has to be used in Uni Gen to prevent the closing the GCB to the dead bus. It is strongly recommended to use the hard wiring of this signal between InteliNeo and Uni Gen. In the Uni Gen it should be connected to input GCB closing Block.

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Subgroup: Uni Gen 16

Uni Gen 16 Nominal P

Value group	Universal Gensets	**Related FW**	2.2.0
Units	[-]		
Comm object	18970	**Related applications**	MINT, MPTM
Description			
This Value is a product of reading via LAI **Uni Gen 16 Nom P**.			

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Uni Gen 16 Actual P

Value group	Universal Gensets	**Related FW**	2.2.0
Units	[-]		
Comm object	18864	**Related applications**	MINT, MPTM
Description			
This Value is a product of reading via LAI **Uni Gen 16 Actual P**.			

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Uni Gen 16 Actual Q

Value group	Universal Gensets	**Related FW**	2.2.0
Units	[-]		
Comm object	18848	**Related applications**	MINT, MPTM
Description			
This Value is a product of reading via LAI **Uni Gen 16 Actual Q**.			

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Uni Gen 16 Actual S

Value group	Universal Gensets	**Related FW**	2.2.0
Units	[-]		
Comm object	18832	**Related applications**	MINT, MPTM
Description			
This Value is calculated internally from **Uni Gen 16 Actual P** and **Uni Gen 16 Actual Q**.			

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Uni Gen 16 Actual Power Factor

Value group	Universal Gensets	**Related FW**	2.2.0
Units	[-]		
Comm object	18951	**Related applications**	MINT, MPTM
Description			
This Value is calculated internally from **Uni Gen 16 Actual P** and **Uni Gen 16 Actual S**.			

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Uni Gen 16 Actual Load Character

Value group	Universal Gensets	**Related FW**	2.2.0
Units	[-]		
Comm object	18935	**Related applications**	MINT, MPTM
Description			
This Value is calculated internally from **Uni Gen 16 Actual P** and **Uni Gen 16 Actual Q**.			

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Uni Gen 16 Requested P

Value group	Universal Gensets	**Related FW**	2.2.0
Units	[-]		
Comm object	18897	**Related applications**	MINT, MPTM
Description			
This Value is intended for direct Active Power control of the one specific Uni Gen in on-grid application (Mains parallel operation).			

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Uni Gen 16 Requested Q

Value group	Universal Gensets	**Related FW**	2.2.0
Units	[-]		
Comm object	18881	**Related applications**	MINT, MPTM
Description			
This Value is intended for direct Reactive Power control of the one specific UG in on-grid application (Mains parallel operation).			

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Uni Gen 16 Binary Outputs

Value group	Universal Gensets	**Related FW**	2.2.0
Units	[-]		
Comm object	18913	**Related applications**	MINT, MPTM
Description			
This is the binary value included two specific binary outputs. **Uni Gen 16 Run Request** and **Uni Gen 16 Stop GCB Closing**. **Uni Gen 16 Run Request**: This signal is associated with the LBI UNIVERSAL GENSET START/STOP. This LBI is used to put the Uni Gens in operation. It is accepted in MAN and in AUT mode. The Uni Gen Run Request is influence by Power Management (Load demand Start/Stop) in AUT mode and is issued only if the system needs to start Uni Gens to cover the requested load reserve. In the Uni Gen it should be connected to the Genset Run Request signal. **Uni Gen 16 Stop GCB Closing**: This signal is crucial for safe operation in case that Uni Gen is enabled to closed it's GCB to the dead bus and make it energized. The InteliNeo generates 200 ms long pulse anytime when any controller in the system is about to close the CB to the dead bus. This information has to be used in Uni Gen to prevent the closing the GCB to the dead bus. It is strongly recommended to use the hard wiring of this signal between InteliNeo and Uni Gen. In the Uni Gen it should be connected to input GCB closing Block.			

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Group: Mains/Bus

Mains Import P Monitoring

Value group	Mains	**Related FW**	2.2.0
Units	kW		
Comm object	20172	**Related applications**	MINT, MPTM
Description			
Imported apparent power [kW] from Mains.			

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Mains Import Q Monitoring

Value group	Mains	**Related FW**	2.2.0
Units	kVAr		
Comm object	20171	**Related applications**	MINT, MPTM
Description			
Imported reactive power [kVAr] from Mains.			

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Group: Load

Load P

Value group	Load	**Related FW**	2.2.0
Units	kW		
Comm object	10601	**Related applications**	MINT, MPTM
Description			

Load's active power.

> **IMPORTANT: This Value only display the valid value when the controller operates in MPTM application, see Application Mode. This Value is not relevant for the MINT application and it can display the wrong value.**

Note: *This value can be also switched into one decimal see **Power Formats And Units**.*

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Load Q

Value group	Load	**Related FW**	2.2.0
Units	kVAr		
Comm object	10644	**Related applications**	MINT, MPTM
Description			

Load's reactive power.

> **IMPORTANT: This Value only display the valid value when the controller operates in MPTM application, see Application Mode. This Value is not relevant for the MINT application and it can display the wrong value.**

Note: *This value can be also switched into one decimal see **Power Formats And Units**.*

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Load Power Factor

Load	Load	**Related FW**	2.2.0
Units	[-]		
Comm object	16158	**Related applications**	MINT, MPTM
Description			

Load's power factor.

> **IMPORTANT: This Value only display the valid value when the controller operates in MPTM application, see Application Mode. This Value is not relevant for the MINT application and it can display the wrong value.**

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Load Character

Value group	Load	Related FW	2.2.0
Units	[-]		
Comm object	9026	Related applications	MINT, MPTM
Description			
Load's character. "L" means inductive load, "C" is capacitive and "R" is resistive load (**Load Power Factor** = 1). > **IMPORTANT: This Value only display the valid value when the controller operates in MPTM application, see Application Mode. This Value is not relevant for the MINT application and it can display the wrong value.**			

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Group: Grid Codes

Grid Codes Version

Value group	Grid Codes	Related FW	2.2.0
Units	[-]		
Comm object	16869	Related applications	MPTM
Description			
This value shows the Grid Codes module version.			

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Pmom

Value group	Grid Codes	Related FW	2.2.0
Units	kW		
Comm object	13019	Related applications	MPTM
Description			
This value contains **BESS PTotal Running P** at the moment of start of either **Power Regulation Based On Over/Under Frequency** or **Power Regulation Based On Actual Mains Voltage**. This value is used for calculations. > ***Note:*** *This value can be also switched into one decimal see **Power Formats And Units**.*			

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Test Frequency

Value group	Grid Codes	**Related FW**	2.2.0
Units	Hz		
Comm object	16614	**Related applications**	MPTM
Description			
This value contains frequency for testing of **Grid Codes**. **Grid Codes Test** has to be Enabled and alarm **Wrn Test UPQF** active. The value is filled as **Nominal Frequency** + value from LAI **TestF**.			

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P Over Frequency Curve

Value group	Grid Codes	**Related FW**	2.2.0
Units	%		
Comm object	16185	**Related applications**	MPTM
Description			
This value contains actual y-axe value of **Power Over Frequency** curve while LBO **P Over Frequency Active** is closed, otherwise it has **Invalid flag**.			

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P Under Frequency Curve

Value group	Grid Codes	**Related FW**	2.2.0
Units	%		
Comm object	16184	**Related applications**	MPTM
Description			
This value contains actual y-axe value of **Power Under Frequency** curve while LBO **P Under Frequency Active** is closed, otherwise it has **Invalid flag**.			

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Q(Um) Curve

Value group	Grid Codes	**Related FW**	2.2.0
Units	kVAr		
Comm object	13168	**Related applications**	MPTM
Description			
This value contains target of required reactive power based on **Q(Um)** curve while **PF/Q Control PTM Mode** = Q(Um) and **Breaker state** = ParalOper, otherwise it has **Invalid flag**.			

Note: *This value can be also switched into one decimal see **Power Formats And Units**.*

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Qref/Ulim Curve

Value group	Grid Codes	**Related FW**	2.2.0
Units	kVAr		
Comm object	16149	**Related applications**	MPTM
Description			
This value contains target of required reactive power based on **Qref/Ulim** curve while **PF/Q Control PTM Mode** = Qref/Ulim and **Breaker state** = ParalOper, otherwise it has **Invalid flag**. ***Note:*** *This value can be also switched into one decimal see **Power Formats And Units**.*			

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Q(P) Curve

Value group	Grid Codes	**Related FW**	2.2.0
Units	kVAr		
Comm object	16127	**Related applications**	MPTM
Description			
This value contains target of required reactive power based on **Q(P)** curve while **PF/Q Control PTM Mode** = Q(P) and **Breaker state** = ParalOper, otherwise it has **Invalid flag**. ***Note:*** *This value can be also switched into one decimal see **Power Formats And Units**.*			

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PF(P) Curve

Value group	Grid Codes	**Related FW**	2.2.0
Units	kVAr		
Comm object	13636	**Related applications**	MPTM
Description			
This value contains target of required power factor based on **PF(P)** curve while **PF/Q Control PTM Mode** = PF(P) and **Breaker state** = ParalOper, otherwise it has **Invalid flag**.			

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P(Um) Curve

Value group	Grid Codes	**Related FW**	2.2.0
Units	kW		
Comm object	16568	**Related applications**	MPTM
Description			
This value contains actual value of **P(Um)** curve while **Power Regulation Based On Actual Mains Voltage** is active. The value is either related to value **Pmom** or **Installed Power** based on selected mode of **P(Um)**.			

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Pmom/Pave

Value group	Grid Codes	**Related FW**	2.2.0
Units	kW		
Comm object	16545	**Related applications**	MPTM
Description			
This value contais actual ratio of LAI **PMOM** to **Pave** and is used by application curve **P Mom/Pave Max**.			

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Load Reduction 1 Occurrence

Value group	Grid Codes	**Related FW**	2.2.0
Units	[-]		
Comm object	16089	**Related applications**	MPTM
Description			
This value contains cumulative amount of occurrence of closed LBI **LOAD REDUCTION 1**. See **Load Reduction** for more information. ***Note:*** *This value is never reset, you can change its value via "Set Statistics" in InteliConfig.*			

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Load Reduction 2 Occurrence

Value group	Grid Codes	**Related FW**	2.2.0
Units	[-]		
Comm object	16090	**Related applications**	MPTM
Description			
This value contains cumulative amount of occurrence of closed LBI **LOAD REDUCTION 2**. See **Load Reduction** for more information. ***Note:*** *This value is never reset, you can change its value via "Set Statistics" in InteliConfig.*			

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Load Reduction 3 Occurrence

Value group	Grid Codes	**Related FW**	2.2.0
Units	[-]		
Comm object	16091	**Related applications**	MPTM
Description			
This value contains cumulative amount of occurrence of closed LBI **LOAD REDUCTION 3**. See **Load Reduction** for more information. ***Note:*** *This value is never reset, you can change its value via "Set Statistics" in InteliConfig.*			

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Load Reduction 4 Occurrence

Value group	Grid Codes	**Related FW**	2.2.0
Units	[-]		
Comm object	16092	**Related applications**	MPTM
Description			
This value contains cumulative amount of occurrence of closed LBI **Load Reduction 4**. See **Load Reduction** for more information. ***Note:*** *This value is never reset, you can change its value via "Set Statistics" in InteliConfig.*			

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Load Reduction 1 hrs Actual Month

Value group	Grid Codes	**Related FW**	2.2.0
Units	h		
Comm object	16103	**Related applications**	MPTM
Description			
This value contains total hours of active LBI **Load Reduction 1** in actual month. ***Note:*** *Data are moved to Last Month every 1st day of month at 0:00.*			

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Load Reduction 1min Actual Month

Value group	Grid Codes	**Related FW**	2.2.0
Units	min		
Comm object	16107	**Related applications**	MPTM
Description			
This value contains minutes (up to 59) of active LBI **Load Reduction 1** in actual month. ***Note:*** *Data are moved to Last Month every 1st day of month at 0:00.*			

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Load Reduction 1 hrs Last Month

Value group	Grid Codes	**Related FW**	2.2.0
Units	h		
Comm object	16111	**Related applications**	MPTM
Description			
This value contains total hours of active LBI **Load Reduction 1** in last month. ***Note:*** *Data are replaced with the value **Load Reduction 1 hrs Actual Month** every 1st day of month at 0:00.*			

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Load Reduction 1 min Last Month

Value group	Grid Codes	**Related FW**	2.2.0
Units	min		
Comm object	16115	**Related applications**	MPTM
Description			
This value contains minutes (up to 59) of active LBI **Load Reduction 1** in last month. ***Note:*** *Data are replaced with the value* ***Load Reduction 1min Actual Month*** *every 1st day of month at 0:00.*			

back to List of values

Load Reduction 1 hrs Accumulated

Value group	Grid Codes	**Related FW**	2.2.0
Units	h		
Comm object	16093	**Related applications**	MPTM
Description			
This value contains accumulated hours of active LBI **Load Reduction 1** from last reset of this value. ***Note:*** *You can reset this value via "Set Statistics" in InteliConfig.*			

back to List of values

Load Reduction 1 min Accumulated

Value group	Grid Codes	**Related FW**	2.2.0
Units	min		
Comm object	16094	**Related applications**	MPTM
Description			
This value contains minutes (up to 59) of active LBI **Load Reduction 1** from last reset of this value. ***Note:*** *You can reset this value via "Set Statistics" in InteliConfig.*			

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Load Reduction 2 hrs Actual Month

Value group	Grid Codes	**Related FW**	2.2.0
Units	h		
Comm object	16104	**Related applications**	MPTM
Description			
This value contains total hours of active LBI **Load Reduction 2** in actual month. ***Note:*** *Data are moved to Last Month every 1st day of month at 0:00.*			

back to List of values

Load Reduction 2 min Actual Month

Value group	Grid Codes	**Related FW**	2.2.0
Units	min		
Comm object	16108	**Related applications**	MPTM
Description			
This value contains minutes (up to 59) of active LBI **Load Reduction 2** in actual month. ***Note:*** *Data are moved to Last Month every 1st day of month at 0:00.*			

back to List of values

Load Reduction 2 hrs Last Month

Value group	Grid Codes	**Related FW**	2.2.0
Units	h		
Comm object	16112	**Related applications**	MPTM
Description			
This value contains total hours of active LBI **Load Reduction 2** in last month. ***Note:*** *Data are replaced with the value **Load Reduction 2 hrs Actual Month** every 1st day of month at 0:00.*			

back to List of values

Load Reduction 2 min Last Month

Value group	Grid Codes	**Related FW**	2.2.0
Units	min		
Comm object	16116	**Related applications**	MPTM
Description			
This value contains minutes (up to 59) of active LBI **Load Reduction 2** in last month. ***Note:*** *Data are replaced with the value **Load Reduction 2 min Actual Month** every 1st day of month at 0:00.*			

back to List of values

Load Reduction 2 hrs Accumulated

Value group	Grid Codes	**Related FW**	2.2.0
Units	h		
Comm object	16095	**Related applications**	MPTM
Description			
This value contains accumulated hours of active LBI **Load Reduction 2** from last reset of this value. ***Note:*** *You can reset this value via "Set Statistics" in InteliConfig.*			

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Load Reduction 2 min Accumulated

Value group	Grid Codes	**Related FW**	2.2.0
Units	min		
Comm object	16096	**Related applications**	MPTM
Description			
This value contains minutes (up to 59) of active LBI **LOAD REDUCTION 2** from last reset of this value. ***Note:*** *You can reset this value via "Set Statistics" in InteliConfig.*			

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Load Reduction 3 hrs Actual Month

Value group	Grid Codes	**Related FW**	2.2.0
Units	h		
Comm object	16105	**Related applications**	MPTM
Description			
This value contains total hours of active LBI **LOAD REDUCTION 3** in actual month. ***Note:*** *Data are moved to Last Month every 1st day of month at 0:00.*			

back to List of values

Load Reduction 3 min Actual Month

Value group	Grid Codes	**Related FW**	2.2.0
Units	min		
Comm object	16109	**Related applications**	MPTM
Description			
This value contains minutes (up to 59) of active LBI **LOAD REDUCTION 3** in actual month. ***Note:*** *Data are moved to Last Month every 1st day of month at 0:00.*			

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Load Reduction 3 hrs Last Month

Value group	Grid Codes	**Related FW**	2.2.0
Units	h		
Comm object	16113	**Related applications**	MPTM
Description			
This value contains total hours of active LBI **LOAD REDUCTION 3** in last month. ***Note:*** *Data are replaced with the value **Load Reduction 3 hrs Actual Month** every 1st day of month at 0:00.*			

back to List of values

Load Reduction 3 min Last Month

Value group	Grid Codes	**Related FW**	2.2.0
Units	min		
Comm object	16117	**Related applications**	MPTM
Description			
This value contains minutes (up to 59) of active LBI **Load Reduction 3** in last month. ***Note:*** *Data are replaced with the value* ***Load Reduction 3 min Actual Month*** *every 1st day of month at 0:00.*			

back to List of values

Load Reduction 3 hrs Accumulated

Value group	Grid Codes	**Related FW**	2.2.0
Units	h		
Comm object	16097	**Related applications**	MPTM
Description			
This value contains accumulated hours of active LBI **Load Reduction 3** from last reset of this value. ***Note:*** *You can reset this value via "Set Statistics" in InteliConfig.*			

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Load Reduction 3 min Accumulated

Value group	Grid Codes	**Related FW**	2.2.0
Units	min		
Comm object	16098	**Related applications**	MPTM
Description			
This value contains minutes (up to 59) of active LBI **Load Reduction 3** from last reset of this value. ***Note:*** *You can reset this value via "Set Statistics" in InteliConfig.*			

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Load Reduction 4 hrs Actual Month

Value group	Grid Codes	**Related FW**	2.2.0
Units	h		
Comm object	16106	**Related applications**	MPTM
Description			
This value contains total hours of active LBI **Load Reduction 4** in actual month. ***Note:*** *Data are moved to Last Month every 1st day of month at 0:00.*			

back to List of values

Load Reduction 4 min Actual Month

Value group	Grid Codes	**Related FW**	2.2.0
Units	min		
Comm object	16110	**Related applications**	MPTM
Description			
This value contains minutes (up to 59) of active LBI **Load Reduction 4** in actual month. ***Note:*** *Data are moved to Last Month every 1st day of month at 0:00.*			

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Load Reduction 4 hrs Last Month

Value group	Grid Codes	**Related FW**	2.2.0
Units	h		
Comm object	16114	**Related applications**	MPTM
Description			
This value contains total hours of active LBI **Load Reduction 4** in last month. ***Note:*** *Data are replaced with the value **Load Reduction 4 hrs Actual Month** every 1st day of month at 0:00.*			

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Load Reduction 4 min Last Month

Value group	Grid Codes	**Related FW**	2.2.0
Units	min		
Comm object	16118	**Related applications**	MPTM
Description			
This value contains minutes (up to 59) of active LBI **Load Reduction 4** in last month. ***Note:*** *Data are replaced with the value **Load Reduction 4 min Actual Month** every 1st day of month at 0:00.*			

back to List of values

Load Reduction 4 hrs Accumulated

Value group	Grid Codes	**Related FW**	2.2.0
Units	h		
Comm object	16099	**Related applications**	MPTM
Description			
This value contains accumulated hours of active LBI **Load Reduction 4** from last reset of this value. ***Note:*** *You can reset this value via "Set Statistics" in InteliConfig.*			

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Load Reduction 4 min Accumulated

Value group	Grid Codes	**Related FW**	2.2.0
Units	min		
Comm object	16100	**Related applications**	MPTM
Description			
This value contains minutes (up to 59) of active LBI **LOAD REDUCTION 4** from last reset of this value. ***Note:*** *You can reset this value via "Set Statistics" in InteliConfig.*			

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Group: Mains/Bus

Mains/Bus Frequency

Value group	Mains/Bus	**Related FW**	2.2.0
Units	Hz		
Comm object	20800	**Related applications**	MINT, MPTM
Description			
Frequency of Mains/Bus.			

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Mains/Bus Voltage L1-N

Value group	Value Group Mains/Bus	**Related FW**	2.2.0
Units	V		
Comm object	8195	**Related applications**	MINT, MPTM
Description			
Value of Mains/Bus voltage on phase 1.			

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Mains/Bus Voltage L2-N

Value group	Value Group Mains/Bus	**Related FW**	2.2.0
Units	V		
Comm object	8196	**Related applications**	MINT, MPTM
Description			
Value of Mains/Bus voltage on phase 2.			

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Mains/Bus Voltage L3-N

Value group	Value Group Mains/Bus	**Related FW**	2.2.0
Units	V		
Comm object	8197	**Related applications**	MINT, MPTM
Description			
Value of Mains/Bus voltage on phase 3.			

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Mains/Bus Voltage L1-L2

Value group	Mains/Bus	**Related FW**	2.2.0
Units	V		
Comm object	9631	**Related applications**	MINT, MPTM
Description			
Value of Mains/Bus phase to phase voltage between L1 and L2 phases.			

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Mains/Bus Voltage L2-L3

Value group	Mains/Bus	**Related FW**	2.2.0
Units	V		
Comm object	9632	**Related applications**	MINT, MPTM
Description			
Value of Mains/Bus phase to phase voltage between L2 and L3 phases.			

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Mains/Bus Voltage L3-L1

Value group	Mains/Bus	**Related FW**	2.2.0
Units	V		
Comm object	9633	**Related applications**	MINT, MPTM
Description			
Value of Mains/Bus phase to phase voltage between L3 and L1 phases.			

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Mains/Bus Voltage

Value group	Mains/Bus	**Related FW**	2.2.0
Units	V		
Comm object	10666	**Related applications**	MINT, MPTM
Description			
Average value of all Mains/BusVoltage phases.			

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Mains/Bus V Unabalance Ph-N

Value group	Value Group Mains/Bus	**Related FW**	2.2.0
Units	V		
Comm object	10549	**Related applications**	MINT, MPTM
Description			
This value contains the maximum difference of values **Mains/Bus Voltage L1-N**, **Mains/Bus Voltage L2-N**, **Mains/Bus Voltage L3-N** at a given moment. ***Note:*** *Difference of the values and the evaluation of the protection is influenced by the setpoint* ***Connection type****.*			

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Mains/Bus V Unbalance Ph-Ph

Value group	Mains/Bus	**Related FW**	2.2.0
Units	V		
Comm object	17337	**Related applications**	MINT, MPTM
Description			
This value contains the maximum difference of values **Mains/Bus Voltage L1-L2**, **Mains/Bus Voltage L2-L3**, **Mains/Bus Voltage L3-L1** at a given moment. ***Note:*** *Difference of the values and the evaluation of the protection is influenced by the setpoint* ***Connection type****.*			

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+Mains/Bus Voltage

Value group	Mains/Bus	**Related FW**	2.2.0
Units	V		
Comm object	16615	**Related applications**	MINT, MPTM
Description			
Value of +Mains/Bus Voltage voltage measured by **Symmetrical components**			

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+Mains/Bus Voltage Relative

Value group	Mains/Bus	**Related FW**	2.2.0
Units	%		
Comm object	16616	**Related applications**	MINT, MPTM
Description			
Value of +Mains/Bus Voltage Relative voltage measured by **Symmetrical components** which is related to **Mains/Bus Nominal Voltage Ph-N** or **Mains/Bus Nominal Voltage Ph-Ph**.			

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Mains L1 Current

Value group	Mains/Bus	**Related FW**	2.2.0
Units	A		
Comm object	8208	**Related applications**	MPTM
Description			
Mains' current. ***Note:*** *This value is filled with 0 all the time if* ***Mains Measurement P*** *!= CT.*			

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Mains L1 Current

Value group	Mains/Bus	**Related FW**	2.2.0
Units	A		
Comm object	8801	**Related applications**	MINT, MPTM
Description			
Current of the L1 phase of the Mains/Bus.			

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Mains L2 Current

Value group	Mains/Bus	**Related FW**	2.2.0
Units	A		
Comm object	8802	**Related applications**	MINT, MPTM
Description			
Current of the L2 phase of the Mains/Bus.			

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Mains L2 Current

Value group	Mains/Bus	**Related FW**	2.2.0
Units	A		
Comm object	8803	**Related applications**	MINT, MPTM
Description			
Current of the L3 phase of the Mains/Bus.			

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Mains Import P

Value group	Mains/Bus	**Related FW**	2.2.0
Units	kW		
Comm object	8703	**Related applications**	MPTM
Description			
Imported active power [kW] from Mains.			

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Mains P L1

Value group	Mains/Bus	**Related FW**	2.2.0
Units	kW		
Comm object	8805	**Related applications**	MINT, MPTM
Description			
Imported active power [kW] from L1 phase of the Mains.			

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Mains P L2

Value group	Mains/Bus	**Related FW**	2.2.0
Units	kW		
Comm object	8806	**Related applications**	MINT, MPTM
Description			
Imported active power [kW] from L2 phase of the Mains.			

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Mains P L3

Value group	Mains/Bus	**Related FW**	2.2.0
Units	kW		
Comm object	8807	**Related applications**	MINT, MPTM
Description			
Imported active power [kW] from L3 phase of the Mains.			

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Mains Import Q

Value group	Mains/Bus	**Related FW**	2.2.0
Units	kVAr		
Comm object	8704	**Related applications**	MPTM
Description			
Imported reactive power [kVAr] from Mains.			

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Mains Import Q L1

Value group	Mains/Bus	**Related FW**	2.2.0
Units	kW		
Comm object	8808	**Related applications**	MINT, MPTM
Description			
Imported reactive power [kVAr] from L1 phase of the Mains.			

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Mains Import Q L2

Value group	Mains/Bus	**Related FW**	2.2.0
Units	kW		
Comm object	8809	**Related applications**	MINT, MPTM
Description			
Imported reactive power [kVAr] from L2 phase of the Mains.			

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Mains Import Q L3

Value group	Mains/Bus	**Related FW**	2.2.0
Units	kW		
Comm object	8810	**Related applications**	MINT, MPTM
Description			
Imported reactive power [kVAr] from L3 phase of the Mains.			

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Mains/BusMainsBus Left Import SMains S

Value group	Mains/Bus	**Related FW**	2.2.0
Units	kVA		
Comm object	8811	**Related applications**	MINT, MPTM
Description			
Imported apparent power [kVA] from Mains.			

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Mains S L1

Value group	Mains/Bus	**Related FW**	2.2.0
Units	kVA		
Comm object	8812	**Related applications**	MINT, MPTM
Description			
Imported apparent power [kVA] from L1 phase of the Mains.			

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Mains S L2

Value group	Mains/Bus	**Related FW**	2.2.0
Units	kVA		
Comm object	8813	**Related applications**	MINT, MPTM
Description			
Imported apparent power [kVA] from L2 phase of the Mains.			

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Mains S L3

Value group	Mains/Bus	**Related FW**	2.2.0
Units	kVA		
Comm object	8814	**Related applications**	MINT, MPTM
Description			
Imported apparent power [kVA] from L3 phase of the Mains.			

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Mains PFMains PF

Value group	Mains/Bus	**Related FW**	2.2.0
Units	[-]		
Comm object	16157	**Related applications**	MPTM
Description			
Power factor of the Mains.			

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Mains Load CharacterMains Load Character

Value group	Mains/Bus	**Related FW**	2.2.0
Units	[-]		
Comm object	8709	**Related applications**	MPTM
Description			
Character of Mains load. "L" means inductive load, "C" is capacitive and "R" is resistive load (**Mains PFMains PF** = 1). Load character of the Mains. L = inductive load, C = capacitive load, and R = resistive load (**Mains PFMains PF** = 1).			

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Mains Power Factor L1Mains Power Factor L1

Value group	Mains/Bus	**Related FW**	2.2.0
Units	[-]		
Comm object	20580	**Related applications**	MINT, MPTM
Description			
Power factor of the L1 phase of the Mains/Bus.			

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Mains Load Character L1Mains Load Char L1

Value group	Mains/Bus	**Related FW**	2.2.0
Units	[-]		
Comm object	8818	**Related applications**	MINT, MPTM
Description			
Load character of the L1 phase of the Mains. L = inductive load, C = capacitive load, and R = resistive load (**Mains Power Factor L1Mains Power Factor L1** = 1).			

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Mains Power Factor L2Mains Power Factor L2

Value group	Mains/Bus	**Related FW**	2.2.0
Units	[-]		
Comm object	20581	**Related applications**	MINT, MPTM
Description			
Power factor of the L2 phase of the Mains/Bus.			

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Mains Load Character L2Mains Load Char L2

Value group	Mains/Bus	**Related FW**	2.2.0
Units	[-]		
Comm object	8819	**Related applications**	MINT, MPTM
Description			
Load character of the L2 phase of the Mains. L = inductive load, C = capacitive load, and R = resistive load (**Mains Power Factor L2Mains Power Factor L2** = 1).			

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Mains Power Factor L3Mains Power Factor L3

Value group	Mains/Bus	**Related FW**	2.2.0
Units	[-]		
Comm object	20582	**Related applications**	MINT, MPTM
Description			
Power factor of the L3 phase of the Mains/Bus.			

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Mains Load Character L3Mains Load Char L3

Value group	Mains/Bus	**Related FW**	2.2.0
Units	[-]		
Comm object	8820	**Related applications**	MINT, MPTM
Description			
Load character of the L3 phase of the Mains. L = inductive load, C = capacitive load, and R = resistive load (**Mains Power Factor L3Mains Power Factor L3** = 1).			

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Mains Voltage THD L1Mains Voltage THD L1

Value group	Mains/Bus	**Related FW**	2.2.0
Units	%		
Comm object	16060	**Related applications**	MINT, MPTM
Description			
This value represents **Voltage Total Harmonic Distortion Mains/Bus Voltage L1-N**.			

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Mains Voltage THD L2Mains Voltage THD L2

Value group	Mains/Bus	**Related FW**	2.2.0
Units	%		
Comm object	16061	**Related applications**	MINT, MPTM
Description			
This value represents **Voltage Total Harmonic Distortion** of **Mains/Bus Voltage L2-N**.			

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Mains Voltage THD L3Mains Voltage THD L3

Value group	Mains/Bus	**Related FW**	2.2.0
Units	%		
Comm object	16062	**Related applications**	MINT, MPTM
Description			
This value represents **Voltage Total Harmonic Distortion** of **Mains/Bus Voltage L3-N**.			

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Mains Current THD L1

Value group	Mains/Bus	**Related FW**	2.2.0
Units	%		
Comm object	16064	**Related applications**	MPTM
Description			
This value represents **Current Total Harmonic Distortion** of **Mains L1 CurrentMains L1 Current**.			

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Mains Current THD L2

Value group	Mains/Bus	**Related FW**	2.2.0
Units	%		
Comm object	16065	**Related applications**	MPTM
Description			
This value represents **Current Total Harmonic Distortion** of **Mains L2 Current**.			

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Mains Current THD L3

Value group	Mains/Bus	**Related FW**	2.2.0
Units	%		
Comm object	16066	**Related applications**	MINT, MPTM
Description			
This value represents **Current Total Harmonic Distortion** of **Mains L2 Current**.			

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Max Vector Shift

Value group	Mains/Bus	**Related FW**	2.2.0
Units	°		
Comm object	9847	**Related applications**	MINT, MPTM
Description			
Maximal measured value of **Vector shift** of the Mains. It is reset to zero always when: › **Vector Shift Protection** = Parallel Only - controller goes to parallel toMains operation › **Vector Shift Protection** = Enabled - MCB gets closed			

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Mains Voltage 10min Avg L1-N

Value group	Value Group Mains/Bus	**Related FW**	2.2.0
Units	V		
Comm object	16651	**Related applications**	MPTM
Description			
This value contains 10-minutes average of **Mains/Bus Voltage L1-N**. See **10-minutes averages** for more information. ***Note:*** *Value is reset when controller is switched off.*			

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Mains Voltage 10min Avg L2-N

Value group	Value Group Mains/Bus	**Related FW**	2.2.0
Units	V		
Comm object	16652	**Related applications**	MPTM
Description			
This value contains 10-minutes average of **Mains/Bus Voltage L2-N**. See **10-minutes averages** for more information. ***Note:*** *Value is reset when controller is switched off.*			

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Mains Voltage 10min Avg L3-N

Value group	Value Group Mains/Bus	**Related FW**	2.2.0
Units	V		
Comm object	16653	**Related applications**	MPTM
Description			
This value contains 10-minutes average of **Mains/Bus Voltage L3-N**. See **10-minutes averages** for more information. ***Note:*** *Value is reset when controller is switched off.*			

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Mains Voltage 1min Avg L1-N

Value group	Value Group Mains/Bus	**Related FW**	2.2.0
Units	V		
Comm object	16654	**Related applications**	MPTM
Description			
This value contains 1-minute average of **Mains/Bus Voltage L1-N**. See **1-minute averages** for more information. ***Note:*** *Value is reset when controller is switched off.*			

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Mains Voltage 1min Avg L2-N

Value group	Value Group Mains/Bus	**Related FW**	2.2.0
Units	V		
Comm object	16655	**Related applications**	MPTM
Description			
This value contains 1-minute average of **Mains/Bus Voltage L2-N**. See **1-minute averages** for more information. ***Note:*** *Value is reset when controller is switched off.*			

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Mains Voltage 1min Avg L3-N

Value group	Value Group Mains/Bus	**Related FW**	2.2.0
Units	V		
Comm object	16656	**Related applications**	MPTM
Description			
This value contains 1-minute average of **Mains/Bus Voltage L3-N**. See **1-minute averages** for more information. ***Note:*** *Value is reset when controller is switched off.*			

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Mains Voltage 10min Avg L1-L2

Value group	Mains/Bus	**Related FW**	2.2.0
Units	V		
Comm object	16082	**Related applications**	MPTM
Description			
This value contains 10-minutes average of **Mains/Bus Voltage L1-L2**. See **10-minutes averages** for more information. ***Note:*** *Value is reset when controller is switched off.*			

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Mains Voltage 10min Avg L2-L3

Value group	Mains/Bus	**Related FW**	2.2.0
Units	V		
Comm object	16083	**Related applications**	MPTM
Description			
This value contains 10-minutes average of **Mains/Bus Voltage L2-L3**. See **10-minutes averages** for more information. ***Note:*** *Value is reset when controller is switched off.*			

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Mains Voltage 10min Avg L3-L1

Value group	Mains/Bus	**Related FW**	2.2.0
Units	V		
Comm object	16084	**Related applications**	MPTM
Description			
This value contains 10-minutes average of **Mains/Bus Voltage L3-L1**. See **10-minutes averages** for more information. ***Note:*** *Value is reset when controller is switched off.*			

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Mains Voltage 1min Avg L1-L2

Value group	Mains/Bus	**Related FW**	2.2.0
Units	V		
Comm object	16085	**Related applications**	MPTM
Description			
This value contains 1-minute average of **Mains/Bus Voltage L1-L2**. See **1-minute averages** for more information. ***Note:*** *Value is reset when controller is switched off.*			

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Mains Voltage 1min Avg L2-L3

Value group	Mains/Bus	**Related FW**	2.2.0
Units	V		
Comm object	16086	**Related applications**	MPTM
Description			
This value contains 1-minute average of **Mains/Bus Voltage L2-L3**. See **1-minute averages** for more information. ***Note:*** *Value is reset when controller is switched off.*			

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Mains Voltage 1min Avg L3-L1

Value group	Mains/Bus	**Related FW**	2.2.0
Units	V		
Comm object	16087	**Related applications**	MPTM
Description			
This value contains 1-minute average of **Mains/Bus Voltage L3-L1**. See **1-minute averages** for more information. ***Note:*** *Value is reset when controller is switched off.*			

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ROCOF1

Value group	Mains/Bus	**Related FW**	2.2.0
Units	Hz/s		
Comm object	9848	**Related applications**	MINT, MPTM
Description			
This value contains actual rate of change of frequency measured by **ROCOF1 Protection**. See **ROCOF** for more information.			

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Max ROCOF1

Value group	Mains/Bus	**Related FW**	2.2.0
Units	Hz/s		
Comm object	10049	**Related applications**	MINT, MPTM
Description			

This value contains maximal rate of change of frequency measured by **ROCOF1 Protection** since the protection got active.

See **ROCOF** for more information.

Setting		**Reset of value**
ROCOF1 Protection = Enabled	**Vector Shift/ROCOF CB Selector** = MCB	When MCB closes.
	Vector Shift/ROCOF CB Selector = BCB	When BCB closes.
ROCOF1 Protection = Parallel Only		After entering parallel operation (**Breaker state** = ParalOper)

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ROCOF2

Value group	Mains/Bus	**Related FW**	2.2.0
Units	Hz/s		
Comm object	16153	**Related applications**	MINT, MPTM
Description			
This value contains actual rate of change of frequency measured by **ROCOF2 Protection**. See **ROCOF** for more information.			

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Max ROCOF2

Value group	Mains/Bus	**Related FW**	2.2.0
Units	Hz/s		
Comm object	16163	**Related applications**	MINT, MPTM
Description			
This value contains maximal rate of change of frequency measured by **ROCOF2 Protection** since the protection got active. See **ROCOF** for more information.			

Setting		**Reset of value**
ROCOF2 Protection = Enabled	**Vector Shift/ROCOF CB Selector** = MCB	When MCB closes.
	Vector Shift/ROCOF CB Selector = BCB	When BCB closes.
ROCOF2 Protection = Parallel Only		After entering parallel operation (**Breaker state** = ParalOper)

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ROCOF3

Value group	Mains/Bus	**Related FW**	2.2.0
Units	Hz/s		
Comm object	16154	**Related applications**	MINT, MPTM
Description			
This value contains actual rate of change of frequency measured by **ROCOF3 Protection**. See **ROCOF** for more information.			

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Max ROCOF3

Value group	Mains/Bus	**Related FW**	2.2.0
Units	Hz/s		
Comm object	16164	**Related applications**	MINT, MPTM
Description			

This value contains maximal rate of change of frequency measured by **ROCOF3 Protection** since the protection got active.

See **ROCOF** for more information.

Setting		**Reset of value**
ROCOF3 Protection = Enabled	**Vector Shift/ROCOF CB Selector** = MCB	When MCB closes.
	Vector Shift/ROCOF CB Selector = BCB	When BCB closes.
ROCOF3 Protection = Parallel Only		After entering parallel operation (**Breaker state** = ParalOper)

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ROCOF4

Value group	Mains/Bus	**Related FW**	2.2.0
Units	Hz/s		
Comm object	16155	**Related applications**	MINT, MPTM
Description			

This value contains actual rate of change of frequency measured by **ROCOF4 Protection**.

See **ROCOF** for more information.

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Max ROCOF4

Value group	Mains/Bus	**Related FW**	2.2.0
Units	Hz/s		
Comm object	16165	**Related applications**	MINT, MPTM
Description			

This value contains maximal rate of change of frequency measured by **ROCOF4 Protection** since the protection got active.

See **ROCOF** for more information.

Setting		**Reset of value**
ROCOF4 Protection = Enabled	**Vector Shift/ROCOF CB Selector** = MCB	When MCB closes.
	Vector Shift/ROCOF CB Selector = BCB	When BCB closes.
ROCOF4 Protection = Parallel Only		After entering parallel operation (**Breaker state** = ParalOper)

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Group: System

Total BESS P

Value group	System	**Related FW**	2.2.0
Units	kWh		
Comm object	17909	**Related applications**	MINT, MPTM
Description			

This value represents the total active power P of all BESS units across the entire system (within one control group).

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Total BESS Q

Value group	System	**Related FW**	2.2.0
Units	kVAr		
Comm object	17908	**Related applications**	MINT, MPTM
Description			

This value represents the total reactive power Q of all BESS units across the entire system (within one control group).

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Total BESS Power Factor

Value group	System	**Related FW**	2.2.0
Units	kWh		
Comm object	17907	**Related applications**	MINT, MPTM
Description			
This value represents the agregated PF of all BESS units across the entire system (within one control group)..			

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Total BESS Load Character

Value group	System	**Related FW**	2.2.0
Units	-		
Comm object	17906	**Related applications**	MINT, MPTM
Description			
This value represents the agregated load character of all BESS units across the entire system (within one control group).			

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Total BESS Max Charging P

Value group	System	**Related FW**	2.2.0
Units	kW		
Comm object	17905	**Related applications**	MINT, MPTM
Description			
This value represents the combined maximum charging power of all BESS units within the system. It is calculated by summing the individual maximum charging power values **Max Charging P** of each BESS unit. This aggregated value is used in all related functions to manage and optimize the overall charging capabilities of the BESS units across the entire system.			

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Total BESS Max Discharging P

Value group	System	**Related FW**	2.2.0
Units	kW		
Comm object	17904	**Related applications**	MINT, MPTM
Description			
This value represents the combined maximum discharging power of all BESS units within the system. It is calculated by summing the individual maximum discharging power values **Max Discharging P** of each BESS unit. This aggregated value is used in all related functions to manage and optimize the overall discharging capabilities of the BESS units across the entire system..			

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Total Genset P

Value group	Gensets	**Related FW**	2.2.0
Units	kW		
Comm object	20183	**Related applications**	MINT, MPTM
Description			
This value represents the total power of all running Gen-sets.			

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Total Genset Q

Value group	Gensets	**Related FW**	2.2.0
Units	kVAr		
Comm object	20182	**Related applications**	MINT, MPTM
Description			
This value represents the reactive power of all running Gen-sets.			

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Total Genset Power Factor

Value group	Gensets	**Related FW**	2.2.0
Units	[-]		
Comm object	20181	**Related applications**	MINT, MPTM
Description			
This value represents the total power factor of all running Gen-sets.			

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Total Genset Load Character

Value group	Gensets	**Related FW**	2.2.0
Units	[-]		
Comm object	20180	**Related applications**	MINT, MPTM
Description			
This value represents the total character of all running Gen-sets.			

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Gen P Min

Value group	Power ManagementGensets	**Related FW**	2.2.0
Units	%		
Comm object	17668	**Related applications**	MINT
Description			
By default this value will display the setting of the setpoint **#Gen P Min**. Having LAI **Gen P Min** configured the value will display the prioritized LAI.			

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Total PV Nominal P

Value group	System	**Related FW**	2.2.0
Units	kW		
Comm object	17903	**Related applications**	MINT, MPTM
Description			
This value represents the combined nominal power of all photovoltaic (PV) units within the system. It is calculated by summing the nominal power ratings of each individual PV unit. This aggregated value is used to assess and manage the overall power generation capacity of the PV units across the entire system.			

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Total PV Actual P

Value group	System	**Related FW**	2.2.0
Units	kW		
Comm object	17902	**Related applications**	MINT, MPTM
Description			
This value represents the combined actual power output of all photovoltaic (PV) units within the system at a given moment. It is calculated by summing the actual power outputs of each individual PV unit. This aggregated value is used to monitor and manage the current power generation performance of the PV units across the entire system.			

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Total PV Actual Q

Value group	System	**Related FW**	2.2.0
Units	kVAr		
Comm object	17901	**Related applications**	MINT, MPTM
Description			
This value represents the combined actual reactive power output of all photovoltaic (PV) units within the system at a given moment. It is calculated by summing the real-time reactive power outputs of each individual PV unit. This aggregated value is used to monitor and manage the current reactive power performance of the PV units across the entire system.			

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Total PV Power Factor

Value group	System	**Related FW**	2.2.0
Units	kWh		
Comm object	17900	**Related applications**	MINT, MPTM
Description			
This value represents the aggregated power factor of all photovoltaic (PV) units within the system. It is calculated by combining the power factors of each individual PV unit.			

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Total PV Load Character

Value group	System	**Related FW**	2.2.0
Units	-		
Comm object	17899	**Related applications**	MINT, MPTM
Description			
This value represents the aggregated load character of all photovoltaic (PV) units within the system.			

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Total WT Nominal P

Value group	System	**Related FW**	2.2.0
Units	kW		
Comm object	17898	**Related applications**	MINT, MPTM
Description			
This value represents the combined nominal power of all wind turbines (WT) within the system. It is calculated by summing the nominal power ratings of each individual WT. This aggregated value is used to assess and manage the overall power generation capacity of the wind turbines across the entire system.			

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Total WT Actual P

Value group	System	**Related FW**	2.2.0
Units	kW		
Comm object	17897	**Related applications**	MINT, MPTM
Description			
This value represents the combined actual power output of all wind turbines (WT) within the system at a given moment. It is calculated by summing the real-time power outputs of each individual WT. This aggregated value is used to monitor and manage the current power generation performance of the wind turbines across the entire system.			

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Total WT Actual Q

Value group	System	**Related FW**	2.2.0
Units	kVAr		
Comm object	17896	**Related applications**	MINT, MPTM
Description			
This value represents the combined actual reactive power output of all wind turbines (WT) within the system at a given moment. It is calculated by summing the real-time reactive power outputs of each individual WT. This aggregated value is used to monitor and manage the current reactive power performance of the wind turbines across the entire system.			

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Total WT Power Factor

Value group	System	**Related FW**	2.2.0
Units	-		
Comm object	17895	**Related applications**	MINT, MPTM
Description			
This value represents the aggregated power factor of all wind turbines (WT) within the system. It is calculated by combining the power factors of each individual WT.			

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Total WT Load Character

Value group	System	**Related FW**	2.2.0
Units	-		
Comm object	17894	**Related applications**	MINT, MPTM
Description			
This value represents the aggregated load character of all wind turbines (WT) within the system.			

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Group: Power Management

Engine Priority

Value group	Power Management	**Related FW**	2.2.0
Units	-		
Comm object	8624	**Related applications**	MINT
Description			
This value shows current priority number of the unit. It corresponds to the setpoint **Priority** except following situations: › If at least one of binary inputs **Top Priority** is configured on some source and is active › **#Priority Auto Swap** is active			

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Actual Reserve

Value group	Power Management	**Related FW**	2.2.0
Units	kW		
Comm object	15805	**Related applications**	MINT
Description			
Actual absolute reserve in **Power Management**. This value shows the actual load reserve of the system (group). The load reserve is the difference of actual P and nominal P of the all dipatchable sources ,like the BESS available for discharging or genset operating in power management.			

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Start Reserve

Value group	Power Management	**Related FW**	2.2.0
Units	kW		
Comm object	15806	**Related applications**	MINT
Description			
Required minimal **Actual Reserve** for starting of next unit in the **Power Management**. Actual nominal power of all running Gen-sets in Load Sharing connected to the same group.			

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Stop Reserve

Value group	Power Management	**Related FW**	2.2.0
Units	kW		
Comm object	15807	**Related applications**	MINT
Description			
Required maximal **Actual Reserve** for stopping of next unit in the **Power Management**.			

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Dynamic Spinning Reserve

Value group	Power Management	**Related FW**	2.2.0
Units	kW		
Comm object	15673	**Related applications**	MINT
Description			
The value **Dynamic Spinning Reserve** is added to required load reserve given by setpoints **#Starting Load Reserve 1** and **#Stopping Load Reserve 1** (according to actual load reserve set 1, 2, 3 or 4) to shift the actual load reserve settings in dynamic way.			

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Dynamic Spinning Reserve Offset

Value group	Power Management	**Related FW**	2.2.0
Units	kW		
Comm object	15674	**Related applications**	MINT
Description			
The value **Dynamic Spinning Reserve Offset** is added only to required stopping load reserve given by setpoints **#Stopping Load Reserve 1** (according to actual load reserve set 1, 2, 3 or 4) to create some dynamic offset between starting and stopping load reserve.			

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Actual Relative Reserve

Value group	Power Management	**Related FW**	2.2.0
Units	%		
Comm object	10788	**Related applications**	MINT
Description			
Actual relative reserve in **Power Management**.			

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Start Relative Reserve

Value group	Power Management	**Related FW**	2.2.0
Units	%		
Comm object	10786	**Related applications**	MINT
Description			
Required minimal **Actual Relative Reserve** for starting of next unit in the **Power Management**.			

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Stop Relative Reserve

Value group	Power Management	**Related FW**	2.2.0
Units	%		
Comm object	10787	**Related applications**	MINT
Description			
Required maximal **Actual Relative Reserve** for stopping of next unit in the **Power Management**.			

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Total Running P

Value group	Power Management	**Related FW**	2.2.0
Units	kW		
Comm object	10657	**Related applications**	MINT
Description			
Actual value of active power from all controllers running in **Power Management**.			

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Total Running Q

Value group	Power Management	**Related FW**	2.2.0
Units	kVAr		
Comm object	10656	**Related applications**	MINT
Description			
Actual value of reactive power from all controllers running in **Power Management**. Actual value of reactive power from all controllers connected to the bus.			

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Running Nominal Power In PM

Value group	Power Management	**Related FW**	2.2.0
Units	kW		
Comm object	10999	**Related applications**	MINT
Description			
Actual nominal power of all running controllers on inter-controller CAN in **Power Management**.			

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Running Nominal Power Of All

Value group	Power Management	**Related FW**	2.2.0
Units	kW		
Comm object	10658	**Related applications**	MINT
Description			
Actual nominal power of all running controllers on inter-controller CAN.			

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Available Nominal Power

Value group	Power Management	**Related FW**	2.2.0
Units	kW		
Comm object	10998	**Related applications**	MINT
Description			
Available nominal power of all controllers on inter-controller CAN in **Power Management**.			

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Minimal Running Nominal Power

Value group	Power Management	**Related FW**	2.2.0
Units	kW		
Comm object	10012	**Related applications**	MINT
Description			
Actual minimal nominal power of all Controllers, which are running.			

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Actual Power Band 32

Value group	Power Management	Related FW	2.2.0
Units	[-]		
Comm object	8974	Related applications	MINT
Description			

Required state of the Controllers with CAN address between 1 .. 32 in the actual power band of **Power Management**.

- Log 0: Controller should be stopped
- Log 1: Controller should be running

Note: *Actual power band = group of Controllers which should be running with actual load.*

Note: *Value is taken into account only if **#Priority Auto Swap** = Efficient.*

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Actual Power Band 64

Value group	Power Management	Related FW	2.2.0
Units	[-]		
Comm object	16690	Related applications	MINT
Description			

Required state of the Gen-sets with CAN address between 33 .. 64 in the actual power band of **Power Management**.

- Log 0: Gen-set should be stopped
- Log 1: Gen-set should be running

Note: *Actual power band = group of Gen-sets which should be running with actual load.*

Note: *Value is taken into account only if **#Priority Auto Swap** = Efficient.*

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Next Power Band 32

Value group	Power Management	Related FW	2.2.0
Units	-		
Comm object	8975	Related applications	MINT
Description			

Required state of the Gen-sets with CAN address between 1 .. 32 in the next power band of **Power Management**.

- Log 0: Gen-set should be stopped if load is decreased
- Log 1: Gen-set should be started if load is increased

Note: *Next power band = group of Gen-sets which should be running after load change.*

Note: *Value is taken into account only if **#Priority Auto Swap** = Efficient.*

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Next Power Band 64

Value group	Power Management	**Related FW**	2.2.0
Units	-		
Comm object	16691	**Related applications**	MINT
Description			
Required state of the Gen-sets with CAN address between 33 .. 64 in the next power band of **Power Management**. › Log 0: Gen-set should be stopped if load is decreased › Log 1: Gen-set should be started if load is increased ***Note:*** *Next power band = group of Gen-sets which should be running after load change.* ***Note:*** *Value is taken into account only if **#Priority Auto Swap** = Efficient.*			

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Group: Frequency/Load Control

BESS Required P Target

Value group	Frequency/Load Control Frequency/Load Control	**Related FW**	2.2.0
Units	kW		
Comm object	8663	**Related applications**	MINT, MPTM
Description			
This value shows required active power at the end of ramping.			

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BESS Required P

Value group	Frequency/Load Control Frequency/Load Control	**Related FW**	2.2.0
Units	kW		
Comm object	13105	**Related applications**	MINT, MPTM
Description			
This value shows required active power relative to the ramping procedure i.e. required active power right now.			

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BESS Required Relative P

Value group	Frequency/Load Control	**Related FW**	2.2.0
Units	% of **Nominal power**		
Comm object	15900	**Related applications**	MINT, MPTM
Description			
Relative value of required power of the BESS. Relative value of requested power from HLC. For more information **see BESS Output Control on page 1**.			

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Frequency Regulator Output

Value group	Frequency/Load Control Frequency/Load Control	**Related FW**	2.2.0
Units	V		
Comm object	9052	**Related applications**	MINT, MPTM
Description			
This is the actual voltage on the frequency regulator output of the controller. In case the Analog Output is switched to PWM mode, the relation is: › 10 V = ~100 % PWM. › -10 V = 0 % PWM			

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BESS Frequency Required

Value group	Frequency/Load Control	**Related FW**	2.2.0
Units	Hz		
Comm object	19446	**Related applications**	MPTM
Description			
Requested BESS frequency in Hz. Intended for BESS P control when operating in U-f control mode. See chapter **BESS output control methods P-Q / U-f**.			

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BESS Frequency Offset

Value group	Frequency/Load Control	**Related FW**	2.2.0
Units	Hz		
Comm object	19447	**Related applications**	MPTM
Description			
Relative value of requested power of the BESS. Intended for BESS P control when operating in U-f control mode. See chapter **BESS output control methods P-Q / U-f**. BESS output control methods P-Q / U-f.			

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BESS P Request %

Value group	Frequency/Load Control	**Related FW**	2.2.0
Units	%		
Comm object	19448	**Related applications**	MPTM
Description			
Relative request for BESS kW/Hz output in %. Intended for BESS P control when operating in U-f control mode. See chapter **BESS output control methods P-Q / U-f**. BESS output control methods P-Q / U-f			

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System Load Control

Value group	Frequency/Load Control	**Related FW**	2.2.0
Units	[-]		
Comm object	10792	**Related applications**	MPTM
Description			

This value contains the actual LoadControl mode that the BESS is currently using. This value may differ from setpoint **Load Control PTM Mode** which contains requested Load Control mode.

List of possible states:

None	The system is not operating.
Island	The system operates in the Island mode.
Baseload	The system operates in Baseload mode which is adjusted by the setpoint **BESS Charge Power**/**BESS Discharge Power** while LBI **BESS Charge Enable**/**BESS Discharge Enable** is active.
Baseload with I/E Limit	The system operates in Baseload mode with import/export limitation. Requested load is adjusted by the setpoint **BESS Charge Power**/**BESS Discharge Power** while LBI **BESS Charge Enable**/**BESS Discharge Enable** is active but it is limitated by the setpoint **Import Load**.
Import/Export	The system operates in Import/Export mode which is adjusted by the setpoint **Import Load**.

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Frequency Balancing Weight

Value group	Frequency/Load Control	**Related FW**	2.2.0
Units	[-]		
Comm object	17599	**Related applications**	MINT, MPTM
Description			

This value is related to the function **Dynamic Isochronous Frequency and Voltage Control**

This value is calculated as the minimum output from the curves **Dynamic f Balance Weight - P** Curve and **Dynamic f Balance Weight - f**, multiplied by the **Frequency Balancing Weight** setpoint.

> ***Note:*** *This value is updated only during control modes in which it is actively used by the controller—specifically, in island operation mode when the system is in the Loaded state.*

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Group: Voltage/PF Control

System PF/Q Control

Value group	Voltage/PF Control Voltage/VAR Control	**Related FW**	2.2.0
Units	[-]		
Comm object	10793	**Related applications**	MPTM
Description			

This value contains the actual PF/Q Control mode that the BESS is currently using. This value may differ from setpoint **PF/Q Control PTM Mode** which contains requested PF/Q Control mode.

List of possible states:

None	The system is not operating.
Island	The system operates in the Island mode.
PF Control BASE	The system operates in PF Control mode which is adjusted by the setpoint **#System Power Factor**.
PF(Pm) BASE	The system operates in PF(Pm) mode which is adjusted by the application curve **PF(P)** in x-axe range 0 to 100%.
Q Control BASE	The system operates in Q Control mode which is adjusted by the setpoint **#System Base Q**.
Q(Um) BASE	The system operates in Q(Um) mode which is adjusted by the application curve **Q(Um)** with possible offset by the setpoint **Q(Um) 0 Reference**.
Q(P) BASE	The system operates in Q(P) mode which is adjusted by the application curve **Q(P)** in x-axe range 0 to 100%.
Qref/Ulim BASE	The system operates in Qref/Ulim mode which is adjusted by the application curve **Qref/Ulim** with possible offset by the setpoint **Qref/Pnom Shift**.
PF Control IMP/EXP	The system operates in PF Control mode which is adjusted by the setpoint **Import Power Factor**.
PF(Pm) IMP/EXP	The system operates in PF(Pm) mode which is adjusted by the application curve **PF(P)** in x-axe range -100 to 100%.
Q Control IMP/EXP	The system operates in Q Control mode which is adjusted by the setpoint **Import Q**.
Q(Um) IMP/EXP	The system operates in Q(Um) mode which is adjusted by the application curve **Q(Um)** with possible offset by the setpoint **Q(Um) 0 Reference**.
Q(P) IMP/EXP	The system operates in Q(P) mode which is adjusted by the application curve **Q(P)** in x-axe range -100 to 100%.
Qref/Ulim IMP/EXP	The system operates in Qref/Ulim mode which is adjusted by the application curve **Qref/Ulim** with possible offset by the setpoint **Qref/Pnom Shift**.
PF Control ANEXT BASE	The system operates in PF Control mode which is adjusted by the LAI **PF Control: ANEXT Base PF**.
Q Control ANEXT BASE	The system operates in Q Control mode which is adjusted by the LAI **Q Control: ANEXT Base Q**.
Q(Um) ANEXT BASE	The system operates in Q(Um) mode which is adjusted by the application curve **Q(Um)** with possible offset by the LAI **Q(Um): 0 Ref ANEXT Base Q**.
Qref/Ulim ANEXT BASE	The system operates in Qref/Ulim mode which is adjusted by the application curve **Qref/Ulim** with possible offset by the LAI **Qref/Ulim: ANEXT Qref/Pnom B Q**.
PF Control ANEXT IMP/EXP	The system operates in PF Control mode which is adjusted by the LAI **PF Control: ANEXT Imp/Exp PF**.
Q Control ANEXT IMP/EXP	The system operates in Q Control mode which is adjusted by the LAI **Q(Um): 0 Ref ANEXT Imp/Exp Q**.
Q(Um) ANEXT IMP/EXP	The system operates in Q(Um) mode which is adjusted by the application curve **Q(Um)** with possible offset by the LAI **Q(Um): 0 Ref ANEXT Base Q**.
Qref/Ulim ANEXT IMP/EXP	The system operates in Qref/Ulim mode which is adjusted by the application curve **Qref/Ulim** with possible offset by the LAI **Qref/Ulim: ANEXT Qref/Pnom I/E Q**.

None	BESS is not loaded and rated change is not applied, or the engine is stopped.
Const Excitation	Constant excitation request while GCB is closed and rated change or PF/Q control is **not** active. Usually this state should occur only if rated change is actively used and no rate (regulation) is required at the moment.
V Raise	Rated change while BESS is unloaded (GCB opened).
V Lower	Rated change while BESS is unloaded (GCB opened).
Var Raise	Rated change while BESS is in the parallel operation.
Var Lower	Rated change while BESS is in the parallel operation.
Var Shar	BESS is loaded by reactive power request from Mains controller which is shared with all units in the same group. Only if PF/Q control is active.
Base PF	BESS is loaded by local base PF request (**Local Base Power Factor**) + rated change if Var Raise/Lower is used. Only if PF/Q control is active.
Base Q	BESS is loaded by local base Q request (**Local Base Q**) + rated change if Var Raise/Lower is used. Only if PF/Q control is active.
Ana Lc Baseload	BESS is loaded by local base PF request (**PF CONTROL: ANEXT BASE PF**) + rated change if Var Raise/Lower is used. Only if PF/Q control is active.
Ana Lc Baseload	BESS is loaded by local base Q request (**Q CONTROL: ANEXT BASE Q**) + rated change if Var Raise/Lower is used. Only if PF/Q control is active.
Droop	Var/voltage is controlled by the droop control (emergency or manual droop active). Rated change is not available.

Note: *BESSs can be automatically forced to do Var Shar to pervent overload or reverse power on other units.*

None	BESS is not loaded and rated change is not applied, or the engine is stopped.
Const Excitation	Constant excitation request for all BESSs in Var Shar while rated change or PF/Q control is **not** active. Usually this state should occur only if rated change is actively used and no rate (regulation) is required at the moment.
V Raise	Rated change while system is in the island oepration and permissive snychronization is active.
V Lower	Rated change while system is in the island oepration and permissive snychronization is active.
Var Raise	Rated change while system is in the parallel operation.
Var Lower	Rated change while system is in the parallel operation.
Base PF	BESSs are loaded by request from Mains controller which is shared with all units in the same group (**#System Power Factor** + rated change if Load Raise/Lower is used).
Base Q	BESSs are loaded by request from Mains controller which is shared with all units in the same group (**#System Base Q** + rated change if Load Raise/Lower is used).
Ana Lc Baseload	BESSs are loaded by request from Mains controller which is shared with all units in the same group (**PF CONTROL: ANEXT BASE PF** + rated change if Var Raise/Lower is used).

Ana Sys Base PF	BESSs are loaded by request from Mains controller which is shared with all units in the same group (**Q CONTROL: ANEXT BASE Q** + rated change if Var Raise/Lower is used).
Imp/Exp PF	BESSs are loaded by request from Mains controller which is shared with all units in the same group (**Import Power Factor** + rated change if Load Raise/Lower is used).
Imp/Exp Q	BESSs are loaded by request from Mains controller which is shared with all units in the same group (**Import Q** + rated change if Load Raise/Lower is used).
Ana Imp/Exp PF	BESSs are loaded by request from Mains controller which is shared with all units in the same group (**PF CONTROL: ANEXT IMP/EXP PF** + rated change if Var Raise/Lower is used).
Ana Imp/Exp Q	BESSs are loaded by request from Mains controller which is shared with all units in the same group (**Q CONTROL: ANEXT IMP/EXP Q** + rated change if Var Raise/Lower is used).

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BESS Required Q

Value group	Voltage/PF Control	**Related FW**	2.2.0
Units	kVAr		
Comm object	12877	**Related applications**	MINT, MPTM
Description			
Required reactive power.			

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BESS Required Qrel Lim

Value group	Voltage/PF Control	**Related FW**	2.2.0
Units	%		
Comm object	13169	**Related applications**	MINT, MPTM
Description			
Required relative reactive power.			

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BESS Required Relative Q

Value group	Voltage/PF Control	**Related FW**	2.2.0
Units	%		
Comm object	15901	**Related applications**	MINT, MPTM
Description			
Relative value of required reactive power of the BESS. Relative value of requested reactive power from HLC. For more information **see BESS Output Control on page 1**.			

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BESS Required PF

Value group	Voltage/PF Control	**Related FW**	2.2.0
Units	[-]		
Comm object	16159	**Related applications**	MINT, MPTM
Description			
Required Power Factor.			

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BESS Required PF Character

Value group	Voltage/PF Control	**Related FW**	2.2.0
Units	[-]		
Comm object	9033	**Related applications**	MINT, MPTM
Description			
Required Power Factor Character.			

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Voltage Regulator Output

Value group	Voltage/PF Control	**Related FW**	2.2.0
Units	V		
Comm object	9053	**Related applications**	MINT, MPTM
Description			
This is the actual voltage on the voltage governor output of the controller. In case the Analog Output is switched to PWM mode, the relation is: › 10 V = ~100 % PWM. › -10 V = 0 % PWM			

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Voltage Request

Value group	Voltage/PF Control	**Related FW**	2.2.0
Units	%		
Comm object	14997	**Related applications**	MINT, MPTM
Description			
This value contains the voltage control signal expressed in % for internal Voltage Request of internal Voltage Regulator.			

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BESS Voltage Required

Value group	Voltage/PF Control	**Related FW**	2.2.0
Units	V		
Comm object	19443	**Related applications**	MINT, MPTM
Description			
Requested BESS output Voltage in V. Intended for BESS Q/PF control when operating in U-f control mode. See chapter **BESS output control methods P-Q / U-f**. BESS output control methods P-Q / U-f			

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BESS Voltage Offset

Value group	Voltage/PF Control	**Related FW**	2.2.0
Units	%		
Comm object	19444	**Related applications**	MINT, MPTM
Description			
Requested offset from the BESS nominal output Voltage in V (positive or negative). Intended for BESS Q/PF control when operating in U-f control mode. See chapter **BESS output control methods P-Q / U-f**. BESS output control methods P-Q / U-f			

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BESS Q Required %

Value group	Voltage/PF Control	**Related FW**	2.2.0
Units	%		
Comm object	19445	**Related applications**	MINT, MPTM
Description			
Relative value of requested reactive power of the BESS.			

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Voltage Balancing Weight

Value group	Voltage/PF Control	**Related FW**	2.2.0
Units	[-]		
Comm object	17598	**Related applications**	MINT, MPTM
Description			
This value is related to the function **Dynamic Isochronous Frequency and Voltage Control** This value is calculated as the minimum output from the curves **Dynamic U Balance Weight - Q** Curve and **Dynamic U Balance Weight - U**, multiplied by the **Voltage Balancing Weight** setpoint. ***Note:*** *This value is updated only during control modes in which it is actively used by the controller—specifically, in island operation mode when the system is in the Loaded state.*			

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Group: Controller I/O

Battery Voltage

Value group	Controller I/O	**Related FW**	2.2.0
Units	V		
Comm object	8213	**Related applications**	MINT, MPTM
Description			
Controller's supply voltage.			

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CU-AIN-01

Value group	Controller I/O	**Related FW**	2.2.0
Units	Configurable		
Comm object	9155	**Related applications**	MINT, MPTM
Description			
This is the value of the analog input 1 of the controller. ***Note:*** *Name of this value is changed according to the controller configuration.*			

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CU-AIN-02

Value group	Controller I/O	**Related FW**	2.2.0
Units	Configurable		
Comm object	9156	**Related applications**	MINT, MPTM
Description			
This is the value of the analog input 2 of the controller. ***Note:*** *Name of this value is changed according to the controller configuration.*			

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CU-AIN-03

Value group	Controller I/O	**Related FW**	2.2.0
Units	Configurable		
Comm object	9157	**Related applications**	MINT, MPTM
Description			
This is the value of the analog input 3 of the controller. ***Note:*** *Name of this value is changed according to the controller configuration.*			

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CU-AIN-04

Value group	Controller I/O	**Related FW**	2.2.0
Units	Configurable		
Comm object	9158	**Related applications**	MINT, MPTM
Description			
This is the value of the analog input 4 of the controller. ***Note:*** *Name of this value is changed according to the controller configuration.*			

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Binary Inputs

Value group	Controller I/O	**Related FW**	2.2.0
Units	[-]		
Comm object	8235	**Related applications**	MINT, MPTM
Description			
States of the binary inputs of the controller. 01. CU-BIN-01 02. CU-BIN-02 03. CU-BIN-03 04. CU-BIN-04 05. CU-BIN-05 06. CU-BIN-06 07. CU-BIN-07 08. CU-BIN-08 09. CU-BIN-09 10. CU-BIN-10 11. CU-BIN-11 12. CU-BIN-12 ***Note:*** *Names are changed based on names of representative binary inputs. See Default configuration to see default binary inputs names.*			

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E-STOP

Value group	Controller I/O	Related FW	2.2.0
Units	[-]		
Comm object	15780	Related applications	MINT, MPTM
Description			
Value of ㉓ **E-STOP** . › Log .1 - E-STOP has voltage - alarm **E-STOP** is inactive › Log. 0 - E-STOP has no voltage - alarm **E-STOP** is active			

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Binary Outputs

Value group	Controller I/O	Related FW	2.2.0
Units	[-]		
Comm object	8239	Related applications	MINT, MPTM
Description			
State of the binary outputs of the controller. 01. CU-BOUT-01 02. CU-BOUT-02 03. CU-BOUT-03 04. CU-BOUT-04 05. CU-BOUT-05 06. CU-BOUT-06 07. CU-BOUT-07 08. CU-BOUT-08 09. CU-BOUT-09 10. CU-BOUT-10 11. CU-BOUT-11 12. CU-BOUT-12 ***Note:*** *Names are changed based on names of representative binary outputs.*			

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Group: TotalMultiBESS

MultiBESS P Nominal

Value group	TotalMultiBESS	Related FW	2.2.0
Units	[kW]		
Comm object	17655	Related applications	MINT, MPTM
Description			

MultiBESS P Nominal represents the **total nominal active power capacity** of the entire MultiBESS system as calculated by the master controller (InteliNeo 6000). It defines the maximum continuous power that the system is designed to deliver under normal operating conditions.

Source:

- Derived from the **BESS Nominal Power** values configured in each subordinate InteliNeo 530 BESS unit.

Aggregation Method:

- The InteliNeo 6000 aggregates these values using a sum function across all active BESS units.
- Aggregation is conditioned by the LBI signal **BESS 01 Ready To Load**, ensuring that only units which are online and in a ready state contribute to the total nominal power.

> **IMPORTANT: This Value MultiBESS P Nominal must be manually configured in the InteliNeo 6000 as a Forced Value upon the setpoint Nominal power.**

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MultiBESS P

Value group	TotalMultiBESS	Related FW	2.2.0
Units	[kW]		
Comm object	17659	Related applications	MINT, MPTM
Description			

MultiBESS P represents the total real-time active power output of the entire MultiBESS system as seen by the master controller (InteliNeo 6000).

Source:

- Derived from the **BESS P** values of all subordinate InteliNeo 530 BESS units.

Aggregation Method:

- The InteliNeo 6000 aggregates the individual **BESS XX Actual P** values using a sum function.
- Only units that are online and in a ready state (as indicated by the LBI signal **BESS 01 Ready To Load** are included in the aggregation

> **IMPORTANT: The value must be linked to the LAI AC BESS P manually.**

> **IMPORTANT: The Controller must operate in mode of "AC Values via LAI", it means that the setpoint BESS AC Measurement has to be set in CT Analog Inputs.**

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MultiBESS Q

Value group	TotalMultiBESS	Related FW	2.2.0
Units	[kVAr]		
Comm object	17658	Related applications	MINT, MPTM
Description			

MultiBESS Q represents the total real-time reactive power output of the entire MultiBESS system as seen by the master controller (InteliNeo 6000).

Source:

- Derived from the **BESS Q** values of all subordinate InteliNeo 530 BESS units.

Aggregation Method:

- The InteliNeo 6000 aggregates the individual **BESS XX Actual Q** values using a sum function.
- Only units that are online and in a ready state (as indicated by the LBI signal **BESS 01 Ready To Load** are included in the aggregation.

> **IMPORTANT: The value must be linked to the LAI AC BESS Q manually.**

> **IMPORTANT: The Controller must operate in mode of "AC Values via LAI", it means that the setpoint BESS AC Measurement has to be set in CT Analog Inputs.**

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Group: Statistics

PV kWh

Value group	Statistics	Related FW	2.2.0
Units	kWh		
Comm object	15575	Related applications	MINT, MPTM
Description			

Represents the total energy produced by the PV system, aggregated from the energy values reported by each individual PV inverter (e.g., LAI **PV 01 kWh**).

> ***Note:*** *This value is not based on the integration of the PV active power over time. Instead, it is directly derived from the cumulative energy readings provided by the inverters. For more details, see the section:* ***PV kWh statistics****.*

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PV Annual kWh

Value group	Statistics	Related FW	2.2.0
Units	kWh		
Comm object	15576	Related applications	MINT, MPTM
Description			

Total energy produced by the PV system over a one-year period. Calculated from the **PV kWh** value.

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PV Monthly kWh

Value group	Statistics	**Related FW**	2.2.0
Units	kWh		
Comm object	15577	**Related applications**	MINT, MPTM
Description			
Total energy produced by the PV system over a one-month period. Calculated from the **PV kWh** value.			

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PV Weekly kWh

Value group	Statistics	**Related FW**	2.2.0
Units	kWh		
Comm object	15578	**Related applications**	MINT, MPTM
Description			
Total energy produced by the PV system over a one-week period. Calculated from the **PV kWh** value.			

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PV Daily kWh

Value group	Statistics	**Related FW**	2.2.0
Units	kWh		
Comm object	15579	**Related applications**	MINT, MPTM
Description			
Total energy produced by the PV system over a one-day period. Calculated from the **PV kWh** value.			

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Maximal PV kWh

Value group	Statistics	**Related FW**	2.2.0
Units	[-]		
Comm object	18716	**Related applications**	MINT, MPTM
Description			
This Value is related to the function **PV curtailment counter**. It is theoretical value of the maximal energy which could be produced if the PV energy was not curtailed. Calculation of the this value is based on the the integration of the value **PV Max P** during the time.			

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PV Total Curtailed kWh

Value group	Statistics	**Related FW**	2.2.0
Units	kWh		
Comm object	19548	**Related applications**	MINT, MPTM
Description			
The total energy lost due to curtailment across all PV arrays. If **LAI: Irradiation of PV Array X** is not configured, then this statistics is not counted.			

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PV Curtailed Annual kWh

Value group	Statistics	**Related FW**	2.2.0
Units	kWh		
Comm object	19549	**Related applications**	MINT, MPTM
Description			
The energy lost due to curtailment over the course of a year.			

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PV Curtailed Monthly kWh

Value group	Statistics	**Related FW**	2.2.0
Units	kWh		
Comm object	19550	**Related applications**	MINT, MPTM
Description			
Monthly energy losses due to curtailment.			

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PV Curtailed Weekly kWh

Value group	Statistics	**Related FW**	2.2.0
Units	kWh		
Comm object	19551	**Related applications**	MINT, MPTM
Description			
Weekly energy losses due to curtailment.			

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PV Curtailed Daily kWh

Value group	Statistics	**Related FW**	2.2.0
Units	kWh		
Comm object	19552	**Related applications**	MINT, MPTM
Description			
Daily energy losses due to curtailment.			

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WT kWh

Value group	Statistics	**Related FW**	2.2.0
Units	kWh		
Comm object	15834	**Related applications**	MINT, MPTM
Description			
This statistical value is showing the total kWh produced by the WT. The value is obtained by counting the active power (**WT Actual P**) of the WT.			

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WT Annual kWh

Value group	Statistics	**Related FW**	2.2.0
Units	kWh		
Comm object	15835	**Related applications**	MINT, MPTM
Description			
This statistical value is showing the total kWh produced by the WT per year. The value is obtained by counting the active power (**WT Actual P**) of the WT.			

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WT Monthly kWh

Value group	Statistics	**Related FW**	2.2.0
Units	kWh		
Comm object	15836	**Related applications**	MINT, MPTM
Description			
This statistical value is showing the total kWh produced by the WT per month. The value is obtained by counting the active power (**WT Actual P**) of the WT.			

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WT Weekly kWh

Value group	Statistics	**Related FW**	2.2.0
Units	kWh		
Comm object	15837	**Related applications**	MINT, MPTM
Description			
This statistical value is showing the total kWh produced by the WT per week. The value is obtained by counting the active power (**WT Actual P**) of the WT.			

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WT Daily kWh

Value group	Statistics	**Related FW**	2.2.0
Units	kWh		
Comm object	15838	**Related applications**	MINT, MPTM
Description			
This statistical value is showing the total kWh produced by the WT per day. The value is obtained by counting the active power (**WT Actual P**) of the WT.			

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Batt. Charging Cycles

Value group	Statistics	**Related FW**	2.2.0
Units	[-]		
Comm object	20230	**Related applications**	MINT, MPTM
Description			
This statistical value shows the charging cycles of the BESS. It is incremented together with LAI **BATTERY CHARGING CYCLES** which is the input for this value. ***Note:*** *Usually one charging cycle is defined as complete discharge of fully charged battery or a series of partial drains equal to the battery's capacity.*			

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Batt. Discharge kWh

Value group	Statistics	**Related FW**	2.2.0
Units	kWh		
Comm object	15829	**Related applications**	MINT, MPTM
Description			
Represents the total amount of energy (in kilowatt-hours) that has been discharged from a specific BESS unit. This value is read directly from the BESS and is used to calculate interval-based statistics. ***Note:*** *BESS statistics are based on reading the energy data directly from the BESS units. InteliNeo does not support calculating BESS energy values by integrating the current active power of the BESS system over time.*			

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Batt. Discharge Annual kWh

Value group	Statistics	**Related FW**	2.2.0
Units	kWh		
Comm object	15830	**Related applications**	MINT, MPTM
Description			
Total energy discharged from the battery over the past year. The calculation is based on the value **Batt. Discharge kWh**.			

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Batt. Discharge Month kWh

Value group	Statistics	**Related FW**	2.2.0
Units	kWh		
Comm object	15831	**Related applications**	MINT, MPTM
Description			
Total energy discharged from the battery during the current or selected month. The calculation is based on the value **Batt. Discharge kWh**.			

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Batt. Discharge Week kWh

Value group	Statistics	**Related FW**	2.2.0
Units	kWh		
Comm object	15832	**Related applications**	MINT, MPTM
Description			
Total energy discharged from the battery during the current or selected week. The calculation is based on the value **Batt. Discharge kWh**.			

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Batt. Discharge Daily kWh

Value group	Statistics	**Related FW**	2.2.0
Units	kWh		
Comm object	15833	**Related applications**	MINT, MPTM
Description			
Total energy discharged from the battery during the current or selected day. The calculation is based on the value **Batt. Discharge kWh**.			

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Batt. Charge kWh

Value group	Statistics	**Related FW**	2.2.0
Units	kWh		
Comm object	15824	**Related applications**	MINT, MPTM
Description			
Represents the total amount of energy (in kilowatt-hours) that has been charged into a specific BESS unit. This value is read directly from the BESS and is used to calculate interval-based statistics. ***Note:*** *BESS statistics are based on reading the energy data directly from the BESS units. InteliNeo does not support calculating BESS energy values by integrating the current active power of the BESS system over time.*			

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Batt. Charge Annual kWh

Value group	Statistics	**Related FW**	2.2.0
Units	kWh		
Comm object	15825	**Related applications**	MINT, MPTM
Description			
Total energy charged into the battery over the past year. The calculation is based on the value **Batt. Charge kWh** .			

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Batt. Charge Month kWh

Value group	Statistics	**Related FW**	2.2.0
Units	kWh		
Comm object	15826	**Related applications**	MINT, MPTM
Description			
Total energy charged into the battery during the current or selected month. The calculation is based on the value **Batt. Charge kWh** .			

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Batt. Charge Week kWh

Value group	Statistics	**Related FW**	2.2.0
Units	kWh		
Comm object	15827	**Related applications**	MINT, MPTM
Description			
Total energy charged into the battery during the current or selected week. The calculation is based on the value **Batt. Charge kWh** .			

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Batt. Charge Daily kWh

Value group	Statistics	**Related FW**	2.2.0
Units	kWh		
Comm object	15828	**Related applications**	MINT, MPTM
Description			
Total energy charged into the battery during the current or selected day. The calculation is based on the value **Batt. Charge kWh** .			

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Hours Of Silent

Value group	Statistics	**Related FW**	2.2.0
Units	h		
Comm object	20130	**Related applications**	MINT, MPTM
Description			
This statistical value is showing diesel-off operation compared to total hours in hours.			

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Carbon Offset Equivalent

Value group	Statistics	**Related FW**	2.2.0
Units	t		
Comm object	19897	**Related applications**	MINT, MPTM
Description			
This statistical value is showing saved CO2 produced by diesel/gas genset per generated kWh by alternative source of energy in tons.			

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Gen kWh

Value group	Statistics	**Related FW**	2.2.0
Units	kWh		
Comm object	15580	**Related applications**	MINT, MPTM
Description			
This statistical value is showing the total sum of energy in kWh.			

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Gen Annual kWh

Value group	Statistics	**Related FW**	2.2.0
Units	kWh		
Comm object	15581	**Related applications**	MINT, MPTM
Description			
This statistical value is showing the sum of energy in kWh per year.			

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Gen Daily kWh

Value group	Statistics	**Related FW**	2.2.0
Units	kWh		
Comm object	15584	**Related applications**	MINT, MPTM
Description			
This statistical value is showing the sum of energy in kWh per day.			

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Gen Monthly kWh

Value group	Statistics	**Related FW**	2.2.0
Units	kWh		
Comm object	15582	**Related applications**	MINT, MPTM
Description			
This statistical value is showing the sum of energy in kWh per month.			

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Gen Weekly kWh

Value group	Statistics	**Related FW**	2.2.0
Units	kWh		
Comm object	15583	**Related applications**	MINT, MPTM
Description			
This statistical value is showing the sum of energy in kWh per week.			

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Fuel Used

Value group	Statistics	**Related FW**	2.2.0
Units	l		
Comm object	15585	**Related applications**	MINT, MPTM
Description			
This statistical value is showing the total fuel consumption from all gensets in litres.			

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Fuel Annual

Value group	Statistics	**Related FW**	2.2.0
Units	l		
Comm object	15586	**Related applications**	MINT, MPTM
Description			
This statistical value is showing the fuel consumption from all gensets in litres per year.			

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Fuel Monthly

Value group	Statistics	**Related FW**	2.2.0
Units	l		
Comm object	15587	**Related applications**	MINT, MPTM
Description			
This statistical value is showing the fuel consumption from all gensets in litres per month.			

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Fuel Weekly

Value group	Statistics	**Related FW**	2.2.0
Units	l		
Comm object	15588	**Related applications**	MINT, MPTM
Description			
This statistical value is showing the fuel consumption from all gensets in litres per week.			

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Fuel Daily

Value group	Statistics	**Related FW**	2.2.0
Units	l		
Comm object	15589	**Related applications**	MINT, MPTM
Description			
This statistical value is showing the fuel consumption from all gensets in litres per day.			

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PCC kWh

Value group	Statistics	**Related FW**	2.2.0
Units	kWh		
Comm object	8205	**Related applications**	MINT, MPTM
Description			
This statistical value is showing the total kWh produced by the BESS. The value is obtained by counting the active power (**BESS P**) of the BESS.			

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PCC kVArh

Value group	Statistics	**Related FW**	2.2.0
Units	kVArh		
Comm object	8539	**Related applications**	MINT, MPTM
Description			
This statistical value is showing the total kVArh produced by the BESS. The value is obtained by counting the reactive power (**BESS Q**) of the BESS.			

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PCC kVAh

Value group	Statistics	**Related FW**	2.2.0
Units	kVAh		
Comm object	13663	**Related applications**	MINT, MPTM
Description			
This statistical value is showing the total kVAh produced by the BESS. The value is obtained by counting the apparent power (**BESS S**) of the BESS.			

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Mains kWh Mains kWh

Value group	Statistics	**Related FW**	2.2.0
Units	kVAh		
Comm object	11025	**Related applications**	MPTM
Description			
Counter of **Mains Import P**, when the value is negative ***Note:*** *This value can be also switched into one decimal see* ***Power Formats And Units****.*			

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Mains kVArh Mains kVAr

Value group	Statistics	**Related FW**	2.2.0
Units	kVArh		
Comm object	11026	**Related applications**	MPTM
Description			
Counter of **Mains Import Q**, when the value is negative ***Note:*** *This value can be also switched into one decimal see* ***Power Formats And Units****.*			

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Running Hours

Value group	Statistics	**Related FW**	2.2.0
Units	hours		
Comm object	8206	**Related applications**	MINT, MPTM
Description			
BESS operation hours counter. The BESS hours are incremented in the controller while the BESS is running. Source of running hours is adjusted via setpoint **Run Hours Source**.			

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Conditioned Running Hours 1

Value group	Statistics	**Related FW**	2.2.0
Units	hours		
Comm object	20292	**Related applications**	MINT, MPTM
Description			
This value contains counted hours while corresponding LBI is active.			

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Conditioned Running Hours 2

Value group	Statistics	**Related FW**	2.2.0
Units	hours		
Comm object	20293	**Related applications**	MINT, MPTM
Description			
This value contains counted hours while corresponding LBI is active.			

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Num Starts

Value group	Statistics	**Related FW**	2.2.0
Units	[-]		
Comm object	8207	**Related applications**	MINT, MPTM
Description			
BESS start commands counter. The counter is increased only by 1 even if the particular start command will take more than one attempt.			

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Maintenance Timer 1 RunHours

Value group	Statistics	**Related FW**	2.2.0
Units	hours		
Comm object	11616	**Related applications**	MINT, MPTM
Description			
Countdown running hours until next maintenance. Initial value can be set in **Maintenance Timer 1 RunHours**.			

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Maintenance Timer 1 Interval

Value group	Statistics	**Related FW**	2.2.0
Units	hours		
Comm object	16387	**Related applications**	MINT, MPTM
Description			
Countdown days until next maintenance. Initial value can be set in **Maintenance Timer 1 Interval**.			

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Maintenance Timer 2 RunHours

Value group	Statistics	**Related FW**	2.2.0
Units	hours		
Comm object	11617	**Related applications**	MINT, MPTM
Description			
Countdown running hours until next maintenance. Initial value can be set in **Maintenance Timer 2 RunHours**.			

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Maintenance Timer 2 Interval

Value group	Statistics	**Related FW**	2.2.0
Units	hours		
Comm object	16388	**Related applications**	MINT, MPTM
Description			
Countdown days until next maintenance. Initial value can be set in **Maintenance Timer 2 Interval**.			

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Maintenance Timer 3 RunHours

Value group	Statistics	**Related FW**	2.2.0
Units	hours		
Comm object	11618	**Related applications**	MINT, MPTM
Description			
Countdown running hours until next maintenance. Initial value can be set in **Maintenance Timer 3 RunHours**.			

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Maintenance Timer 3 Interval

Value group	Statistics	**Related FW**	2.2.0
Units	hours		
Comm object	16389	**Related applications**	MINT, MPTM
Description			
Countdown days until next maintenance. Initial value can be set in **Maintenance Timer 3 Interval**.			

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Maintenance Timer 4 RunHours

Value group	Statistics	**Related FW**	2.2.0
Units	hours		
Comm object	11619	**Related applications**	MINT, MPTM
Description			
Countdown running hours until next maintenance. Initial value can be set in **Maintenance Timer 4 RunHours**.			

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Maintenance Timer 4 Interval

Value group	Statistics	**Related FW**	2.2.0
Units	hours		
Comm object	20288	**Related applications**	MINT, MPTM
Description			
Countdown days until next maintenance. Initial value can be set in **Maintenance Timer 4 Interval**.			

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Num E-Stops

Value group	Statistics	**Related FW**	2.2.0
Units	[-]		
Comm object	11195	**Related applications**	MINT, MPTM
Description			
This value counts amount of BESS shutdowns which are triggered by **E-STOP** or **Emergency Stop**. ***Note:*** *Value is incremented only if BESS was running during alarm activation.*			

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Shutdowns

Value group	Statistics	**Related FW**	2.2.0
Units	[-]		
Comm object	11196	**Related applications**	MINT, MPTM
Description			
This counter counts occurrences of a **Shutdown** alarm which actually shutdowns the BESS. If 2 shutdown alarms are received at the same time, this value is increased only by 1. ***Note:*** *This value does not count occurrences of **E-STOP** and **Emergency Stop**. These are counted separately in **Num E-Stops**.*			

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Fast Pulse Counter 1

Value group	Statistics	**Related FW**	2.2.0
Units	[-]		
Comm object	20303	**Related applications**	MINT, MPTM
Description			
This is the Statistic value of the Fast Pulse Counter 1 which is physically configured to binary input 9. Change the conversion rate via setpoint **Conversion Coeff. Fast Pulse 1**. See the chapter **Pulse Counters** for more information. ***Note:*** *The Value can be set via InteliConfig in the interface "Set Statistics".*			

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Fast Pulse Counter 2

Value group	Statistics	**Related FW**	2.2.0
Units	[-]		
Comm object	20304	**Related applications**	MINT, MPTM
Description			
This is the Statistic value of the Fast Pulse Counter 2 which is physically configured to binary input 10. Change the conversion rate via setpoint **Conversion Coeff. Fast Pulse 2**. See the chapter **Pulse Counters** for more information. ***Note:*** *The Value can be set via InteliConfig in the interface "Set Statistics".*			

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Pulse Counter 1

Value group	Statistics	**Related FW**	2.2.0
Units	[-]		
Comm object	10986	**Related applications**	MINT, MPTM
Description			
This is the Statistic value of the Pulse Counter 1 which is connected with LBI **PULSE COUNTER 1**. Change the conversion rate via setpoint **Conversion Coefficient Pulse 1**. See the chapter **Pulse Counters** for more information. ***Note:*** *The Value can be set via InteliConfig in the interface "Set Statistics".*			

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Pulse Counter 2

Value group	Statistics	**Related FW**	2.2.0
Units	[-]		
Comm object	10987	**Related applications**	MINT, MPTM
Description			
This is the Statistic value of Pulse the Counter 2 which is connected with LBI **PULSE COUNTER 2**. Change the conversion rate via setpoint **Conversion Coefficient Pulse 2**. See the chapter **Pulse Counters** for more information. ***Note:*** *The Value can be set via InteliConfig in the interface "Set Statistics".*			

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Group: Info

Application Mode

Value group	Info	**Related FW**	2.2.0
Units	[-]		
Comm object	14446	**Related applications**	MINT, MPTM
Description			
This value reflects which application is used for the controller at the moment. **IMPORTANT: Application Mode can be changed only if Controller Mode = OFF.**			

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Controller Mode

Value group	Info	**Related FW**	2.2.0
Units	[-]		
Comm object	9887	**Related applications**	MINT, MPTM
Description			
This value displays the setting of the setpoint **Controller Mode**.			

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Load Shedding Status

Value group	Info	**Related FW**	2.2.0
Units	[-]		
Comm object	9591	**Related applications**	MINT, MPTM
Description			
This value contains actual active highest stage of **Load shedding stages**. Value has range from 0 to 8 12, where 0 means no load shedding stage is active.			

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BESS state

Value group	Info	**Related FW**	2.2.0
Units	[-]		
Comm object	9244	**Related applications**	MINT, MPTM
Description			
This value contains actual BESS state message.			

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Breaker state

Value group	Info	**Related FW**	2.2.0
Units	[-]		
Comm object	9245	**Related applications**	MINT, MPTM
Description			
This value contains actual breaker state message.			

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Timer Text

Value group	Info	**Related FW**	2.2.0
Units	[-]		
Comm object	10040	**Related applications**	MINT, MPTM
Description			

This value contains actual timer text message.

- No Timer
- ES Ready To Load
- Stop Time
- Precharging TO
- Start Delay
- SyncTOut
- Unloading
- Ready To Start
- BESS Start TO
- MinStabTO
- MaxStabTO
- Next Start Del
- Next Stop Del

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Connection Type

Value group	Info	**Related FW**	2.2.0
Units	[-]		
Comm object	12944	**Related applications**	MINT, MPTM
Description			
This value contains name of currently selected connection type, which is adjusted via **Connection type**.			

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Timer Value

Value group	Info	**Related FW**	2.2.0
Units	[MM:SS]		
Comm object	14147	**Related applications**	MINT, MPTM
Description			
This value contains time of active timer which is counted down, name of the timer is in value **Timer Text**.			

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ID String

Value group	Info	**Related FW**	2.2.0
Units	[-]		
Comm object	24501	**Related applications**	MINT, MPTM
Description			
Name of controller which is used in InteliConfig in command bar.			

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FW Version

Value group	Info	**Related FW**	2.2.0
Units	[-]		
Comm object	24339	**Related applications**	MINT, MPTM
Description			
Major and minor firmware version number.			

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Application

Value group	Info	**Related FW**	2.2.0
Units	[-]		
Comm object	8480	**Related applications**	MINT, MPTM
Description			
The value contains actual application in controller.			

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FW Branch

Value group	Info	**Related FW**	2.2.0
Units	[-]		
Comm object	8707	**Related applications**	MINT, MPTM
Description			
The value contains actual branch of firmware in controller.			

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CAN Intercontroller Comm Mode

Value group	Info	**Related FW**	2.2.0
Units	[-]		
Comm object	23969	**Related applications**	MINT, MPTM
Description			
This value contains actual mode of **CAN Intercontroller Communication**. ***Note:*** *In case that there is a mismatch between this value and setpoint **CAN ICC Mode**, alarm **ALI CAN Mode Inconsistency** is activated.*			

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CAN Intercontroller Comm Redundancy

Value group	Info	**Related FW**	2.2.0
Units	[-]		
Comm object	23970	**Related applications**	MINT, MPTM
Description			
This value informs if CAN Intercontroller communication Redundancy is enabled or not. ***Note:*** *In case that there is a mismatch between this value and setpoint **CAN ICC Mode**, alarm **ALI CAN Mode Inconsistency** is activated.*			

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Screen Mask

Value group	Info	**Related FW**	2.2.0
Units	[-]		
Comm object	20164	**Related applications**	MINT, MPTM
Description			
This value consist of information about each type of source integrated by InteliNeo. Most of the instruments in IV5.2 screens, in Inteli SCADA od screens of InteliConfig reffers to this value.			

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SD Card Status

Value group	Info	**Related FW**	2.2.0
Units	[-]		
Comm object	20589	**Related applications**	MINT, MPTM
Description			

This value shows the actual status of the SD Card.

Value	Meaning
Mount In Progress	The SD Card is being booted.
Not Inserted	There is no SD Card in the SD card slot detected.
Unmount	The SD card is inserted but the setpoint **SD Card File System** is set to Unmount option.
Ready To Use	SD Card is mounted and ready to be used.
Format Required	The wrong file system format of the SD Card is detected.
Formatting	The formatting process of the SD Card is active.
Formatting Failed	The formatting process failed.
Write Protected	It is not possible to write data on SD Card (Read Only mode).
Not Supported	Used SD Card is not supported (wrong parameters of the SD card).
Error	This status is used for any other errors which are not covered by the states above.

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SD Card Capacity

Value group	Info	**Related FW**	2.2.0
Units	[GB]		
Comm object	20026	**Related applications**	MINT, MPTM
Description			

This value provides information about SD Card storage capacity in GB.

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SD Card Free Space

Value group	Info	**Related FW**	2.2.0
Units	[%]		
Comm object	20027	**Related applications**	MINT, MPTM
Description			

This value shows relative free space of SD Card storage.

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History Lifetime

Value group	Info	**Related FW**	2.2.0
Units	[%]		
Comm object	20284	**Related applications**	MINT, MPTM
Description			

This value shows the lifetime usage of non-volatile memory which is used for storing of history records. Please refer to the table below for detailed information.

Value [%]	Meaning
- 1	Memory's lifetime usage can not be obtained.
10	Memory's lifetime usage is between 0-10%.
20	Memory's lifetime usage is between 11-20%..
30	Memory's lifetime usage is between 21-30%.
40	Memory's lifetime usage is between 31-40%.
50	Memory's lifetime usage is between 41-50%.
60	Memory's lifetime usage is between 51-60%.
70	Memory's lifetime usage is between 61-70%.
80	Memory's lifetime usage is between 71-80%.
90	Memory's lifetime usage is between 81-90%.
100	Memory's lifetime usage is between 91-100%.
110	Memory's lifetime usage is over 100 %. The memory may fail.

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Forced Value Status

Value group	Info	**Related FW**	2.2.0
Units	[-]		
Comm object	20544	**Related applications**	MINT, MPTM
Description			

This value contains list of all 32 LBIs for **Forced Value**. Logical 1 means that the respective LBI is currently activated.

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SW Key Feature List

Value group	Info	**Related FW**	2.2.0
Units	[-]		
Comm object	20591	**Related applications**	MINT, MPTM
Description			
This value contains list of premium features which are unlocked by SW key. Logical 1 means that the feature is activated and can be used without of restrictions. 1. CAN Intercontroller RedundancyReserved 2. Modbus Master 3. Hot Swap Redundancy 4. PLC ExtendedReserved 5. Variable Speed BESS Reserved			

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Hot Swap Redundancy Status

Value group	Info	**Related FW**	2.2.0
Units	[-]		
Comm object	16887	**Related applications**	MINT, MPTM
Description			

This value contains list of status bits related to Hot Swap Redundancy. If **Hot Swap Redundancy** = Master, at least one of the bits 01-04 is active, bits 05-08 are never active. If **Hot Swap Redundancy** = Backup, at least one of the bits 05-08 is active, bits 01-04 are never active. If **Hot Swap Redundancy** = Disabled, none of the bits is active.

Master: Backup Alive	> this controller is the master > the master is receiving heartbeat from backup
Master: Backup Control	> this controller is the master > the master is considered to be dead by the backup controller > the master is forced to the listening mode > **the backup is controlling**
Master: Ready to Control	> this controller is the master > the master is alive > **the master is controlling/the master is ready to control**
Master: Data Synchro Fail	> this controller is the master > the master is not receiving data from backup
Backup: Master Alive	> this controller is the backup > the backup is receiving heartbeat from master
Backup: Master Control	> this controller is the backup > the backup is considered to be dead by the master controller > the backup is forced to the listening mode > **the master is controlling**
Backup: Ready to Control	> this controller is the backup > the backup is alive > **the backup is controlling/the backup is ready to control**
Backup: Data Synchro Fail	> this controller is the backup > the backup is not receiving data from master

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CAN16

Value group	Info	**Related FW**	2.2.0
Units	[-]		
Comm object	8546	**Related applications**	MINT
Description			
This value contains binary information about controllers connected via **CAN2A** and/or **Communication peripherals** with **CAN Controller Address** = <1,16>. Each bit represent controller with the same CAN address as number of the bit. › Log. 1 - this controller receives messages from the controller with specific CAN address › Log. 0 - this controller does not receive messages from the controller with specific CAN address			

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CAN32

Value group	Info	**Related FW**	2.2.0
Units	[-]		
Comm object	8827	**Related applications**	MINT
Description			
This value contains binary information about controllers connected via **CAN2A** and/or **Communication peripherals** with **CAN Controller Address** = <17,32>. Each bit represent controller with the same CAN address as number of the bit. › Log. 1 - this controller receives messages from the controller with specific CAN address › Log. 0 - this controller does not receive messages from the controller with specific CAN address			

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CAN48

Value group	Info	**Related FW**	2.2.0
Units	[-]		
Comm object	16684	**Related applications**	MINT
Description			
This value contains binary information about controllers connected via **CAN2A** and/or **Communication peripherals** with **CAN Controller Address** = <33,48>. Each bit represent controller with the same CAN address as number of the bit. › Log. 1 - this controller receives messages from the controller with specific CAN address › Log. 0 - this controller does not receive messages from the controller with specific CAN address			

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CAN64

Value group	Info	**Related FW**	2.2.0
Units	[-]		
Comm object	16685	**Related applications**	MINT
Description			
This value contains binary information about controllers connected via **CAN2A** and/or **Communication peripherals** with **CAN Controller Address** = <49,64>. Each bit represent controller with the same CAN address as number of the bit. › Log. 1 - this controller receives messages from the controller with specific CAN address › Log. 0 - this controller does not receive messages from the controller with specific CAN address			

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Reg16

Value group	Info	**Related FW**	2.2.0
Units	[-]		
Comm object	11081	**Related applications**	MINT
Description			
This value contains binary information about controllers connected via **CAN2A** and/or **Communication peripherals** with **CAN Controller Address** = <1,16>. Each bit represent controller with the same CAN address as number of the bit. › Log. 1 - controller with this CAN address is in the same group (is connected to the same bus). › Log. 0 - controller with this CAN address is **NOT** in the same group (is **NOT** connected to the same bus).			

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Reg32

Value group	Info	**Related FW**	2.2.0
Units	[-]		
Comm object	11082	**Related applications**	MINT
Description			
This value contains binary information about controllers connected via **CAN2A** and/or **Communication peripherals** with **CAN Controller Address** = <17,32>. Each bit represent controller with the same CAN address as number of the bit. › Log. 1 - controller with this CAN address is in the same group (is connected to the same bus). › Log. 0 - controller with this CAN address is **NOT** in the same group (is **NOT** connected to the same bus).			

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Reg48

Value group	Info	**Related FW**	2.2.0
Units	[-]		
Comm object	16688	**Related applications**	MINT
Description			
This value contains binary information about controllers connected via **CAN2A** and/or **Communication peripherals** with **CAN Controller Address** = <33,48>. Each bit represent controller with the same CAN address as number of the bit. › Log. 1 - controller with this CAN address is in the same group (is connected to the same bus). › Log. 0 - controller with this CAN address is **NOT** in the same group (is **NOT** connected to the same bus).			

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Reg64

Value group	Info	**Related FW**	2.2.0
Units	[-]		
Comm object	16689	**Related applications**	MINT
Description			
This value contains binary information about controllers connected via **CAN2A** and/or **Communication peripherals** with **CAN Controller Address** = <49,64>. Each bit represent controller with the same CAN address as number of the bit. › Log. 1 - controller with this CAN address is in the same group (is connected to the same bus). › Log. 0 - controller with this CAN address is **NOT** in the same group (is **NOT** connected to the same bus).			

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Gen Loaded 16

Value group	Info	**Related FW**	2.2.0
Units	[-]		
Comm object	10196	**Related applications**	MINT
Description			
This value contains binary information about controllers connected via **CAN2A** and/or **Communication peripherals** with **CAN Controller Address** = <1,16>. Each bit represent controller with the same CAN address as number of the bit. › Log. 1 - controller with this CAN address is currently loaded › Log. 0 - controller with this CAN address is currently not loaded			

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Gen Loaded 32

Value group	Info	**Related FW**	2.2.0
Units	[-]		
Comm object	10197	**Related applications**	MINT
Description			
This value contains binary information about controllers connected via **CAN2A** and/or **Communication peripherals** with **CAN Controller Address** = <17,32>. Each bit represent controller with the same CAN address as number of the bit. › Log. 1 - controller with this CAN address is currently loaded › Log. 0 - controller with this CAN address is currently not loaded			

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Gen Loaded 48

Value group	Info	**Related FW**	2.2.0
Units	[-]		
Comm object	16686	**Related applications**	MINT
Description			
This value contains binary information about controllers connected via **CAN2A** and/or **Communication peripherals** with **CAN Controller Address** = <33,48>. Each bit represent controller with the same CAN address as number of the bit. › Log. 1 - controller with this CAN address is currently loaded › Log. 0 - controller with this CAN address is currently not loaded			

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Gen Loaded 64

Value group	Info	**Related FW**	2.2.0
Units	[-]		
Comm object	16687	**Related applications**	MINT
Description			
This value contains binary information about controllers connected via **CAN2A** and/or **Communication peripherals** with **CAN Controller Address** = <49,64>. Each bit represent controller with the same CAN address as number of the bit. › Log. 1 - controller with this CAN address is currently loaded › Log. 0 - controller with this CAN address is currently not loaded			

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SPI Module A

Value group	Info	**Related FW**	2.2.0
Units	[-]		
Comm object	14447	**Related applications**	MINT, MPTM
Description			
Detected Plug-in module in the slot A.			

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SPI Module B

Value group	Info	**Related FW**	2.2.0
Units	[-]		
Comm object	14448	**Related applications**	MINT, MPTM
Description			
Detected Plug-in module in the slot B.			

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Group: User Buttons

User Buttons 1-32

Value group	User Buttons	Related FW	2.2.0
Units	[-]		
Comm object	20743	Related applications	MINT, MPTM
Description			

State of **User Buttons**.

1. User Button 1
2. User Button 2
3. User Button 3
4. User Button 4
5. User Button 5
6. User Button 6
7. User Button 7
8. User Button 8
9. User Button 9
10. User Button 10
11. User Button 11
12. User Button 12
13. User Button 13
14. User Button 14
15. User Button 15
16. User Button 16
17. User Button 17
18. User Button 18
19. User Button 19
20. User Button 20
21. User Button 21
22. User Button 22
23. User Button 23
24. User Button 24
25. User Button 25
26. User Button 26
27. User Button 27
28. User Button 28
29. User Button 29
30. User Button 30
31. User Button 31
32. User Button 32

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User Buttons 33-48

Value group	User Buttons	Related FW	2.2.0
Units	[-]		
Comm object	17863	Related applications	MINT, MPTM
Description			
State of **User Buttons**. 33. User Button 33 34. User Button 34 35. User Button 35 36. User Button 36 37. User Button 37 38. User Button 38 39. User Button 39 40. User Button 40 41. User Button 41 42. User Button 42 43. User Button 43 44. User Button 44 45. User Button 45 46. User Button 46 47. User Button 47 48. User Button 48			

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Group: Log Bout

Log Bout 1

Value group	Log Bout	Related FW	2.2.0
Units	[-]		
Comm object	9143	Related applications	MINT, MPTM
Description			
State of binary outputs.			

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Log Bout 2

Value group	Log Bout	**Related FW**	2.2.0
Units	[-]		
Comm object	9144	**Related applications**	MINT, MPTM
Description			
State of binary outputs.			

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Log Bout 3

Value group	Log Bout	**Related FW**	2.2.0
Units	[-]		
Comm object	9145	**Related applications**	MINT, MPTM
Description			
State of binary outputs.			

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Log Bout 4

Value group	Log Bout	**Related FW**	2.2.0
Units	[-]		
Comm object	9146	**Related applications**	MINT, MPTM
Description			
State of binary outputs.			

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Log Bout 5

Value group	Log Bout	**Related FW**	2.2.0
Units	[-]		
Comm object	9147	**Related applications**	MINT, MPTM
Description			
State of binary outputs.			

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Log Bout 6

Value group	Log Bout	**Related FW**	2.2.0
Units	[-]		
Comm object	9148	**Related applications**	MINT, MPTM
Description			
State of binary outputs.			

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Log Bout 7

Value group	Log Bout	**Related FW**	2.2.0
Units	[-]		
Comm object	9149	**Related applications**	MINT, MPTM
Description			
State of binary outputs.			

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Log Bout 8

Value group	Log Bout	**Related FW**	2.2.0
Units	[-]		
Comm object	9150	**Related applications**	MINT, MPTM
Description			
State of binary outputs.			

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Log Bout 9

Value group	Log Bout	**Related FW**	2.2.0
Units	[-]		
Comm object	11896	**Related applications**	MINT, MPTM
Description			
State of binary outputs.			

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Log Bout 10

Value group	Log Bout	**Related FW**	2.2.0
Units	[-]		
Comm object	11897	**Related applications**	MINT, MPTM
Description			
State of binary outputs.			

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Log Bout 11

Value group	Log Bout	**Related FW**	2.2.0
Units	[-]		
Comm object	11898	**Related applications**	MINT, MPTM
Description			
State of binary outputs.			

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Log Bout 12

Value group	Log Bout	**Related FW**	2.2.0
Units	[-]		
Comm object	11899	**Related applications**	MINT, MPTM
Description			
State of binary outputs.			

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Log Bout 13

Value group	Log Bout	**Related FW**	2.2.0
Units	[-]		
Comm object	11900	**Related applications**	MINT, MPTM
Description			
State of binary outputs.			

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Log Bout 14

Value group	Log Bout	**Related FW**	2.2.0
Units	[-]		
Comm object	11901	**Related applications**	MINT, MPTM
Description			
State of binary outputs.			

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Log Bout 15

Value group	Log Bout	**Related FW**	2.2.0
Units	[-]		
Comm object	11902	**Related applications**	MINT, MPTM
Description			
State of binary outputs.			

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Log Bout 16

Value group	Log Bout	**Related FW**	2.2.0
Units	[-]		
Comm object	11903	**Related applications**	MINT, MPTM
Description			
State of binary outputs.			

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Group: Scheduler

Time

Setpoint group	Scheduler	**Related FW**	2.2.0
Range [units]	HH:MM:SS [-]		
Default value	0:0:0	**Force value**	NO
Step	[-]		
Comm object	24554	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Always		
Description			
Real time clock adjustment.			

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Date

Setpoint group	Scheduler	**Related FW**	2.2.0
Range [units]	YYYY-MM-DD [-]		
Default value	2017-01-01	**Force value**	NO
Step	[-]		
Comm object	24553	**Related applications**	MINT, MPTM
Config level	Standard		
Setpoint visibility	Always		
Description			
Actual date adjustment.			

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Time Mode

Value group	Scheduler	**Related FW**	2.2.0
Units	[-]		
Comm object	20252	**Related applications**	MINT, MPTM
Description			
Shows setup time mode. STD - Standard zone time (e.g GMT+1 for Prague) DST - Daylight Saving Time = STD+1 (e.g. GMT+2 for Prague)			

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Sunrise Time

Value group	Scheduler	**Related FW**	2.2.0
Units	[hh:mm.ss]		
Comm object	20223	**Related applications**	MINT, MPTM
Description			
This value indicates the time until sunrise.			

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Sunset Time

Value group	Scheduler	**Related FW**	2.2.0
Units	[hh:mm.ss]		
Comm object	20221	**Related applications**	MINT, MPTM
Description			
This value indicates the time until sunset.			

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Time To Sunrise

Value group	Scheduler	**Related FW**	2.2.0
Units	[min]		
Comm object	19046	**Related applications**	MINT, MPTM
Description			
This value shows remaining time until sunrise.			

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Time To Sunset

Value group	Scheduler	**Related FW**	2.2.0
Units	[min]		
Comm object	19047	**Related applications**	MINT, MPTM
Description			
This value shows remaining time until sunset.			

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Exercise Timer 1

Value group	Scheduler	**Related FW**	2.2.0
Units	[hh:mm.ss]		
Comm object	19664	**Related applications**	MINT, MPTM
Description			
Value for Exercise Timer 1.			

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Exercise Timer 2

Value group	Scheduler	**Related FW**	2.2.0
Units	[hh:mm.ss]		
Comm object	19665	**Related applications**	MINT, MPTM
Description			
Value for Exercise Timer 2.			

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Exercise Timer 3

Value group	Scheduler	**Related FW**	2.2.0
Units	[hh:mm.ss]		
Comm object	19666	**Related applications**	MINT, MPTM
Description			
Value for Exercise Timer 3.			

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Exercise Timer 4

Value group	Scheduler	**Related FW**	2.2.0
Units	[hh:mm.ss]		
Comm object	19667	**Related applications**	MINT, MPTM
Description			
Value for Exercise Timer 4.			

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Exercise Timer 5

Value group	Scheduler	**Related FW**	2.2.0
Units	[hh:mm.ss]		
Comm object	19668	**Related applications**	MINT, MPTM
Description			
Value for Exercise Timer 5.			

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Exercise Timer 6

Value group	Scheduler	**Related FW**	2.2.0
Units	[hh:mm.ss]		
Comm object	19669	**Related applications**	MINT, MPTM
Description			
Value for Exercise Timer 6.			

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Exercise Timer 7

Value group	Scheduler	**Related FW**	2.2.0
Units	[hh:mm.ss]		
Comm object	19670	**Related applications**	MINT, MPTM
Description			
Value for Exercise Timer 7.			

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Exercise Timer 8

Value group	Scheduler	**Related FW**	2.2.0
Units	[hh:mm.ss]		
Comm object	19671	**Related applications**	MINT, MPTM
Description			
Value for Exercise Timer 8.			

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Exercise Timer 9

Value group	Scheduler	**Related FW**	2.2.0
Units	[hh:mm.ss]		
Comm object	19672	**Related applications**	MINT, MPTM
Description			
Value for Exercise Timer 9.			

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Exercise Timer 10

Value group	Scheduler	**Related FW**	2.2.0
Units	[hh:mm.ss]		
Comm object	19673	**Related applications**	MINT, MPTM
Description			
Value for Exercise Timer 10.			

back to List of values

Exercise Timer 11

Value group	Scheduler	**Related FW**	2.2.0
Units	[hh:mm.ss]		
Comm object	19674	**Related applications**	MINT, MPTM
Description			
Value for Exercise Timer 11.			

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Exercise Timer 12

Value group	Scheduler	**Related FW**	2.2.0
Units	[hh:mm.ss]		
Comm object	19675	**Related applications**	MINT, MPTM
Description			
Value for Exercise Timer 12.			

back to List of values

Exercise Timer 13

Value group	Scheduler	**Related FW**	2.2.0
Units	[hh:mm.ss]		
Comm object	19676	**Related applications**	MINT, MPTM
Description			
Value for Exercise Timer 13.			

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Exercise Timer 14

Value group	Scheduler	**Related FW**	2.2.0
Units	[hh:mm.ss]		
Comm object	19677	**Related applications**	MINT, MPTM
Description			
Value for Exercise Timer 14.			

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Exercise Timer 15

Value group	Scheduler	**Related FW**	2.2.0
Units	[hh:mm.ss]		
Comm object	19678	**Related applications**	MINT, MPTM
Description			
Value for Exercise Timer 15.			

back to List of values

Exercise Timer 16

Value group	Scheduler	**Related FW**	2.2.0
Units	[hh:mm.ss]		
Comm object	19679	**Related applications**	MINT, MPTM
Description			
Value for Exercise Timer 16.			

back to List of values

Exercise Timer 17

Value group	Scheduler	**Related FW**	2.2.0
Units	[hh:mm.ss]		
Comm object	17772	**Related applications**	MINT, MPTM
Description			
Value for Exercise Timer 17.			

back to List of values

Exercise Timer 18

Value group	Scheduler	**Related FW**	2.2.0
Units	[hh:mm.ss]		
Comm object	17773	**Related applications**	MINT, MPTM
Description			
Value for Exercise Timer 18.			

back to List of values

Exercise Timer 19

Value group	Scheduler	**Related FW**	2.2.0
Units	[hh:mm.ss]		
Comm object	17774	**Related applications**	MINT, MPTM
Description			
Value for Exercise Timer 19.			

back to List of values

Exercise Timer 20

Value group	Scheduler	**Related FW**	2.2.0
Units	[hh:mm.ss]		
Comm object	17775	**Related applications**	MINT, MPTM
Description			
Value for Exercise Timer 20.			

back to List of values

Exercise Timer 21

Value group	Scheduler	**Related FW**	2.2.0
Units	[hh:mm.ss]		
Comm object	17776	**Related applications**	MINT, MPTM
Description			
Value for Exercise Timer 21.			

back to List of values

Exercise Timer 22

Value group	Scheduler	**Related FW**	2.2.0
Units	[hh:mm.ss]		
Comm object	17777	**Related applications**	MINT, MPTM
Description			
Value for Exercise Timer 22.			

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Exercise Timer 23

Value group	Scheduler	**Related FW**	2.2.0
Units	[hh:mm.ss]		
Comm object	17778	**Related applications**	MINT, MPTM
Description			
Value for Exercise Timer 23.			

back to List of values

Exercise Timer 24

Value group	Scheduler	**Related FW**	2.2.0
Units	[hh:mm.ss]		
Comm object	17779	**Related applications**	MINT, MPTM
Description			
Value for Exercise Timer 24.			

back to List of values

Exercise Timer 25

Value group	Scheduler	**Related FW**	2.2.0
Units	[hh:mm.ss]		
Comm object	17780	**Related applications**	MINT, MPTM
Description			
Value for Exercise Timer 25.			

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Exercise Timer 26

Value group	Scheduler	**Related FW**	2.2.0
Units	[hh:mm.ss]		
Comm object	17781	**Related applications**	MINT, MPTM
Description			
Value for Exercise Timer 26.			

back to List of values

Exercise Timer 27

Value group	Scheduler	**Related FW**	2.2.0
Units	[hh:mm.ss]		
Comm object	17782	**Related applications**	MINT, MPTM
Description			
Value for Exercise Timer 27.			

back to List of values

Exercise Timer 28

Value group	Scheduler	**Related FW**	2.2.0
Units	[hh:mm.ss]		
Comm object	17783	**Related applications**	MINT, MPTM
Description			
Value for Exercise Timer 28.			

back to List of values

Exercise Timer 29

Value group	Scheduler	**Related FW**	2.2.0
Units	[hh:mm.ss]		
Comm object	17784	**Related applications**	MINT, MPTM
Description			
Value for Exercise Timer 29.			

back to List of values

Exercise Timer 30

Value group	Scheduler	**Related FW**	2.2.0
Units	[hh:mm.ss]		
Comm object	17785	**Related applications**	MINT, MPTM
Description			
Value for Exercise Timer 30.			

back to List of values

Group: CM-4G-GPS

Signal Strength

Value group	CM-4G-GPS	**Related FW**	2.2.0
Units	[%]		
Comm object	24302	**Related applications**	MINT, MPTM
Description			
This value represents signal strenght in the percentage.			

back to List of values

Network Status

Value group	CM-4G-GPS	**Related FW**	2.2.0
Units			
Comm object	23972	**Related applications**	MINT, MPTM
Description			
Status of attachment into packet data network (status of PDP context).			

back to List of values

Network Name

Value group	CM-4G-GPS	**Related FW**	2.2.0
Units			
Comm object	24147	**Related applications**	MINT, MPTM
Description			
Operator name or MCC-MNC code.			

back to List of values

Network Mode

Value group	CM-4G-GPS	**Related FW**	2.2.0
Units			
Comm object	24146	**Related applications**	MINT, MPTM
Description			
Mode of the network (2G/3G/4G).			

back to List of values

Modem Status

Value group	CM-4G-GPS	**Related FW**	2.2.0
Units			
Comm object	24288	**Related applications**	MINT, MPTM
Description			
The text of this value represents the status of the modem.			

back to List of values

IP Address

Value group	CM-4G-GPS	**Related FW**	2.2.0
Units			
Comm object	23971	**Related applications**	MINT, MPTM
Description			
IP address of the module.			

back to List of values

Primary DNS

Value group	CM-4G-GPS	**Related FW**	2.2.0
Units			
Comm object	23984	**Related applications**	MINT, MPTM
Description			
Address of the primary DNS.			

back to List of values

Secondary DNS

Value group	CM-4G-GPS	**Related FW**	2.2.0
Units			
Comm object	23983	**Related applications**	MINT, MPTM
Description			
Address of the secondary DNS.			

back to List of values

Last E-mail Result

Value group	CM-4G-GPS	Related FW	2.2.0
Units			
Comm object	24307	Related applications	MINT, MPTM
Description			

Result of last email, which was sent by controller.

Code	Description
0	Email was successfully sent.
2	It is not possible to establish connection with SMTP server.
3	SMTP server is not ready for communication.
4	Maximum transmitted data length not defined.
5	No response from SMTP server.
6	Command to SMTP server not sent.
7	Did not receive data from SMTP server.
8	HELO command was refused.
11	AUTH LOGIN command was refused.
12	Wrong user name.
13	Wrong password.
14	MAIL FROM command was refused.
15	RCPT TO command was refused.
16	DATA command was refused.
17	Sending of email failed.
18	SMTP server rejected email data.
19	SMTP server rejected email data.
20	QUIT command was refused.
22	Process of sending email aborted.
23	Closing connection error.
24	Failed to accept server response after connection is established.
25	It is impossible to create data for command DATA.
26	It is impossible to read data for command DATA.
28	Error during encoding process.
30	SMTP server address translation error (from DNS server).

back to List of values

GPS Status

Value group	CM-4G-GPS	**Related FW**	2.2.0
Units			
Comm object	23973	**Related applications**	MINT, MPTM
Description			

Value describing the GPS signal status.

Code	Description
Undefined	GPS signal is not available. Check antenna connection.
Searching	Looking up for signal from available satellites.
Fixed	GPS signal available.

back to List of values

Latitude

Value group	CM-4G-GPS	**Related FW**	2.2.0
Units			
Comm object	24268	**Related applications**	MINT, MPTM
Description			

Actual GPS latitude. Positions on north hemisphere have positive value, position on south hemisphere have negative value.

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Longitude

Value group	CM-4G-GPS	**Related FW**	2.2.0
Units			
Comm object	24267	**Related applications**	MINT, MPTM
Description			

Actual GPS longitude. Positions on east hemisphere have positive value, position on west hemisphere have negative value.

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HomePosDist

Value group	CM-4G-GPS	**Related FW**	2.2.0
Units			
Comm object	11680	**Related applications**	MINT, MPTM
Description			
Actual distance from home position. Home position is adjusted via setpoints **Home Latitude** and **Home Longitude** or by binary input **GEO HOME POSITION**.			

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Active Satellites

Value group	CM-4G-GPS	**Related FW**	2.2.0
Units			
Comm object	24265	**Related applications**	MINT, MPTM
Description			
Number of available satellites for GPS location.			

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Speed

Value group	CM-4G-GPS	**Related FW**	2.2.0
Units			
Comm object	24264	**Related applications**	MINT, MPTM
Description			
Actual speed of the controller calculated from the GPS coordinates.			

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AirGate ID

Value group	CM-4G-GPS	**Related FW**	2.2.0
Units			
Comm object	24309	**Related applications**	MINT, MPTM
Description			
Identification string generated by AirGate server for the purpose of establishing communication via InteliConfig or any other supported PC tool.			

back to List of values

AirGate Status

Value group	CM-4G-GPS	**Related FW**	2.2.0
Units			
Comm object	23967	**Related applications**	MINT, MPTM
Description			
Diagnostic code for AirGate connection. Helps in troubleshooting.			

back to List of values

AirGate Servicing Node

Value group	CM-4G-GPS	**Related FW**	2.2.0
Units			
Comm object	23991	**Related applications**	MINT, MPTM
Description			
IP address of AirGate 2 node to which the module is currently attached.			

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Modem FW Version

Value group	CM-4G-GPS	**Related FW**	2.2.0
Units			
Comm object	24149	**Related applications**	MINT, MPTM
Description			
FW Version of the modem.			

back to List of values

Modem IMEI

Value group	CM-4G-GPS	**Related FW**	2.2.0
Units			
Comm object	23828	**Related applications**	MINT, MPTM
Description			
IMEI of the modem.			

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Group: Ethernet

Subgroup: Ethernet Port Status

ETH Port 1 Status

Value group	Ethernet	**Related FW**	2.2.0
Units	[-]		
Comm object	24050	**Related applications**	MINT, MPTM
Description			

This value reflects what communication mode is used on the Ethernet Port 1.

Link Down	There is no connected cable to the Ethernet Port (socket) or the cable is broken.
10- HD	10 Mbit Half-Duplex
10- FD	10 Mbit Full-Duplex
100- HD	100 Mbit Half-Duplex
100- FD	100 Mbit Full-Duplex

Note: *Note: At one time the Half-Duplex can only send or receive the information whereas Full-Duplex can do both at once.*

back to List of values

ETH Port 2 StatusETH Port 3 Status

Value group	Ethernet	**Related FW**	2.2.0
Units	[-]		
Comm object	24088	**Related applications**	MINT, MPTM
Description			

This value reflects what communication mode is used on the Ethernet Port 2.

Link Down	There is no connected cable to the Ethernet Port (socket) or the cable is broken.
10- HD	10 Mbit Half-Duplex
10- FD	10 Mbit Full-Duplex
100- HD	100 Mbit Half-Duplex
100- FD	100 Mbit Full-Duplex

Note: *Note: At one time the Half-Duplex can only send or receive the information whereas Full-Duplex can do both at once.*

back to List of values

ETH Port 3 Status

Value group	Ethernet	**Related FW**	2.2.0
Units	[-]		
Comm object	24064	**Related applications**	MINT, MPTM
Description			

This value reflects what communication mode is used on the Ethernet Port 3.

Link Down	There is no connected cable to the Ethernet Port (socket) or the cable is broken.
10- HD	10 Mbit Half-Duplex
10- FD	10 Mbit Full-Duplex
100- HD	100 Mbit Half-Duplex
100- FD	100 Mbit Full-Duplex

Note: *Note: At one time the Half-Duplex can only send or receive the information whereas Full-Duplex can do both at once.*

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Subgroup: Trusted Interface

MAC Address

Value group	Ethernet	**Related FW**	2.2.0
Units	[-]		
Comm object	23834	**Related applications**	MINT, MPTM
Description			

MAC address of the controller's trusted interface.

back to List of values

Current IP Address

Value group	Ethernet	**Related FW**	2.2.0
Units	[-]		
Comm object	24060	**Related applications**	MINT, MPTM
Description			

Current IP address of the **Communication peripherals** interface.

back to List of values

Current Subnet Mask

Value group	Ethernet	**Related FW**	2.2.0
Units	[-]		
Comm object	24058	**Related applications**	MINT, MPTM
Description			
Current subnet mask of the **Communication peripherals** interface.			

back to List of values

Current Gateway

Value group	Ethernet	**Related FW**	2.2.0
Units	[-]		
Comm object	24056	**Related applications**	MINT, MPTM
Description			
Current gateway address the **Communication peripherals** communication.			

back to List of values

ETH Interface Status

Value group	Ethernet	**Related FW**	2.2.0
Units	[-]		
Comm object	24062	**Related applications**	MINT, MPTM
Description			
Current status.of the **Communication peripherals** communication.			

back to List of values

Subgroup: Untrusted Interface

MAC Address

Value group	Ethernet	**Related FW**	2.2.0
Units	[-]		
Comm object	24333	**Related applications**	MINT, MPTM
Description			
MAC address of the controller's untrusted interface. MAC address of the controller's ethernet interface.			

back to List of values

Current IP Address

Value group	Ethernet	**Related FW**	2.2.0
Units	[-]		
Comm object	24184	**Related applications**	MINT, MPTM
Description			
Current IP address of the **Ethernet 2** interface.			

back to List of values

Current Subnet Mask

Value group	Ethernet	**Related FW**	2.2.0
Units	[-]		
Comm object	24183	**Related applications**	MINT, MPTM
Description			
Current subnet mask of the **Ethernet 2** interface.			

back to List of values

Current Gateway

Value group	Ethernet	**Related FW**	2.2.0
Units	[-]		
Comm object	24182	**Related applications**	MINT, MPTM
Description			
Current IP gateway address of the **Ethernet 2** communications.			

back to List of values

Primary DNS

Value group	Ethernet	**Related FW**	2.2.0
Units	[-]		
Comm object	24181	**Related applications**	MINT, MPTM
Description			
Current domain name server of the **Ethernet 2** interface.			

back to List of values

Secondary DNS

Value group	Ethernet	**Related FW**	2.2.0
Units	[-]		
Comm object	24100	**Related applications**	MINT, MPTM
Description			
Backup domain name server of the **Ethernet 2** interface.			

back to List of values

ETH Interface Status

Value group	Ethernet	**Related FW**	2.2.0
Units	[-]		
Comm object	24180	**Related applications**	MINT, MPTM
Description			
Current status of the **Ethernet 2** communication.			

back to List of values

AirGate Status

Value group	Ethernet	Related FW	2.2.0
Units	[-]		
Comm object	24007	Related applications	MINT, MPTM
Description			

Diagnostic code for AirGate connection. Helps with troubleshooting.

> **IMPORTANT: If the AirGate key in the Access Administration is empty the controller will not connect to the AirGate despite the function is enabled. Access Administration is available in Tools of the InteliConfig.**

Code	Value	Description
0	Not defined	Not trying to connect to AirGate. This is initial value of the status.
1	Waiting to connect	Waiting for the next attempt to connect to a node.
2	Resolving	Resolving the domain name of the node to which it is attempting to connect.
3	Connecting	Attempting to estabilish TCP link to the node.
4	Creating secure channel	Encrypted channel is being negotiated.
5	Registration	Encrypted channel has been estabilished.
6	Connected, inoperable	AirGate server has not sent an authorization yet.
7	Connected, operable	AiGate server authorized the connection and the AirGate connection is up and running.
8	Suspended, empty key	The service is enabled but suspended due to empty AirGate key.

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AirGate ID

Value group	Ethernet	Related FW	2.2.0
Units	[-]		
Comm object	24345	Related applications	MINT, MPTM
Description			

Identification string generated by AirGate server for the purpose of establishing communication via InteliConfig or any other supported PC tool.

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AirGate Servicing Node

Value group	Info	**Related FW**	2.2.0
Units	[-]		
Comm object	24010	**Related applications**	MINT, MPTM
Description			
This value displays the IP address to Servicing node to which is controller connected in order to use AirGate connection.			

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Last E-mail Result

Value group	Ethernet	**Related FW**	2.2.0
Units	[-]		
Comm object	24332	**Related applications**	MINT, MPTM
Description			

Result of last email, which was sent by controller.

Code	Description
0	Email was successfully sent.
1	SIMCom declined connection request.
2	It is not possible to establish connection with SMTP server.
3	SMTP server is not ready for communication.
4	Maximum transmitted data length not defined.
5	No response from SMTP server.
6	Command to SMTP server not sent.
7	Did not receive data from SMTP server.
8	HELO command was refused.
9	EHLO command was refused.
10	SMTP server does not support 8-bit encoding.
11	AUTH LOGIN command was refused.
12	Wrong user name.
13	Wrong password.
14	MAIL FROM command was refused.
15	RCPT TO command was refused.
16	DATA command was refused.
17	Sending of email failed.
18	SMTP server rejected email data.
19	SMTP server rejected email data.
20	QUIT command was refused.
21	There is no valid server IP address.
22	Process of sending email aborted.
23	Closing connection error.
24	Failed to accept server response after connection is established.
25	It is impossible to create data for command DATA.
26	It is impossible to read data for command DATA.
27	Email address can???t be read.
28	Error during encoding process.
29	Error during HMAC MD5 encoding process.
30	There is no attempt for sending email yet.

31	Cannot resolve SMTP server's IP address.
32	Error while reading CO 24327 (base64 email data)
33	Problem with authorization type (i.e. smtp.gmail.com support only STARTTLS)
34	SMTP server does not support STARTTLS command.
35	STARTTLS command was refused.
36	There is a problem during TLS handshake process.

back to List of values

Subgroup: Modbus Interface

MAC Address

Value group	Ethernet	**Related FW**	2.2.0
Units	[-]		
Comm object	23833	**Related applications**	MINT, MPTM
Description			
MAC address of the controller's Modbus interface.			

back to List of values

Current IP Address

Value group	ETH Interface 3 - Modbus	**Related FW**	2.2.0
Units	[-]		
Comm object	24046	**Related applications**	MINT, MPTM
Description			
Current IP address of the **Communication peripherals** interface.			

back to List of values

Current Subnet Mask

Value group	ETH Interface 3 - Modbus	**Related FW**	2.2.0
Units	[-]		
Comm object	24044	**Related applications**	MINT, MPTM
Description			
Current subnet mask of the **Communication peripherals** interface.			

back to List of values

Current Gateway

Value group	ETH Interface 3 - Modbus	**Related FW**	2.2.0
Units	[-]		
Comm object	24042	**Related applications**	MINT, MPTM
Description			
Current IP gateway address of the **Communication peripherals** communications.			

back to List of values

Primary DNS

Value group	ETH Interface 3 - Modbus	**Related FW**	2.2.0
Units	[-]		
Comm object	24039	**Related applications**	MINT, MPTM
Description			
Current domain name server of the **Communication peripherals** interface.			

back to List of values

Secondary DNS

Value group	ETH Interface 3 - Modbus	**Related FW**	2.2.0
Units	[-]		
Comm object	24037	**Related applications**	MINT, MPTM
Description			
Backup domain name server of the **Communication peripherals** interface.			

back to List of values

ETH Interface Status

Value group	ETH Interface 3 - Modbus	**Related FW**	2.2.0
Units	[-]		
Comm object	24048	**Related applications**	MINT, MPTM
Description			
Current status of the **Communication peripherals** communication.			

back to List of values

Group: PLC

PLC-AOUT 1

Value group	PLC	**Related FW**	2.2.0
Units	[-]		
Comm object	21248	**Related applications**	MINT, MPTM
Description			
State of analog output of PLC.			

back to List of values

PLC-AOUT 2

Value group	PLC	**Related FW**	2.2.0
Units	[-]		
Comm object	21249	**Related applications**	MINT, MPTM
Description			
State of analog output of PLC.			

back to List of values

PLC-AOUT 3

Value group	PLC	**Related FW**	2.2.0
Units	[-]		
Comm object	21250	**Related applications**	MINT, MPTM
Description			
State of analog output of PLC.			

back to List of values

PLC-AOUT 4

Value group	PLC	**Related FW**	2.2.0
Units	[-]		
Comm object	21251	**Related applications**	MINT, MPTM
Description			
State of analog output of PLC.			

back to List of values

PLC-AOUT 5

Value group	PLC	**Related FW**	2.2.0
Units	[-]		
Comm object	21252	**Related applications**	MINT, MPTM
Description			
State of analog output of PLC.			

back to List of values

PLC-AOUT 6

Value group	PLC	**Related FW**	2.2.0
Units	[-]		
Comm object	21253	**Related applications**	MINT, MPTM
Description			
State of analog output of PLC.			

back to List of values

PLC-AOUT 7

Value group	PLC	**Related FW**	2.2.0
Units	[-]		
Comm object	21254	**Related applications**	MINT, MPTM
Description			
State of analog output of PLC.			

back to List of values

PLC-AOUT 8

Value group	PLC	**Related FW**	2.2.0
Units	[-]		
Comm object	21255	**Related applications**	MINT, MPTM
Description			
State of analog output of PLC.			

back to List of values

PLC-AOUT 9

Value group	PLC	**Related FW**	2.2.0
Units	[-]		
Comm object	21256	**Related applications**	MINT, MPTM
Description			
State of analog output of PLC.			

back to List of values

PLC-AOUT 10

Value group	PLC	**Related FW**	2.2.0
Units	[-]		
Comm object	21257	**Related applications**	MINT, MPTM
Description			
State of analog output of PLC.			

back to List of values

PLC-AOUT 11

Value group	PLC	**Related FW**	2.2.0
Units	[-]		
Comm object	21258	**Related applications**	MINT, MPTM
Description			
State of analog output of PLC.			

back to List of values

PLC-AOUT 12

Value group	PLC	**Related FW**	2.2.0
Units	[-]		
Comm object	21259	**Related applications**	MINT, MPTM
Description			
State of analog output of PLC.			

back to List of values

PLC-AOUT 13

Value group	PLC	**Related FW**	2.2.0
Units	[-]		
Comm object	21260	**Related applications**	MINT, MPTM
Description			
State of analog output of PLC.			

back to List of values

PLC-AOUT 14

Value group	PLC	**Related FW**	2.2.0
Units	[-]		
Comm object	21261	**Related applications**	MINT, MPTM
Description			
State of analog output of PLC.			

back to List of values

PLC-AOUT 15

Value group	PLC	**Related FW**	2.2.0
Units	[-]		
Comm object	21262	**Related applications**	MINT, MPTM
Description			
State of analog output of PLC.			

back to List of values

PLC-AOUT 16

Value group	PLC	**Related FW**	2.2.0
Units	[-]		
Comm object	21263	**Related applications**	MINT, MPTM
Description			
State of analog output of PLC.			

back to List of values

PLC-AOUT 17

Value group	PLC	**Related FW**	2.2.0
Units	[-]		
Comm object	21264	**Related applications**	MINT, MPTM
Description			
State of analog output of PLC.			

back to List of values

PLC-AOUT 18

Value group	PLC	**Related FW**	2.2.0
Units	[-]		
Comm object	21265	**Related applications**	MINT, MPTM
Description			
State of analog output of PLC.			

back to List of values

PLC-AOUT 19

Value group	PLC	**Related FW**	2.2.0
Units	[-]		
Comm object	21266	**Related applications**	MINT, MPTM
Description			
State of analog output of PLC.			

back to List of values

PLC-AOUT 20

Value group	PLC	**Related FW**	2.2.0
Units	[-]		
Comm object	21267	**Related applications**	MINT, MPTM
Description			
State of analog output of PLC.			

back to List of values

PLC-AOUT 21

Value group	PLC	**Related FW**	2.2.0
Units	[-]		
Comm object	21268	**Related applications**	MINT, MPTM
Description			
State of analog output of PLC.			

back to List of values

PLC-AOUT 22

Value group	PLC	**Related FW**	2.2.0
Units	[-]		
Comm object	21269	**Related applications**	MINT, MPTM
Description			
State of analog output of PLC.			

back to List of values

PLC-AOUT 23

Value group	PLC	**Related FW**	2.2.0
Units	[-]		
Comm object	21270	**Related applications**	MINT, MPTM
Description			
State of analog output of PLC.			

back to List of values

PLC-AOUT 24

Value group	PLC	**Related FW**	2.2.0
Units	[-]		
Comm object	21271	**Related applications**	MINT, MPTM
Description			
State of analog output of PLC.			

back to List of values

PLC-AOUT 25

Value group	PLC	**Related FW**	2.2.0
Units	[-]		
Comm object	21272	**Related applications**	MINT, MPTM
Description			
State of analog output of PLC.			

back to List of values

PLC-AOUT 26

Value group	PLC	**Related FW**	2.2.0
Units	[-]		
Comm object	21273	**Related applications**	MINT, MPTM
Description			
State of analog output of PLC.			

back to List of values

PLC-AOUT 27

Value group	PLC	**Related FW**	2.2.0
Units	[-]		
Comm object	21274	**Related applications**	MINT, MPTM
Description			
State of analog output of PLC.			

back to List of values

PLC-AOUT 28

Value group	PLC	**Related FW**	2.2.0
Units	[-]		
Comm object	21275	**Related applications**	MINT, MPTM
Description			
State of analog output of PLC.			

back to List of values

PLC-AOUT 29

Value group	PLC	**Related FW**	2.2.0
Units	[-]		
Comm object	21276	**Related applications**	MINT, MPTM
Description			
State of analog output of PLC.			

back to List of values

PLC-AOUT 30

Value group	PLC	**Related FW**	2.2.0
Units	[-]		
Comm object	21277	**Related applications**	MINT, MPTM
Description			
State of analog output of PLC.			

back to List of values

PLC-AOUT 31

Value group	PLC	**Related FW**	2.2.0
Units	[-]		
Comm object	21278	**Related applications**	MINT, MPTM
Description			
State of analog output of PLC.			

back to List of values

PLC-AOUT 32

Value group	PLC	**Related FW**	2.2.0
Units	[-]		
Comm object	21279	**Related applications**	MINT, MPTM
Description			
State of analog output of PLC.			

back to List of values

PLC-AOUT 33

Value group	PLC	**Related FW**	2.2.0
Units	[-]		
Comm object	21280	**Related applications**	MINT, MPTM
Description			
State of analog output of PLC.			

back to List of values

PLC-AOUT 34

Value group	PLC	**Related FW**	2.2.0
Units	[-]		
Comm object	21281	**Related applications**	MINT, MPTM
Description			
State of analog output of PLC.			

back to List of values

PLC-AOUT 35

Value group	PLC	**Related FW**	2.2.0
Units	[-]		
Comm object	21282	**Related applications**	MINT, MPTM
Description			
State of analog output of PLC.			

back to List of values

PLC-AOUT 36

Value group	PLC	**Related FW**	2.2.0
Units	[-]		
Comm object	21283	**Related applications**	MINT, MPTM
Description			
State of analog output of PLC.			

back to List of values

PLC-AOUT 37

Value group	PLC	**Related FW**	2.2.0
Units	[-]		
Comm object	21284	**Related applications**	MINT, MPTM
Description			
State of analog output of PLC.			

back to List of values

PLC-AOUT 38

Value group	PLC	**Related FW**	2.2.0
Units	[-]		
Comm object	21285	**Related applications**	MINT, MPTM
Description			
State of analog output of PLC.			

back to List of values

PLC-AOUT 39

Value group	PLC	**Related FW**	2.2.0
Units	[-]		
Comm object	21286	**Related applications**	MINT, MPTM
Description			
State of analog output of PLC.			

back to List of values

PLC-AOUT 40

Value group	PLC	**Related FW**	2.2.0
Units	[-]		
Comm object	21287	**Related applications**	MINT, MPTM
Description			
State of analog output of PLC.			

back to List of values

PLC-AOUT 41

Value group	PLC	**Related FW**	2.2.0
Units	[-]		
Comm object	21288	**Related applications**	MINT, MPTM
Description			
State of analog output of PLC.			

back to List of values

PLC-AOUT 42

Value group	PLC	**Related FW**	2.2.0
Units	[-]		
Comm object	21289	**Related applications**	MINT, MPTM
Description			
State of analog output of PLC.			

back to List of values

PLC-AOUT 43

Value group	PLC	**Related FW**	2.2.0
Units	[-]		
Comm object	21290	**Related applications**	MINT, MPTM
Description			
State of analog output of PLC.			

back to List of values

PLC-AOUT 44

Value group	PLC	**Related FW**	2.2.0
Units	[-]		
Comm object	21291	**Related applications**	MINT, MPTM
Description			
State of analog output of PLC.			

back to List of values

PLC-AOUT 45

Value group	PLC	**Related FW**	2.2.0
Units	[-]		
Comm object	21292	**Related applications**	MINT, MPTM
Description			
State of analog output of PLC.			

back to List of values

PLC-AOUT 46

Value group	PLC	**Related FW**	2.2.0
Units	[-]		
Comm object	21293	**Related applications**	MINT, MPTM
Description			
State of analog output of PLC.			

back to List of values

PLC-AOUT 47

Value group	PLC	**Related FW**	2.2.0
Units	[-]		
Comm object	21294	**Related applications**	MINT, MPTM
Description			
State of analog output of PLC.			

back to List of values

PLC-AOUT 48

Value group	PLC	**Related FW**	2.2.0
Units	[-]		
Comm object	21295	**Related applications**	MINT, MPTM
Description			
State of analog output of PLC.			

back to List of values

PLC-AOUT 49

Value group	PLC	**Related FW**	2.2.0
Units	[-]		
Comm object	21296	**Related applications**	MINT, MPTM
Description			
State of analog output of PLC.			

back to List of values

PLC-AOUT 50

Value group	PLC	**Related FW**	2.2.0
Units	[-]		
Comm object	21297	**Related applications**	MINT, MPTM
Description			
State of analog output of PLC.			

back to List of values

PLC-AOUT 51

Value group	PLC	**Related FW**	2.2.0
Units	[-]		
Comm object	21298	**Related applications**	MINT, MPTM
Description			
State of analog output of PLC.			

back to List of values

PLC-AOUT 52

Value group	PLC	**Related FW**	2.2.0
Units	[-]		
Comm object	21299	**Related applications**	MINT, MPTM
Description			
State of analog output of PLC.			

back to List of values

PLC-AOUT 53

Value group	PLC	**Related FW**	2.2.0
Units	[-]		
Comm object	21300	**Related applications**	MINT, MPTM
Description			
State of analog output of PLC.			

back to List of values

PLC-AOUT 54

Value group	PLC	**Related FW**	2.2.0
Units	[-]		
Comm object	21301	**Related applications**	MINT, MPTM
Description			
State of analog output of PLC.			

back to List of values

PLC-AOUT 55

Value group	PLC	**Related FW**	2.2.0
Units	[-]		
Comm object	21302	**Related applications**	MINT, MPTM
Description			
State of analog output of PLC.			

back to List of values

PLC-AOUT 56

Value group	PLC	**Related FW**	2.2.0
Units	[-]		
Comm object	21303	**Related applications**	MINT, MPTM
Description			
State of analog output of PLC.			

back to List of values

PLC-AOUT 57

Value group	PLC	**Related FW**	2.2.0
Units	[-]		
Comm object	21304	**Related applications**	MINT, MPTM
Description			
State of analog output of PLC.			

back to List of values

PLC-AOUT 58

Value group	PLC	**Related FW**	2.2.0
Units	[-]		
Comm object	21305	**Related applications**	MINT, MPTM
Description			
State of analog output of PLC.			

back to List of values

PLC-AOUT 59

Value group	PLC	**Related FW**	2.2.0
Units	[-]		
Comm object	21306	**Related applications**	MINT, MPTM
Description			
State of analog output of PLC.			

back to List of values

PLC-AOUT 60

Value group	PLC	**Related FW**	2.2.0
Units	[-]		
Comm object	21307	**Related applications**	MINT, MPTM
Description			
State of analog output of PLC.			

back to List of values

PLC-AOUT 61

Value group	PLC	**Related FW**	2.2.0
Units	[-]		
Comm object	21308	**Related applications**	MINT, MPTM
Description			
State of analog output of PLC.			

back to List of values

PLC-AOUT 62

Value group	PLC	**Related FW**	2.2.0
Units	[-]		
Comm object	21309	**Related applications**	MINT, MPTM
Description			
State of analog output of PLC.			

back to List of values

PLC-AOUT 63

Value group	PLC	**Related FW**	2.2.0
Units	[-]		
Comm object	21310	**Related applications**	MINT, MPTM
Description			
State of analog output of PLC.			

back to List of values

PLC-AOUT 64

Value group	PLC	**Related FW**	2.2.0
Units	[-]		
Comm object	21311	**Related applications**	MINT, MPTM
Description			
State of analog output of PLC.			

back to List of values

PLC-BOUT 1

Value group	PLC	**Related FW**	2.2.0
Units	[-]		
Comm object	10424	**Related applications**	MINT, MPTM
Description			
State of binary outputs of PLC.			

back to List of values

PLC-BOUT 2

Value group	PLC	**Related FW**	2.2.0
Units	[-]		
Comm object	10425	**Related applications**	MINT, MPTM
Description			
State of binary outputs of PLC.			

back to List of values

PLC-BOUT 3

Value group	PLC	**Related FW**	2.2.0
Units	[-]		
Comm object	10426	**Related applications**	MINT, MPTM
Description			
State of binary outputs of PLC.			

back to List of values

PLC-BOUT 4

Value group	PLC	**Related FW**	2.2.0
Units	[-]		
Comm object	10427	**Related applications**	MINT, MPTM
Description			
State of binary outputs of PLC.			

back to List of values

PLC-BOUT 5

Value group	PLC	**Related FW**	2.2.0
Units	[-]		
Comm object	10428	**Related applications**	MINT, MPTM
Description			
State of binary outputs of PLC.			

back to List of values

PLC-BOUT 6

Value group	PLC	**Related FW**	2.2.0
Units	[-]		
Comm object	10429	**Related applications**	MINT, MPTM
Description			
State of binary outputs of PLC.			

back to List of values

PLC-BOUT 7

Value group	PLC	**Related FW**	2.2.0
Units	[-]		
Comm object	10430	**Related applications**	MINT, MPTM
Description			
State of binary outputs of PLC.			

back to List of values

PLC-BOUT 8

Value group	PLC	**Related FW**	2.2.0
Units	[-]		
Comm object	10431	**Related applications**	MINT, MPTM
Description			
State of binary outputs of PLC.			

back to List of values

PLC-BOUT 9

Value group	PLC	**Related FW**	2.2.0
Units	[-]		
Comm object	10432	**Related applications**	MINT, MPTM
Description			
State of binary outputs of PLC.			

back to List of values

PLC-BOUT 10

Value group	PLC	**Related FW**	2.2.0
Units	[-]		
Comm object	10433	**Related applications**	MINT, MPTM
Description			
State of binary outputs of PLC.			

back to List of values

PLC-BOUT 11

Value group	PLC	**Related FW**	2.2.0
Units	[-]		
Comm object	10434	**Related applications**	MINT, MPTM
Description			
State of binary outputs of PLC.			

back to List of values

PLC-BOUT 12

Value group	PLC	**Related FW**	2.2.0
Units	[-]		
Comm object	10435	**Related applications**	MINT, MPTM
Description			
State of binary outputs of PLC.			

back to List of values

PLC-BOUT 13

Value group	PLC	**Related FW**	2.2.0
Units	[-]		
Comm object	10436	**Related applications**	MINT, MPTM
Description			
State of binary outputs of PLC.			

back to List of values

PLC-BOUT 14

Value group	PLC	**Related FW**	2.2.0
Units	[-]		
Comm object	10437	**Related applications**	MINT, MPTM
Description			
State of binary outputs of PLC.			

back to List of values

PLC-BOUT 15

Value group	PLC	**Related FW**	2.2.0
Units	[-]		
Comm object	10438	**Related applications**	MINT, MPTM
Description			
State of binary outputs of PLC.			

back to List of values

PLC-BOUT 16

Value group	PLC	**Related FW**	2.2.0
Units	[-]		
Comm object	10439	**Related applications**	MINT, MPTM
Description			
State of binary outputs of PLC.			

back to List of values

PLC-BOUT 17

Value group	PLC	**Related FW**	2.2.0
Units	[-]		
Comm object	14570	**Related applications**	MINT, MPTM
Description			
State of binary outputs of PLC.			

back to List of values

PLC-BOUT 18

Value group	PLC	**Related FW**	2.2.0
Units	[-]		
Comm object	14571	**Related applications**	MINT, MPTM
Description			
State of binary outputs of PLC.			

back to List of values

PLC-BOUT 19

Value group	PLC	**Related FW**	2.2.0
Units	[-]		
Comm object	14572	**Related applications**	MINT, MPTM
Description			
State of binary outputs of PLC.			

back to List of values

PLC-BOUT 20

Value group	PLC	**Related FW**	2.2.0
Units	[-]		
Comm object	14573	**Related applications**	MINT, MPTM
Description			
State of binary outputs of PLC.			

back to List of values

PLC-BOUT 21

Value group	PLC	**Related FW**	2.2.0
Units	[-]		
Comm object	14574	**Related applications**	MINT, MPTM
Description			
State of binary outputs of PLC.			

back to List of values

PLC-BOUT 22

Value group	PLC	**Related FW**	2.2.0
Units	[-]		
Comm object	14575	**Related applications**	MINT, MPTM
Description			
State of binary outputs of PLC.			

back to List of values

PLC-BOUT 23

Value group	PLC	**Related FW**	2.2.0
Units	[-]		
Comm object	14576	**Related applications**	MINT, MPTM
Description			
State of binary outputs of PLC.			

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PLC-BOUT 24

Value group	PLC	**Related FW**	2.2.0
Units	[-]		
Comm object	14577	**Related applications**	MINT, MPTM
Description			
State of binary outputs of PLC.			

back to List of values

PLC-BOUT 25

Value group	PLC	**Related FW**	2.2.0
Units	[-]		
Comm object	14578	**Related applications**	MINT, MPTM
Description			
State of binary outputs of PLC.			

back to List of values

PLC-BOUT 26

Value group	PLC	**Related FW**	2.2.0
Units	[-]		
Comm object	14579	**Related applications**	MINT, MPTM
Description			
State of binary outputs of PLC.			

back to List of values

PLC-BOUT 27

Value group	PLC	**Related FW**	2.2.0
Units	[-]		
Comm object	14580	**Related applications**	MINT, MPTM
Description			
State of binary outputs of PLC.			

back to List of values

PLC-BOUT 28

Value group	PLC	**Related FW**	2.2.0
Units	[-]		
Comm object	14581	**Related applications**	MINT, MPTM
Description			
State of binary outputs of PLC.			

back to List of values

PLC-BOUT 29

Value group	PLC	**Related FW**	2.2.0
Units	[-]		
Comm object	14582	**Related applications**	MINT, MPTM
Description			
State of binary outputs of PLC.			

back to List of values

PLC-BOUT 30

Value group	PLC	**Related FW**	2.2.0
Units	[-]		
Comm object	14583	**Related applications**	MINT, MPTM
Description			
State of binary outputs of PLC.			

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PLC-BOUT 31

Value group	PLC	**Related FW**	2.2.0
Units	[-]		
Comm object	14584	**Related applications**	MINT, MPTM
Description			
State of binary outputs of PLC.			

back to List of values

PLC-BOUT 32

Value group	PLC	**Related FW**	2.2.0
Units	[-]		
Comm object	14585	**Related applications**	MINT, MPTM
Description			
State of binary outputs of PLC.			

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PLC Resource 1

Value group	PLC	**Related FW**	2.2.0
Units	[-]		
Comm object	21216	**Related applications**	MINT, MPTM
Description			
Internal value of PLC block.			

back to List of values

PLC Resource 2

Value group	PLC	**Related FW**	2.2.0
Units	[-]		
Comm object	21217	**Related applications**	MINT, MPTM
Description			
Internal value of PLC block.			

back to List of values

PLC Resource 3

Value group	PLC	**Related FW**	2.2.0
Units	[-]		
Comm object	21218	**Related applications**	MINT, MPTM
Description			
Internal value of PLC block.			

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PLC Resource 4

Value group	PLC	**Related FW**	2.2.0
Units	[-]		
Comm object	21219	**Related applications**	MINT, MPTM
Description			
Internal value of PLC block.			

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PLC Resource 5

Value group	PLC	**Related FW**	2.2.0
Units	[-]		
Comm object	21220	**Related applications**	MINT, MPTM
Description			
Internal value of PLC block.			

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PLC Resource 6

Value group	PLC	**Related FW**	2.2.0
Units	[-]		
Comm object	21221	**Related applications**	MINT, MPTM
Description			
Internal value of PLC block.			

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PLC Resource 7

Value group	PLC	**Related FW**	2.2.0
Units	[-]		
Comm object	21222	**Related applications**	MINT, MPTM
Description			
Internal value of PLC block.			

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PLC Resource 8

Value group	PLC	**Related FW**	2.2.0
Units	[-]		
Comm object	21223	**Related applications**	MINT, MPTM
Description			
Internal value of PLC block.			

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PLC Resource 9

Value group	PLC	**Related FW**	2.2.0
Units	[-]		
Comm object	21224	**Related applications**	MINT, MPTM
Description			
Internal value of PLC block.			

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PLC Resource 10

Value group	PLC	**Related FW**	2.2.0
Units	[-]		
Comm object	21225	**Related applications**	MINT, MPTM
Description			
Internal value of PLC block.			

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PLC Resource 11

Value group	PLC	**Related FW**	2.2.0
Units	[-]		
Comm object	21226	**Related applications**	MINT, MPTM
Description			
Internal value of PLC block.			

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PLC Resource 12

Value group	PLC	**Related FW**	2.2.0
Units	[-]		
Comm object	21227	**Related applications**	MINT, MPTM
Description			
Internal value of PLC block.			

back to List of values

PLC Resource 13

Value group	PLC	**Related FW**	2.2.0
Units	[-]		
Comm object	21228	**Related applications**	MINT, MPTM
Description			
Internal value of PLC block.			

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PLC Resource 14

Value group	PLC	**Related FW**	2.2.0
Units	[-]		
Comm object	21229	**Related applications**	MINT, MPTM
Description			
Internal value of PLC block.			

back to List of values

PLC Resource 15

Value group	PLC	**Related FW**	2.2.0
Units	[-]		
Comm object	21230	**Related applications**	MINT, MPTM
Description			
Internal value of PLC block.			

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PLC Resource 16

Value group	PLC	**Related FW**	2.2.0
Units	[-]		
Comm object	21231	**Related applications**	MINT, MPTM
Description			
Internal value of PLC block.			

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Group: Remote Control

RemoteControl2B 1

Value group	Remote Control	**Related FW**	2.2.0
Units	-		
Comm object	16671	**Related applications**	MINT, MPTM
Description			
This value contains user data written over **Modbus-RTU, Modbus/TCP**. Data type of this value is Int16.			

back to List of values

RemoteControl2B 2

Value group	Remote Control	**Related FW**	2.2.0
Units	-		
Comm object	16672	**Related applications**	MINT, MPTM
Description			
This value contains user data written over **Modbus-RTU, Modbus/TCP**. Data type of this value is Int16.			

back to List of values

RemoteControl2B 3

Value group	Remote Control	**Related FW**	2.2.0
Units	-		
Comm object	16673	**Related applications**	MINT, MPTM
Description			
This value contains user data written over **Modbus-RTU, Modbus/TCP**. Data type of this value is Int16.			

back to List of values

RemoteControl2B 4

Value group	Remote Control	**Related FW**	2.2.0
Units	-		
Comm object	16674	**Related applications**	MINT, MPTM
Description			
This value contains user data written over **Modbus-RTU, Modbus/TCP**. Data type of this value is Int16.			

back to List of values

RemoteControl2B 5

Value group	Remote Control	**Related FW**	2.2.0
Units	-		
Comm object	16675	**Related applications**	MINT, MPTM
Description			
This value contains user data written over **Modbus-RTU, Modbus/TCP**. Data type of this value is Int16.			

back to List of values

RemoteControl2B 6

Value group	Remote Control	**Related FW**	2.2.0
Units	-		
Comm object	16676	**Related applications**	MINT, MPTM
Description			
This value contains user data written over **Modbus-RTU, Modbus/TCP**. Data type of this value is Int16.			

back to List of values

RemoteControl2B 7

Value group	Remote Control	**Related FW**	2.2.0
Units	-		
Comm object	16677	**Related applications**	MINT, MPTM
Description			
This value contains user data written over **Modbus-RTU, Modbus/TCP**. Data type of this value is Int16.			

back to List of values

RemoteControl2B 8

Value group	Remote Control	**Related FW**	2.2.0
Units	-		
Comm object	16678	**Related applications**	MINT, MPTM
Description			
This value contains user data written over **Modbus-RTU, Modbus/TCP**. Data type of this value is Int16.			

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RemoteControl4B 1

Value group	Remote Control	**Related FW**	2.2.0
Units	-		
Comm object	16679	**Related applications**	MINT, MPTM
Description			
This value contains user data written over **Modbus-RTU, Modbus/TCP**. Data type of this value is Int32.			

back to List of values

RemoteControl4B 2

Value group	Remote Control	**Related FW**	2.2.0
Units	-		
Comm object	16680	**Related applications**	MINT, MPTM
Description			
This value contains user data written over **Modbus-RTU, Modbus/TCP**. Data type of this value is Int32.			

back to List of values

RemoteControl4B 3

Value group	Remote Control	**Related FW**	2.2.0
Units	-		
Comm object	16681	**Related applications**	MINT, MPTM
Description			
This value contains user data written over **Modbus-RTU, Modbus/TCP**. Data type of this value is Int32.			

back to List of values

RemoteControl4B 4

Value group	Remote Control	**Related FW**	2.2.0
Units	-		
Comm object	16682	**Related applications**	MINT, MPTM
Description			
This value contains user data written over **Modbus-RTU, Modbus/TCP**. Data type of this value is Int32.			

back to List of values

RemoteControlBin

Value group	Remote Control	**Related FW**	2.2.0
Units	-		
Comm object	16683	**Related applications**	MINT, MPTM
Description			
This value contains user data written over **Modbus-RTU, Modbus/TCP**. Data type of this value is Binary16.			

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Group: DIST-IN 1-32

Binary inputs 1 1-8

Value group	DIST-IN 1-32	**Related FW**	2.2.0
Units	[-]		
Comm object	13301	**Related applications**	MINT, MPTM
Description			

This value contains first 8 Binary Inputs of distributed binary inputs from **DIST-IN** module 1.

Received data are from Controller Unit with **CAN Controller Address** = 1.

1. DISTBIN-1 1
2. DISTBIN-1 2
3. DISTBIN-1 3
4. DISTBIN-1 4
5. DISTBIN-1 5
6. DISTBIN-1 6
7. DISTBIN-1 7
8. DISTBIN-1 8

back to List of values

Binary inputs 1 9-16

Value group	DIST-IN 1-32	**Related FW**	2.2.0
Units	[-]		
Comm object	20890	**Related applications**	MINT, MPTM
Description			

This value contains second 8 Binary Inputs of distributed binary inputs from **DIST-IN** module 1.

> **IMPORTANT: This value is supported only when CAN ICC Mode = 64C CAN FD or 32C CAN FD or 8C CAN FD!**

Received data are from Controller Unit with **CAN Controller Address** = 1.

1. DISTBIN-1 9
2. DISTBIN-1 10
3. DISTBIN-1 11
4. DISTBIN-1 12
5. DISTBIN-1 13
6. DISTBIN-1 14
7. DISTBIN-1 15
8. DISTBIN-1 16

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Binary inputs 1 17-24

Value group	DIST-IN 1-32	Related FW	2.2.0
Units	[-]		
Comm object	16741	Related applications	MINT, MPTM
Description			

This value contains third 8 Binary Inputs of distributed binary inputs from **DIST-IN** module 1.

> **IMPORTANT: This value is supported only when CAN ICC Mode = 64C CAN FD or 32C CAN FD or 8C CAN FD!**

Received data are from Controller Unit with **CAN Controller Address** = 1.

1. DISTBIN-1 17
2. DISTBIN-1 18
3. DISTBIN-1 19
4. DISTBIN-1 20
5. DISTBIN-1 21
6. DISTBIN-1 22
7. DISTBIN-1 23
8. DISTBIN-1 24

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Binary inputs 1 25-32

Value group	DIST-IN 1-32	Related FW	2.2.0
Units	[-]		
Comm object	16805	Related applications	MINT, MPTM
Description			

This value contains fourth 8 Binary Inputs of distributed binary inputs from **DIST-IN** module 1.

> **IMPORTANT: This value is supported only when CAN ICC Mode = 64C CAN FD or 32C CAN FD or 8C CAN FD!**

Received data are from Controller Unit with **CAN Controller Address** = 1.

1. DISTBIN-1 25
2. DISTBIN-1 26
3. DISTBIN-1 27
4. DISTBIN-1 28
5. DISTBIN-1 29
6. DISTBIN-1 30
7. DISTBIN-1 31
8. DISTBIN-1 32

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DISTAIN-1 1

Value group	DIST-IN 1-32	**Related FW**	2.2.0
Units	Based on configuration		
Comm object	20955	**Related applications**	MINT, MPTM
Description			

This value contains data of first distributed analog input from **DIST-IN** module which are received from Controller Unit with **CAN Controller Address** = 1.

> **IMPORTANT: This value is received (and visible) only when it is configured with sensor type "Electronic".**

> **IMPORTANT: This value is supported only when CAN ICC Mode = 64C CAN FD or 32C CAN FD or 8C CAN FD!**

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DISTAIN-1 2

Value group	DIST-IN 1-32	**Related FW**	2.2.0
Units	Based on configuration		
Comm object	20956	**Related applications**	MINT, MPTM
Description			

This value contains data of second distributed analog input from **DIST-IN** module which are received from Controller Unit with **CAN Controller Address** = 1.

> **IMPORTANT: This value is received (and visible) only when it is configured with sensor type "Electronic".**

> **IMPORTANT: This value is supported only when CAN ICC Mode = 64C CAN FD or 32C CAN FD or 8C CAN FD!**

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DISTAIN-1 3

Value group	DIST-IN 1-32	**Related FW**	2.2.0
Units	Based on configuration		
Comm object	20957	**Related applications**	MINT, MPTM
Description			

This value contains data of third distributed analog input from **DIST-IN** module which are received from Controller Unit with **CAN Controller Address** = 1.

> **IMPORTANT: This value is received (and visible) only when it is configured with sensor type "Electronic".**

> **IMPORTANT: This value is supported only when CAN ICC Mode = 64C CAN FD or 32C CAN FD or 8C CAN FD!**

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DISTAIN-1 4

Value group	DIST-IN 1-32	**Related FW**	2.2.0
Units	Based on configuration		
Comm object	20958	**Related applications**	MINT, MPTM
Description			

This value contains data of fourth distributed analog input from **DIST-IN** module which are received from Controller Unit with **CAN Controller Address** = 1.

> **IMPORTANT: This value is received (and visible) only when it is configured with sensor type "Electronic".**

> **IMPORTANT: This value is supported only when CAN ICC Mode = 64C CAN FD or 32C CAN FD or 8C CAN FD!**

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Binary inputs 2 1-8

Value group	DIST-IN 1-32	**Related FW**	2.2.0
Units	[-]		
Comm object	13302	**Related applications**	MINT, MPTM
Description			

This value contains first 8 Binary Inputs of distributed binary inputs from **DIST-IN** module 2.

Received data are from Controller Unit with **CAN Controller Address** = 2.

1. DISTBIN-2 1
2. DISTBIN-2 2
3. DISTBIN-2 3
4. DISTBIN-2 4
5. DISTBIN-2 5
6. DISTBIN-2 6
7. DISTBIN-2 7
8. DISTBIN-2 8

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Binary inputs 2 9-16

Value group	DIST-IN 1-32	**Related FW**	2.2.0
Units	[-]		
Comm object	20891	**Related applications**	MINT, MPTM
Description			

This value contains second 8 Binary Inputs of distributed binary inputs from **DIST-IN** module 2.

> **IMPORTANT: This value is supported only when CAN ICC Mode = 64C CAN FD or 32C CAN FD or 8C CAN FD!**

Received data are from Controller Unit with **CAN Controller Address** = 2.

1. DISTBIN-2 9
2. DISTBIN-2 10
3. DISTBIN-2 11
4. DISTBIN-2 12
5. DISTBIN-2 13
6. DISTBIN-2 14
7. DISTBIN-2 15
8. DISTBIN-2 16

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Binary inputs 2 17-24

Value group	DIST-IN 1-32	**Related FW**	2.2.0
Units	[-]		
Comm object	16742	**Related applications**	MINT, MPTM
Description			

This value contains third 8 Binary Inputs of distributed binary inputs from **DIST-IN** module 2.

> **IMPORTANT: This value is supported only when CAN ICC Mode = 64C CAN FD or 32C CAN FD or 8C CAN FD!**

Received data are from Controller Unit with **CAN Controller Address** = 2.

1. DISTBIN-2 17
2. DISTBIN-2 18
3. DISTBIN-2 19
4. DISTBIN-2 20
5. DISTBIN-2 21
6. DISTBIN-2 22
7. DISTBIN-2 23
8. DISTBIN-2 24

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Binary inputs 2 25-32

Value group	DIST-IN 1-32	Related FW	2.2.0
Units	[-]		
Comm object	16806	Related applications	MINT, MPTM
Description			

This value contains fourth 8 Binary Inputs of distributed binary inputs from **DIST-IN** module 2.

> **IMPORTANT: This value is supported only when CAN ICC Mode = 64C CAN FD or 32C CAN FD or 8C CAN FD!**

Received data are from Controller Unit with **CAN Controller Address** = 2.

1. DISTBIN-2 25
2. DISTBIN-2 26
3. DISTBIN-2 27
4. DISTBIN-2 28
5. DISTBIN-2 29
6. DISTBIN-2 30
7. DISTBIN-2 31
8. DISTBIN-2 32

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DISTAIN-2 1

Value group	DIST-IN 1-32	Related FW	2.2.0
Units	Based on configuration		
Comm object	20959	Related applications	MINT, MPTM
Description			

This value contains data of first distributed analog input from **DIST-IN** module which are received from Controller Unit with **CAN Controller Address** = 2.

> **IMPORTANT: This value is received (and visible) only when it is configured with sensor type "Electronic".**

> **IMPORTANT: This value is supported only when CAN ICC Mode = 64C CAN FD or 32C CAN FD or 8C CAN FD!**

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DISTAIN-2 2

Value group	DIST-IN 1-32	**Related FW**	2.2.0
Units	Based on configuration		
Comm object	20960	**Related applications**	MINT, MPTM
Description			

This value contains data of second distributed analog input from **DIST-IN** module which are received from Controller Unit with **CAN Controller Address** = 2.

> **IMPORTANT: This value is received (and visible) only when it is configured with sensor type "Electronic".**

> **IMPORTANT: This value is supported only when CAN ICC Mode = 64C CAN FD or 32C CAN FD or 8C CAN FD!**

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DISTAIN-2 3

Value group	DIST-IN 1-32	**Related FW**	2.2.0
Units	Based on configuration		
Comm object	20961	**Related applications**	MINT, MPTM
Description			

This value contains data of third distributed analog input from **DIST-IN** module which are received from Controller Unit with **CAN Controller Address** = 2.

> **IMPORTANT: This value is received (and visible) only when it is configured with sensor type "Electronic".**

> **IMPORTANT: This value is supported only when CAN ICC Mode = 64C CAN FD or 32C CAN FD or 8C CAN FD!**

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DISTAIN-2 4

Value group	DIST-IN 1-32	**Related FW**	2.2.0
Units	Based on configuration		
Comm object	20962	**Related applications**	MINT, MPTM
Description			

This value contains data of fourth distributed analog input from **DIST-IN** module which are received from Controller Unit with **CAN Controller Address** = 1.

> **IMPORTANT: This value is received (and visible) only when it is configured with sensor type "Electronic".**

> **IMPORTANT: This value is supported only when CAN ICC Mode = 64C CAN FD or 32C CAN FD or 8C CAN FD!**

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Group: DIST-IN 33-64

Binary inputs 33 1-8

Value group	DIST-IN 33-64	**Related FW**	2.2.0
Units	[-]		
Comm object	25858	**Related applications**	MINT, MPTM
Description			

This value contains first 8 Binary Inputs of distributed binary inputs from **DIST-IN** module 33.

Received data are from Controller Unit with **CAN Controller Address** = 33.

1. DISTBIN-33 1
2. DISTBIN-33 2
3. DISTBIN-33 3
4. DISTBIN-33 4
5. DISTBIN-33 5
6. DISTBIN-33 6
7. DISTBIN-33 7
8. DISTBIN-33 8

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Binary inputs 33 9-16

Value group	DIST-IN 33-64	**Related FW**	2.2.0
Units	[-]		
Comm object	20922	**Related applications**	MINT, MPTM
Description			

This value contains last 8 Binary Inputs of distributed binary inputs from **DIST-IN** module 33.

> **IMPORTANT: This value is supported only when CAN ICC Mode = 64C CAN FD or 8C CAN FD!**

Received data are from Controller Unit with **CAN Controller Address** = 33.

1. DISTBIN-33 9
2. DISTBIN-33 10
3. DISTBIN-33 11
4. DISTBIN-33 12
5. DISTBIN-33 13
6. DISTBIN-33 14
7. DISTBIN-33 15
8. DISTBIN-33 16

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Binary inputs 33 17-24

Value group	DIST-IN 33-64	Related FW	2.2.0
Units	[-]		
Comm object	16773	Related applications	MINT, MPTM
Description			

This value contains first 8 Binary Inputs of distributed binary inputs from **DIST-IN** module 33.

> **IMPORTANT: This value is supported only when CAN ICC Mode = 64C CAN FD or 8C CAN FD!**

Received data are from Controller Unit with **CAN Controller Address** = 33.

1. DISTBIN-33 17
2. DISTBIN-33 18
3. DISTBIN-33 19
4. DISTBIN-33 20
5. DISTBIN-33 21
6. DISTBIN-33 22
7. DISTBIN-33 23
8. DISTBIN-33 24

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Binary inputs 33 25-32

Value group	DIST-IN 33-64	Related FW	2.2.0
Units	[-]		
Comm object	16837	Related applications	MINT, MPTM
Description			

This value contains first 8 Binary Inputs of distributed binary inputs from **DIST-IN** module 33.

> **IMPORTANT: This value is supported only when CAN ICC Mode = 64C CAN FD or 8C CAN FD!**

Received data are from Controller Unit with **CAN Controller Address** = 33.

1. DISTBIN-33 25
2. DISTBIN-33 26
3. DISTBIN-33 27
4. DISTBIN-33 28
5. DISTBIN-33 29
6. DISTBIN-33 30
7. DISTBIN-33 31
8. DISTBIN-33 32

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DISTAIN-33 1

Value group	DIST-IN 33-64	**Related FW**	2.2.0
Units	Based on configuration		
Comm object	21083	**Related applications**	MINT, MPTM
Description			

This value contains data of first distributed analog input from **DIST-IN** module which are received from Controller Unit with **CAN Controller Address** = 33.

> **IMPORTANT: This value is received (and visible) only when it is configured with sensor type "Electronic".**

> **IMPORTANT: This value is supported only when CAN ICC Mode = 64C CAN FD or 8C CAN FD!**

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DISTAIN-33 2

Value group	DIST-IN 33-64	**Related FW**	2.2.0
Units	Based on configuration		
Comm object	21084	**Related applications**	MINT, MPTM
Description			

This value contains data of second distributed analog input from **DIST-IN** module which are received from Controller Unit with **CAN Controller Address** = 33.

> **IMPORTANT: This value is received (and visible) only when it is configured with sensor type "Electronic".**

> **IMPORTANT: This value is supported only when CAN ICC Mode = 64C CAN FD or 8C CAN FD!**

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DISTAIN-33 3

Value group	DIST-IN 33-64	**Related FW**	2.2.0
Units	Based on configuration		
Comm object	21085	**Related applications**	MINT, MPTM
Description			

This value contains data of third distributed analog input from **DIST-IN** module which are received from Controller Unit with **CAN Controller Address** = 33.

> **IMPORTANT: This value is received (and visible) only when it is configured with sensor type "Electronic".**

> **IMPORTANT: This value is supported only when CAN ICC Mode = 64C CAN FD or 8C CAN FD!**

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DISTAIN-33 4

Value group	DIST-IN 33-64	**Related FW**	2.2.0
Units	Based on configuration		
Comm object	21086	**Related applications**	MINT, MPTM
Description			

This value contains data of fourth distributed analog input from **DIST-IN** module which are received from Controller Unit with **CAN Controller Address** = 33.

> **IMPORTANT: This value is received (and visible) only when it is configured with sensor type "Electronic".**

> **IMPORTANT: This value is supported only when CAN ICC Mode = 64C CAN FD or 8C CAN FD!**

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Binary inputs 34 1-8

Value group	DIST-IN 33-64	**Related FW**	2.2.0
Units	[-]		
Comm object	20859	**Related applications**	MINT, MPTM
Description			

This value contains first 8 Binary Inputs of distributed binary inputs from **DIST-IN** module 34.

Received data are from Controller Unit with **CAN Controller Address** = 34.

1. DISTBIN-34 1
2. DISTBIN-34 2
3. DISTBIN-34 3
4. DISTBIN-34 4
5. DISTBIN-34 5
6. DISTBIN-34 6
7. DISTBIN-34 7
8. DISTBIN-34 8

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Binary inputs 34 9-16

Value group	DIST-IN 33-64	**Related FW**	2.2.0
Units	[-]		
Comm object	20923	**Related applications**	MINT, MPTM
Description			

This value contains last 8 Binary Inputs of distributed binary inputs from **DIST-IN** module 34.

> **IMPORTANT: This value is supported only when CAN ICC Mode = 64C CAN FD or 8C CAN FD!**

Received data are from Controller Unit with **CAN Controller Address** = 34.

1. DISTBIN-34 9
2. DISTBIN-34 10
3. DISTBIN-34 11
4. DISTBIN-34 12
5. DISTBIN-34 13
6. DISTBIN-34 14
7. DISTBIN-34 15
8. DISTBIN-34 16

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Binary inputs 34 17-24

Value group	DIST-IN 33-64	**Related FW**	2.2.0
Units	[-]		
Comm object	16774	**Related applications**	MINT, MPTM
Description			

This value contains first 8 Binary Inputs of distributed binary inputs from **DIST-IN** module 34.

> **IMPORTANT: This value is supported only when CAN ICC Mode = 64C CAN FD or 8C CAN FD!**

Received data are from Controller Unit with **CAN Controller Address** = 34.

1. DISTBIN-34 17
2. DISTBIN-34 18
3. DISTBIN-34 19
4. DISTBIN-34 20
5. DISTBIN-34 21
6. DISTBIN-34 22
7. DISTBIN-34 23
8. DISTBIN-34 24

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Binary inputs 34 25-32

Value group	DIST-IN 33-64	**Related FW**	2.2.0
Units	[-]		
Comm object	16838	**Related applications**	MINT, MPTM
Description			

This value contains first 8 Binary Inputs of distributed binary inputs from **DIST-IN** module 34.

> **IMPORTANT: This value is supported only when CAN ICC Mode = 64C CAN FD or 8C CAN FD!**

Received data are from Controller Unit with **CAN Controller Address** = 34.

1. DISTBIN-34 25
2. DISTBIN-34 26
3. DISTBIN-34 27
4. DISTBIN-34 28
5. DISTBIN-34 29
6. DISTBIN-34 30
7. DISTBIN-34 31
8. DISTBIN-34 32

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DISTAIN-34 1

Value group	DIST-IN 33-64	**Related FW**	2.2.0
Units	Based on configuration		
Comm object	21087	**Related applications**	MINT, MPTM
Description			

This value contains data of first distributed analog input from **DIST-IN** module which are received from Controller Unit with **CAN Controller Address** = 34.

> **IMPORTANT: This value is received (and visible) only when it is configured with sensor type "Electronic".**

> **IMPORTANT: This value is supported only when CAN ICC Mode = 64C CAN FD or 8C CAN FD!**

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DISTAIN-34 2

Value group	DIST-IN 33-64	**Related FW**	2.2.0
Units	Based on configuration		
Comm object	21088	**Related applications**	MINT, MPTM
Description			
This value contains data of second distributed analog input from **DIST-IN** module which are received from Controller Unit with **CAN Controller Address** = 34. **IMPORTANT: This value is received (and visible) only when it is configured with sensor type "Electronic".** **IMPORTANT: This value is supported only when CAN ICC Mode = 64C CAN FD or 8C CAN FD!**			

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DISTAIN-34 3

Value group	DIST-IN 33-64	**Related FW**	2.2.0
Units	Based on configuration		
Comm object	21089	**Related applications**	MINT, MPTM
Description			
This value contains data of third distributed analog input from **DIST-IN** module which are received from Controller Unit with **CAN Controller Address** = 34. **IMPORTANT: This value is received (and visible) only when it is configured with sensor type "Electronic".** **IMPORTANT: This value is supported only when CAN ICC Mode = 64C CAN FD or 8C CAN FD!**			

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DISTAIN-34 4

Value group	DIST-IN 33-64	**Related FW**	2.2.0
Units	Based on configuration		
Comm object	21090	**Related applications**	MINT, MPTM
Description			
This value contains data of fourth distributed analog input from **DIST-IN** module which are received from Controller Unit with **CAN Controller Address** = 34. **IMPORTANT: This value is received (and visible) only when it is configured with sensor type "Electronic".** **IMPORTANT: This value is supported only when CAN ICC Mode = 64C CAN FD or 8C CAN FD!**			

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Group: SH Modules

SHBIN-1

Value group	SH Modules	**Related FW**	2.2.0
Units	[-]		
Comm object	10572	**Related applications**	MINT, MPTM
Description			
This value contains Binary Inputs of shared binary inputs from SHBIN module 1. 1. SHBIN-1 1 2. SHBIN-1 2 3. SHBIN-1 3 4. SHBIN-1 4 5. SHBIN-1 5 6. SHBIN-1 6 7. SHBIN-1 7 8. SHBIN-1 8			

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SHBIN-2

Value group	SH Modules	**Related FW**	2.2.0
Units	[-]		
Comm object	10573	**Related applications**	MINT, MPTM
Description			
This value contains Binary Inputs of shared binary inputs from SHBIN module 2. 1. SHBIN-2 1 2. SHBIN-2 2 3. SHBIN-2 3 4. SHBIN-2 4 5. SHBIN-2 5 6. SHBIN-2 6 7. SHBIN-2 7 8. SHBIN-2 8			

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SHBIN-3

Value group	SH Modules	Related FW	2.2.0
Units	[-]		
Comm object	10574	**Related applications**	MINT, MPTM
Description			
This value contains Binary Inputs of shared binary inputs from SHBIN module 3. 1. SHBIN-3 1 2. SHBIN-3 2 3. SHBIN-3 3 4. SHBIN-3 4 5. SHBIN-3 5 6. SHBIN-3 6 7. SHBIN-3 7 8. SHBIN-3 8			

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SHBIN-4

Value group	SH Modules	Related FW	2.2.0
Units	[-]		
Comm object	10575	**Related applications**	MINT, MPTM
Description			
This value contains Binary Inputs of shared binary inputs from SHBIN module 4. 1. SHBIN-4 1 2. SHBIN-4 2 3. SHBIN-4 3 4. SHBIN-4 4 5. SHBIN-4 5 6. SHBIN-4 6 7. SHBIN-4 7 8. SHBIN-4 8			

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SHBIN-5

Value group	SH Modules	Related FW	2.2.0
Units	[-]		
Comm object	11341	**Related applications**	MINT, MPTM
Description			
This value contains Binary Inputs of shared binary inputs from SHBIN module 5. 1. SHBIN-5 1 2. SHBIN-5 2 3. SHBIN-5 3 4. SHBIN-5 4 5. SHBIN-5 5 6. SHBIN-5 6 7. SHBIN-5 7 8. SHBIN-5 8			

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SHBIN-6

Value group	SH Modules	Related FW	2.2.0
Units	[-]		
Comm object	11342	**Related applications**	MINT, MPTM
Description			
This value contains Binary Inputs of shared binary inputs from SHBIN module 6. 1. SHBIN-6 1 2. SHBIN-6 2 3. SHBIN-6 3 4. SHBIN-6 4 5. SHBIN-6 5 6. SHBIN-6 6 7. SHBIN-6 7 8. SHBIN-6 8			

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SHBOUT-1

Value group	SH Modules	Related FW	2.2.0
Units	[-]		
Comm object	10576	**Related applications**	MINT, MPTM
Description			
This value contains Binary Inputs of shared binary outputs from SHBOUT module 1. 1. SHBOUT-1 1 2. SHBOUT-1 2 3. SHBOUT-1 3 4. SHBOUT-1 4 5. SHBOUT-1 5 6. SHBOUT-1 6 7. SHBOUT-1 7 8. SHBOUT-1 8			

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SHBOUT-2

Value group	SH Modules	Related FW	2.2.0
Units	[-]		
Comm object	10577	**Related applications**	MINT, MPTM
Description			
This value contains Binary Inputs of shared binary outputs from SHBOUT module 2. 1. SHBOUT-2 1 2. SHBOUT-2 2 3. SHBOUT-2 3 4. SHBOUT-2 4 5. SHBOUT-2 5 6. SHBOUT-2 6 7. SHBOUT-2 7 8. SHBOUT-2 8			

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SHBOUT-3

Value group	SH Modules	Related FW	2.2.0
Units	[-]		
Comm object	10578	Related applications	MINT, MPTM
Description			
This value contains Binary Inputs of shared binary outputs from SHBOUT module 3. 1. SHBOUT-3 1 2. SHBOUT-3 2 3. SHBOUT-3 3 4. SHBOUT-3 4 5. SHBOUT-3 5 6. SHBOUT-3 6 7. SHBOUT-3 7 8. SHBOUT-3 8			

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SHBOUT-4

Value group	SH Modules	Related FW	2.2.0
Units	[-]		
Comm object	10579	Related applications	MINT, MPTM
Description			
This value contains Binary Inputs of shared binary outputs from SHBOUT module 4. 1. SHBOUT-4 1 2. SHBOUT-4 2 3. SHBOUT-4 3 4. SHBOUT-4 4 5. SHBOUT-4 5 6. SHBOUT-4 6 7. SHBOUT-4 7 8. SHBOUT-4 8			

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SHBOUT-5

Value group	SH Modules	**Related FW**	2.2.0
Units	[-]		
Comm object	11343	**Related applications**	MINT, MPTM
Description			
This value contains Binary Inputs of shared binary outputs from SHBOUT module 5. 1. SHBOUT-5 1 2. SHBOUT-5 2 3. SHBOUT-5 3 4. SHBOUT-5 4 5. SHBOUT-5 5 6. SHBOUT-5 6 7. SHBOUT-5 7 8. SHBOUT-5 8			

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SHBOUT-6

Value group	SH Modules	**Related FW**	2.2.0
Units	[-]		
Comm object	11344	**Related applications**	MINT, MPTM
Description			
This value contains Binary Inputs of shared binary outputs from SHBOUT module 6. 1. SHBOUT-6 1 2. SHBOUT-6 2 3. SHBOUT-6 3 4. SHBOUT-6 4 5. SHBOUT-6 5 6. SHBOUT-6 6 7. SHBOUT-6 7 8. SHBOUT-6 8			

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SHAIN-1 1

Value group	SH Modules	**Related FW**	2.2.0
Units	[-]		
Comm object	10584	**Related applications**	MINT, MPTM
Description			
This value contains data of first shared analog input from SHAOUT module 1. **IMPORTANT: This value is received (and visible) only when it is configured with sensor type "Electronic".**			

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SHAIN-1 2

Value group	SH Modules	**Related FW**	2.2.0
Units	[-]		
Comm object	10585	**Related applications**	MINT, MPTM
Description			
This value contains data of second shared analog input from SHAOUT module 1. **IMPORTANT: This value is received (and visible) only when it is configured with sensor type "Electronic".**			

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SHAIN-1 3

Value group	SH Modules	**Related FW**	2.2.0
Units	[-]		
Comm object	10586	**Related applications**	MINT, MPTM
Description			
This value contains data of third shared analog input from SHAOUT module 1. **IMPORTANT: This value is received (and visible) only when it is configured with sensor type "Electronic".**			

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SHAIN-1 4

Value group	SH Modules	**Related FW**	2.2.0
Units	[-]		
Comm object	10587	**Related applications**	MINT, MPTM
Description			
This value contains data of fourth shared analog input from SHAOUT module 1. **IMPORTANT: This value is received (and visible) only when it is configured with sensor type "Electronic".**			

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SHAIN-2 1

Value group	SH Modules	**Related FW**	2.2.0
Units	[-]		
Comm object	11390	**Related applications**	MINT, MPTM
Description			
This value contains data of first shared analog input from SHAOUT module 2. **IMPORTANT: This value is received (and visible) only when it is configured with sensor type "Electronic".**			

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SHAIN-2 2

Value group	SH Modules	**Related FW**	2.2.0
Units	[-]		
Comm object	11391	**Related applications**	MINT, MPTM
Description			
This value contains data of second shared analog input from SHAOUT module 2. **IMPORTANT: This value is received (and visible) only when it is configured with sensor type "Electronic".**			

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SHAIN-2 3

Value group	SH Modules	**Related FW**	2.2.0
Units	[-]		
Comm object	11392	**Related applications**	MINT, MPTM
Description			
This value contains data of third shared analog input from SHAOUT module 2. **IMPORTANT: This value is received (and visible) only when it is configured with sensor type "Electronic".**			

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SHAIN-2 4

Value group	SH Modules	**Related FW**	2.2.0
Units	[-]		
Comm object	11393	**Related applications**	MINT, MPTM
Description			
This value contains data of fourth shared analog input from SHAOUT module 2. **IMPORTANT: This value is received (and visible) only when it is configured with sensor type "Electronic".**			

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Group: Virtual Shared OUT

Binary outputs 1-8

Value group	Virtual Shared OUT	**Related FW**	2.2.0
Units	[-]		
Comm object	13333	**Related applications**	MINT, MPTM
Description			
This value contains first 8 Binary Outputs of distributed binary outputs from **DIST-OUT** module. 1. DISTBOUT 1 2. DISTBOUT 2 3. DISTBOUT 3 4. DISTBOUT 4 5. DISTBOUT 5 6. DISTBOUT 6 7. DISTBOUT 7 8. DISTBOUT 8			

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Binary outputs 9-16

Value group	Virtual Shared OUT	**Related FW**	2.2.0
Units	[-]		
Comm object	20954	**Related applications**	MINT, MPTM
Description			
This value contains second 8 Binary Outputs of distributed binary outputs from **DIST-OUT** module. **IMPORTANT: This value is supported only when CAN ICC Mode = 64C CAN FD or 32C CAN FD or 8C CAN FD!** 1. DISTBOUT 9 2. DISTBOUT 10 3. DISTBOUT 11 4. DISTBOUT 12 5. DISTBOUT 13 6. DISTBOUT 14 7. DISTBOUT 15 8. DISTBOUT 16			

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Binary outputs 17-24

Value group	Virtual Shared OUT	Related FW	2.2.0
Units	[-]		
Comm object	16870	Related applications	MINT, MPTM
Description			

This value contains third 8 Binary Outputs of distributed binary outputs from **DIST-OUT** module.

> **IMPORTANT: This value is supported only when CAN ICC Mode = 64C CAN FD or 32C CAN FD or 8C CAN FD!**

1. DISTBOUT 17
2. DISTBOUT 18
3. DISTBOUT 19
4. DISTBOUT 20
5. DISTBOUT 21
6. DISTBOUT 22
7. DISTBOUT 23
8. DISTBOUT 24

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Binary outputs 25-32

Value group	Virtual Shared OUT	Related FW	2.2.0
Units	[-]		
Comm object	16871	Related applications	MINT, MPTM
Description			

This value contains fourth 8 Binary Outputs of distributed binary outputs from **DIST-OUT** module.

> **IMPORTANT: This value is supported only when CAN ICC Mode = 64C CAN FD or 32C CAN FD or 8C CAN FD!**

1. DISTBOUT 25
2. DISTBOUT 26
3. DISTBOUT 27
4. DISTBOUT 28
5. DISTBOUT 29
6. DISTBOUT 30
7. DISTBOUT 31
8. DISTBOUT 32

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11.1.5 Application Curves

List of Application Curves

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Q(Um)

Related FW	2.2.0	**Related applications**	MPTM
App Curve ID	0		

Description

This curve is used during Q(Um) power control.

X-axe is relative value of Umains to **Mains/Bus Nominal Voltage Ph-N**.

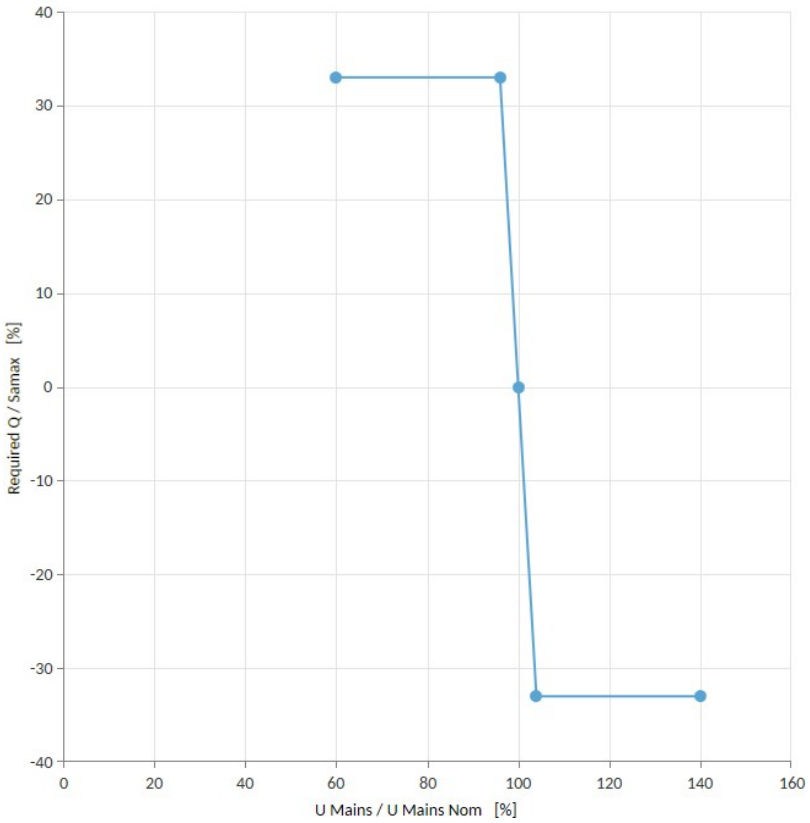
Y-axe is relative value of **BESS Required Q** to **Samax**.

Note: *Umains is average value of **Mains/Bus Voltage L1-N**, **Mains/Bus Voltage L2-N** and **Mains/Bus Voltage L3-N**.*

Default values

X-axe [%]	Y-axe [%]
60.00	33
96.00	33
100.00	0
104.00	-33
140.00	-33

Default appearance



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Qref/Ulim

Related FW	2.2.0	**Related applications**	MPTM
App Curve ID	1		

Description

This curve is used during Qref/Ulim power control.

X-axe is relative value of Umains to **Mains/Bus Nominal Voltage Ph-N**

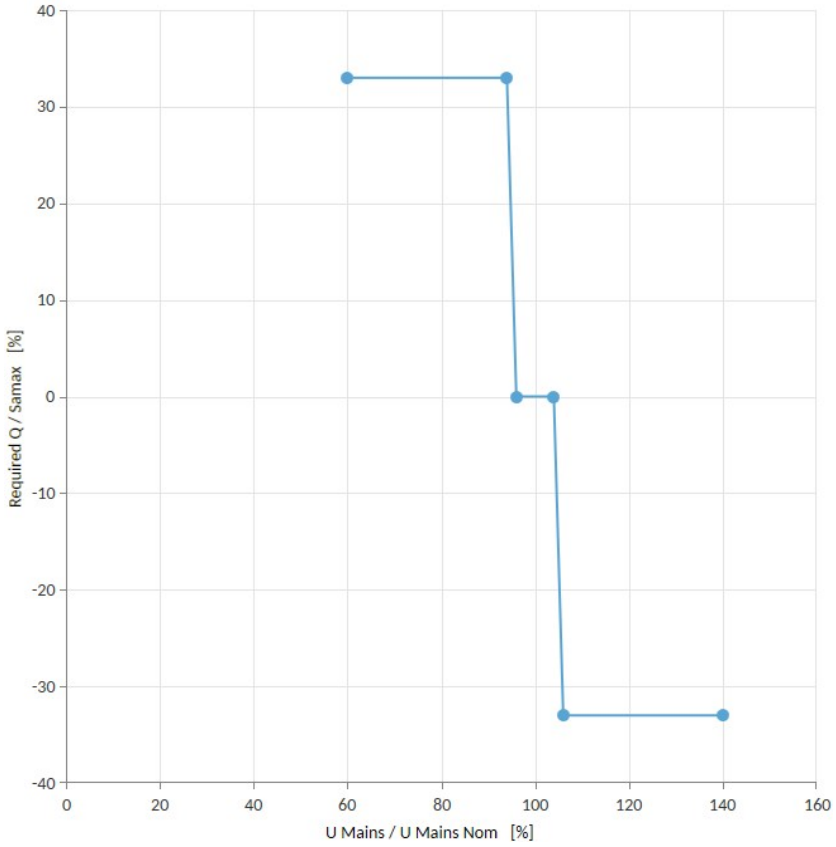
Y-axe is relative value of **BESS Required Q** to **Samax**.

Note: *Umains is average value of **Mains/Bus Voltage L1-N**, **Mains/Bus Voltage L2-N** and **Mains/Bus Voltage L3-N**.*

Default values

X-axe [%]	Y-axe [%]
60.00	33
94.00	33
96.00	0
100.00	0
104.00	-33
140.00	-33

Default appearance



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Q(P)

Related FW	2.2.0	**Related applications**	MPTM
App Curve ID	2		

Description

This curve is used during Q(P) power control.

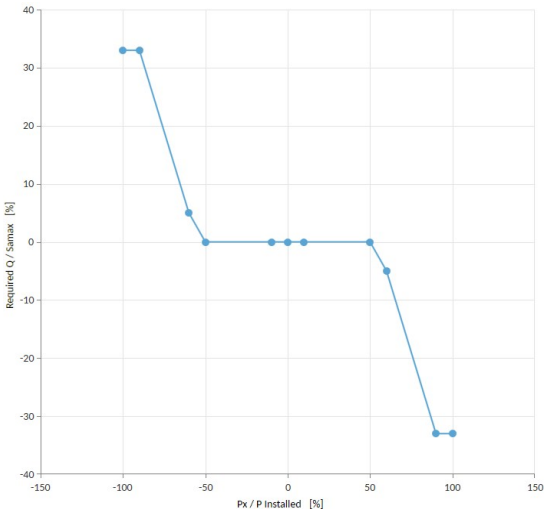
X-axe is relative value of **BESS P** to **Installed Power** (or **Nominal power** in case **Installed Power** = OFF).

Y-axe is relative value of **BESS Required Q** to **Samax**.

Default values

X-axe [%]	Y-axe [%]
-100.00	33
-90.00	33
-60.00	5
-50.00	0
-10.00	0
0.00	0
10.00	0
50.00	0
60.00	-5
90.00	-33
100.00	-33

Default appearance



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PF(P)

Related FW	2.2.0	**Related applications**	MPTM
App Curve ID	3		

Description

This curve is used during PF(Pm) power control.

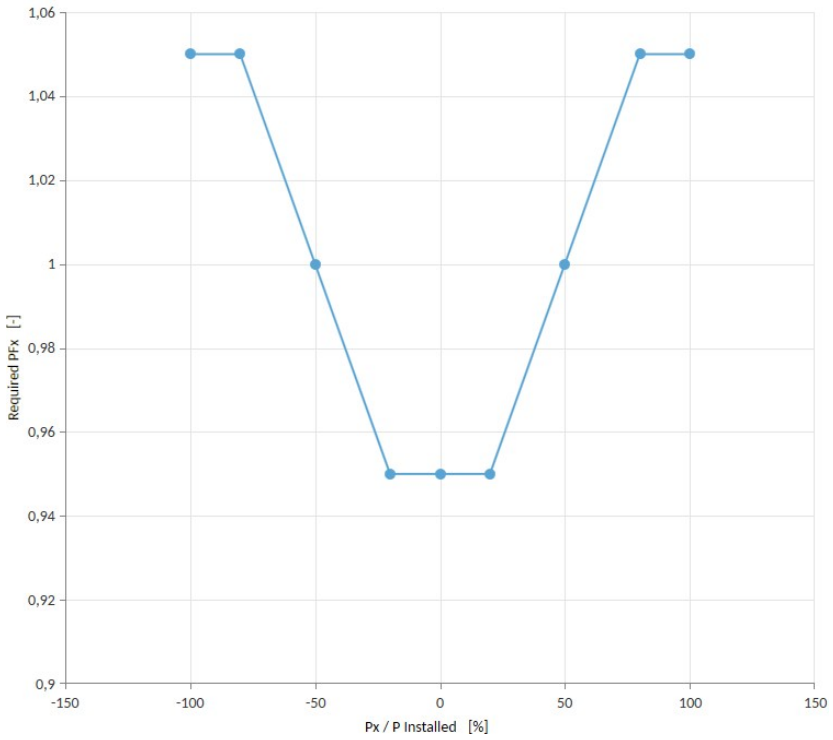
X-axe is relative value of Umains to **Mains/Bus Nominal Voltage Ph-N**

Y-axe is **BESS Required PF** in combination with **BESS Required PF Character**.

Default values

X-axe [%]	Y-axe [-]
-100.00	1.050
-80.00	1.050
-50.00	1.000
-20.00	0.950
0.00	0.950
20.00	0.950
50.00	1.000
80.00	1.050
100.00	1.050

Default appearance



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P(Um)

Related FW	2.2.0	Related applications	MPTM
App Curve ID	16		

Description

This curve is used during **Power Regulation Based On Actual Mains Voltage**.

X-axe is relative value of Umains to **Mains/Bus Nominal Voltage Ph-N**.

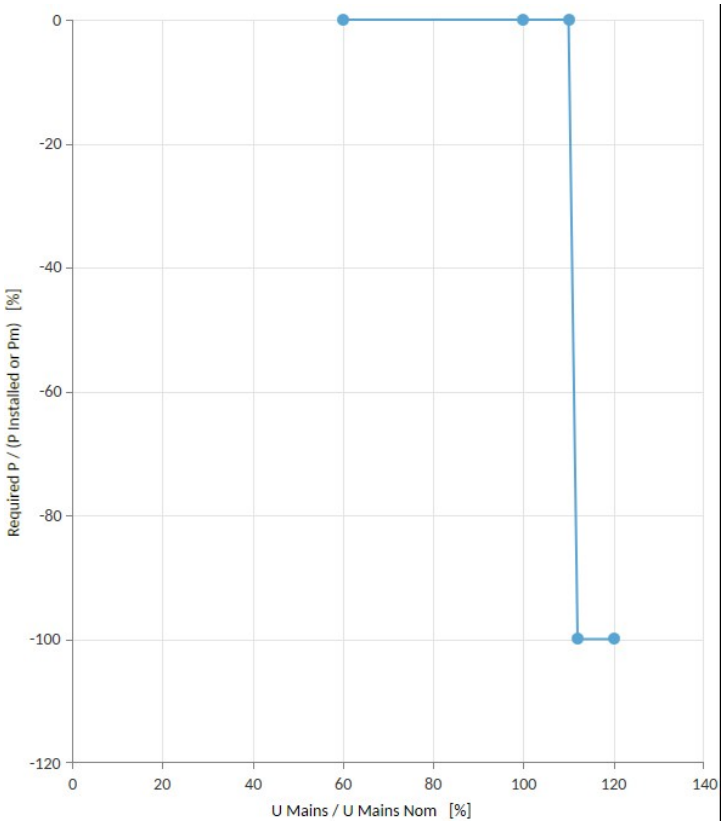
Y-axe is relative value of **BESS Required P Target** to **Installed Power** or **Pmom** based on **P(Um)**.

Note: *Umains is average value of **Mains/Bus Voltage L1-N**, **Mains/Bus Voltage L2-N** and **Mains/Bus Voltage L3-N**.*

Default values

X-axe [%]	Y-axe [%]
60.00	0
100.00	0
110.00	0
112.00	-100
120.00	-100

Default appearance



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P Mom/Pave Max

Related FW	2.2.0	**Related applications**	MPTM
App Curve ID	17		

Description

This curve is used during **Pave** function.

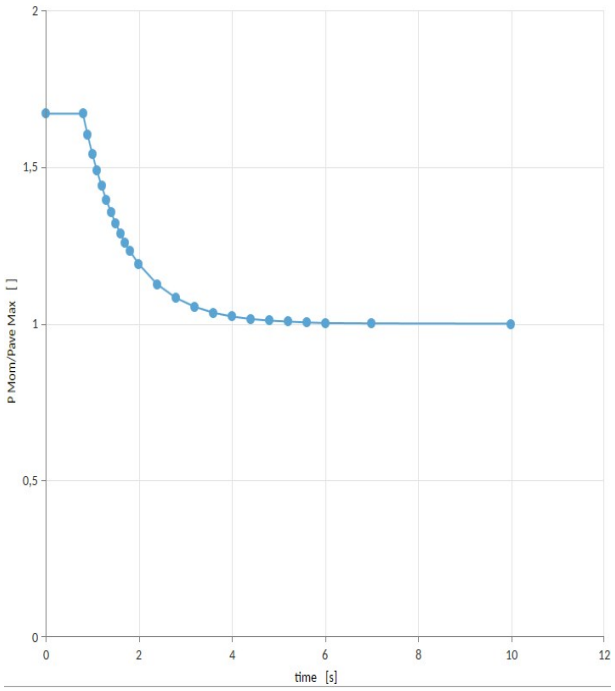
X-axe is time in seconds

Y-axe is value of LAI **PMOM** related to setpoint **Pave**

Default values

X-axe [s]	Y-axe [-]	X-axe [s]	Y-axe [-]
0.00	1.670	2.00	1.125
0.80	1.670	2.40	1.125
0.90	1.603	2.80	1.082
1.00	1.543	3.20	1.054
1.10	1.489	3.60	1.035
1.20	1.440	4.00	1.023
1.30	1.396	4.40	1.015
1.40	1.357	4.80	1.010
1.50	1.321	5.20	1.007
1.60	1.289	5.60	1.004
1.70	1.260	6.00	1.002
1.80	1.234	7.00	1.001
2.00	1.190	10.00	1.000

Default appearance



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Capability L

Related FW	2.2.0	**Related applications**	MINT, MPTM
App Curve ID	4		

Description

This curve defines BESS Operation Area within which it can deliver reactive power continuously without overheating while **BESS Load Character** = L.

X-axe is relative value of **BESS P** to **Nominal power**.

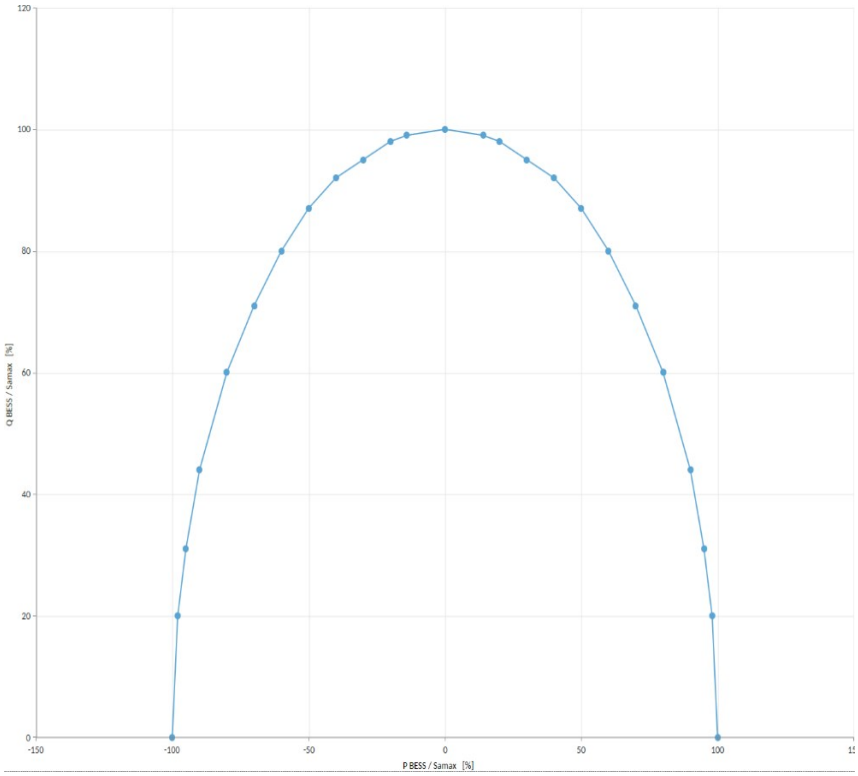
Y-axe is relative value of **BESS Q** to **Samax**.

Note: *The samax value is counted from **Nominal Current** and **BESS Nominal Voltage Ph-N** (or **BESS Nominal Voltage Ph-Ph**) in case that **Samax** = OFF.*

Default values

X-axe [%]	Y-axe [%]
-10	0
0	0
100	106
102	106

Default appearance



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Capability C

Related FW	2.2.0	**Related applications**	MINT, MPTM
App Curve ID	5		

Description

This curve defines **BESS Operation Area** within which it can deliver reactive power continuously without overheating while **BESS Load Character** = C.

X-axe is relative value of **BESS P** to **Nominal power**.

Y-axe is relative value of **BESS Q** to **Samax**.

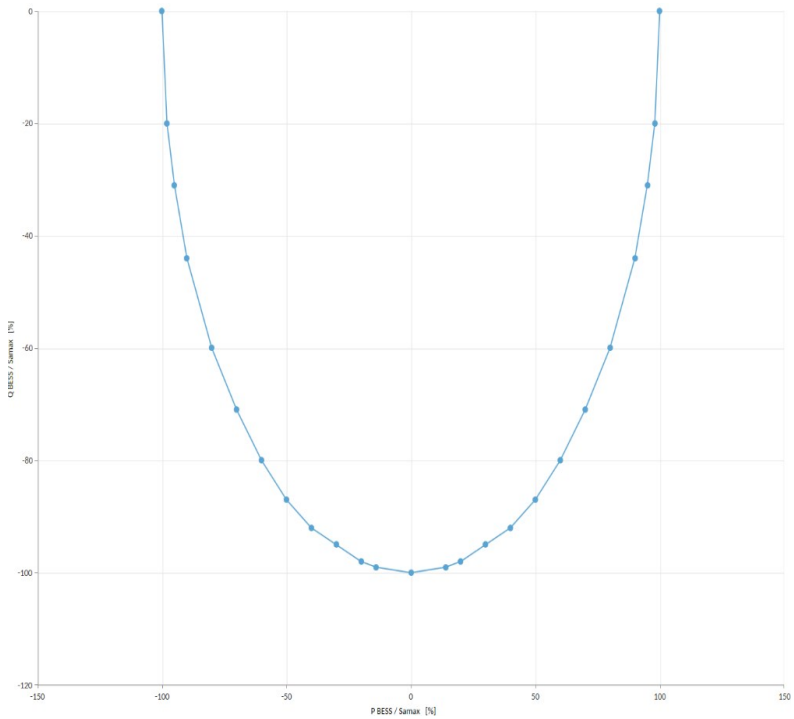
> **IMPORTANT: The Capability C curve have to be setup according to the Capability curve of the worst (weakest) BESS in order to ensure right functionality of the whole system.**

Note: *The samax value is counted from **Nominal Current** and **BESS Nominal Voltage Ph-N** (or **BESS Nominal Voltage Ph-Ph**) in case that **Samax** = OFF.*

Default values

X-axe [%]	Y-axe [%]
-10	0
0	0
100	-60
102	-60

Default appearance



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Power Over Frequency

Related FW	2.2.0	**Related applications**	MPTM
App Curve ID	6		

Description

This curve is used during**Power reduction by over frequency - PoF**.

X-axe is Δf = **Mains/Bus Frequency - Nominal Frequency**.

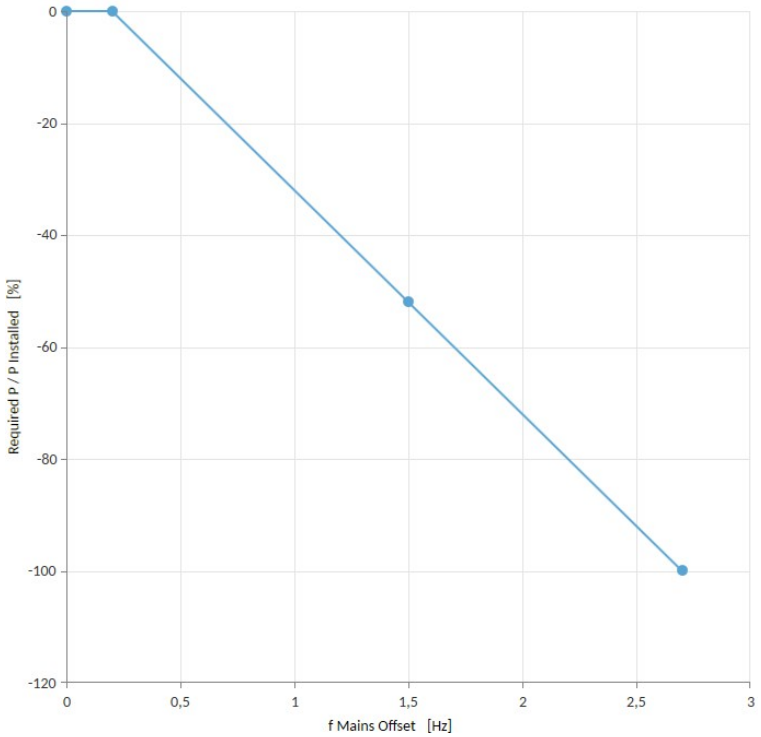
Y-axe is relative value of **BESS Required P** to **Installed Power** (or **Nominal power** in case **Installed Power** = OFF).

Note: *Δf has to be higher than 0.*

Default values

X-axe [Hz]	Y-axe [%]
0.000	0.00
0.200	0.00
1.500	-52.00
2.700	-100.00

Default appearance



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Power Under Frequency

Related FW	2.2.0	**Related applications**	MPTM
App Curve ID	7		

Description

This curve is used during**Power increase by under frequency - PuF**.

X-axe is Δf = **Mains/Bus Frequency - Nominal Frequency**.

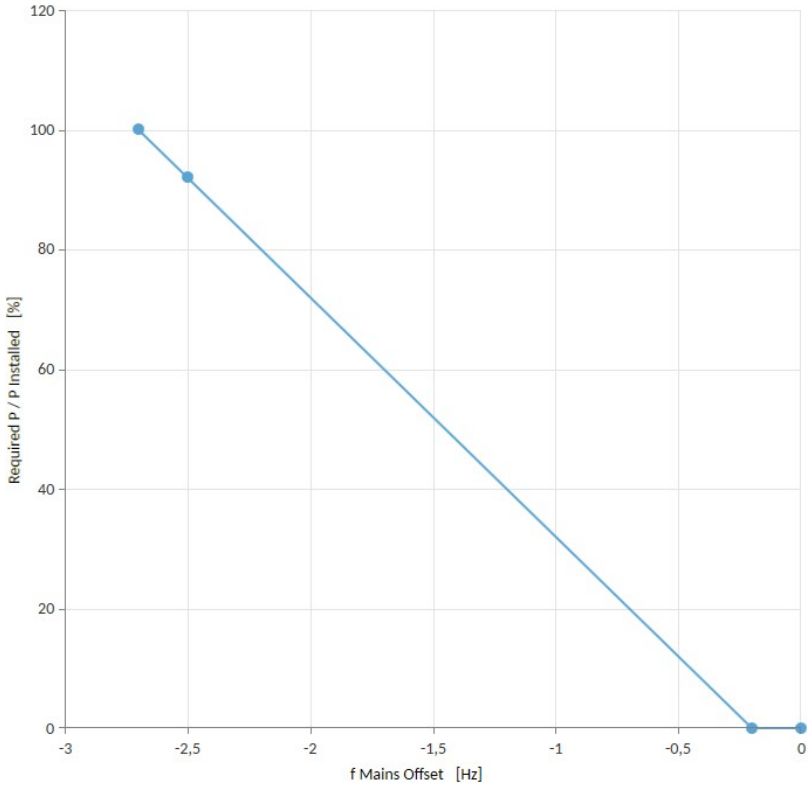
Y-axe is relative value of **BESS Required P** to **Installed Power** (or **Nominal power** in case **Installed Power** = OFF).

Note: *Δf has to be lower than 0.*

Default values

X-axe [Hz]	Y-axe [%]
-2.700	100.00
-2.500	92.00
-0.200	0.00
0.000	0.00

Default appearance



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P For Q UQ L

Related FW	2.2.0	**Related applications**	MPTM
App Curve ID	8		

Description

This curve is used to define UQ area where the BESS can operate during **P For Q** while **BESS Load Character** = L.

X-axe is relative value of Umains to **Mains/Bus Nominal Voltage Ph-N**.

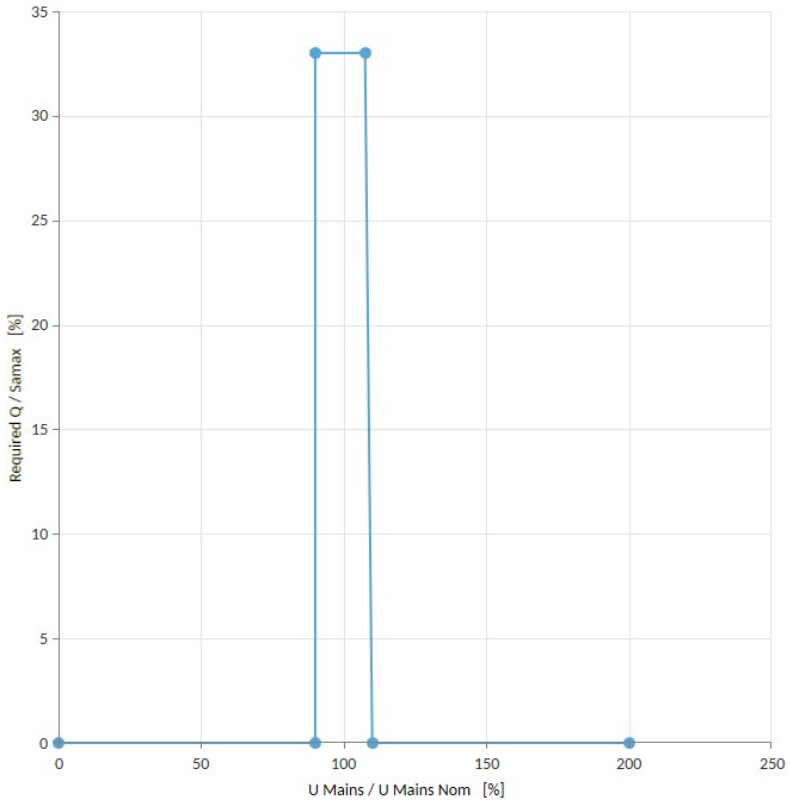
Y-axe is relative value of **BESS Required Q** to **Samax**.

Note: *Umains is average value of **Mains/Bus Voltage L1-N**, **Mains/Bus Voltage L2-N** and **Mains/Bus Voltage L3-N**.*

Default values

X-axe [%]	Y-axe [%]
0.00	00
90.00	00
90.00	33
107.50	33
110.00	0
200.00	0

Default appearance



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P For Q UQ C

Related FW	2.2.0	**Related applications**	MPTM
App Curve ID	9		

Description

This curve is used to define UQ area where the BESS can operate during **P For Q** while **BESS Load Character** = C.

X-axe is relative value of Umains to **Mains/Bus Nominal Voltage Ph-N**.

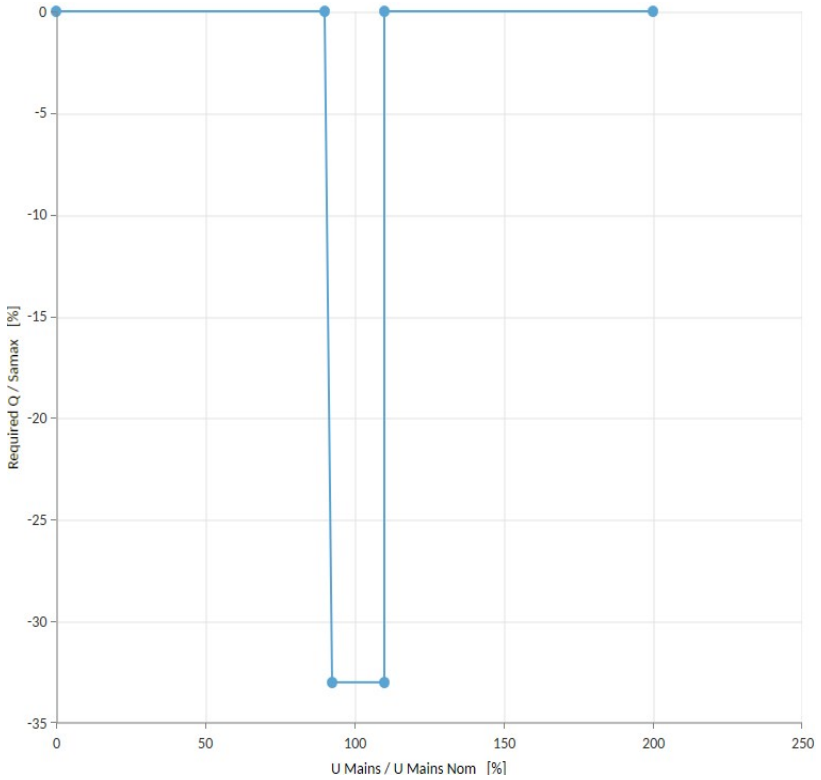
Y-axe is relative value of **BESS Required Q** to **Samax**.

Note: *Umains is average value of **Mains/Bus Voltage L1-N**, **Mains/Bus Voltage L2-N** and **Mains/Bus Voltage L3-N**.*

Default values

X-axe [%]	Y-axe [%]
0.00	00
90.00	00
92.50	-33
110.00	-33
110.00	0
200.00	0

Default appearance



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P For Q PQ L

Related FW	2.2.0	**Related applications**	MPTM
App Curve ID	10		

Description

This curve is used to define PQ area where the BESS can operate during **P For Q** while **BESS Load Character** = L.

X-axe is relative value of **BESS P** to **Installed Power** (or **Nominal power** in case **Installed Power** = OFF).

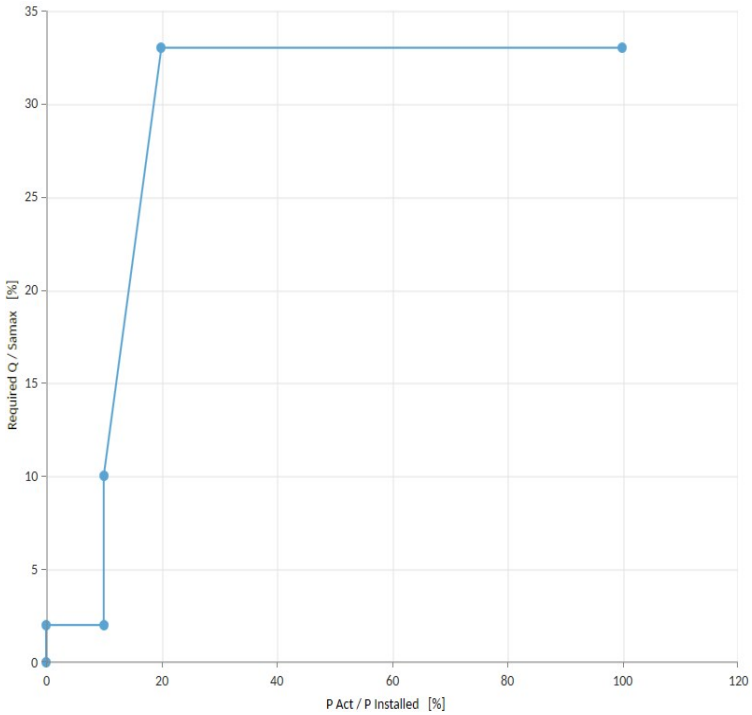
Y-axe is relative value of **BESS Q** to **Installed Power**.(or **Nominal power** in case **Installed Power** = OFF).

Note: *Umains is average value of **Mains/Bus Voltage L1-N**, **Mains/Bus Voltage L2-N** and **Mains/Bus Voltage L3-N**.*

Default values

X-axe [%]	Y-axe [%]
0.00	0
9.00	2
10.00	2
10.00	10
20.00	33
100.00	33

Default appearance



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P For Q PQ C

Related FW	2.2.0	Related applications	MPTM
App Curve ID	11		

Description

This curve is used to define PQ area where the BESS can operate during **P For Q** while **BESS Load Character** = C.

X-axe is relative value of **BESS P** to **Installed Power** (or **Nominal power** in case **Installed Power** = OFF).

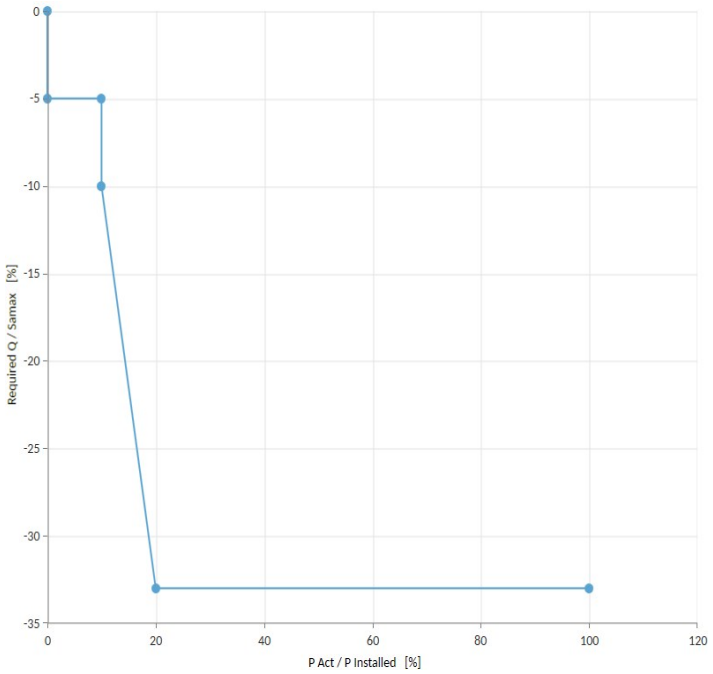
Y-axe is relative value of **BESS Q** to **Installed Power**.(or **Nominal power** in case **Installed Power** = OFF).

Note: *Umains is average value of **Mains/Bus Voltage L1-N**, **Mains/Bus Voltage L2-N** and **Mains/Bus Voltage L3-N**.*

Default values

X-axe [%]	Y-axe [%]
0.00	0
9.00	-5
10.00	-5
10.00	-10
20.00	-33
100.00	-33

Default appearance



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LVRT 3-phase

Related FW	2.2.0	**Related applications**	MPTM
App Curve ID	12		

Description

This curve is used during **Dynamic Support - VRT**. All of **Mains/Bus Voltage L1-N**, **Mains/Bus Voltage L2-N** and **Mains/Bus Voltage L3-N** has to be under **Mains/Bus Nominal Voltage Ph-N** to activate LVRT.

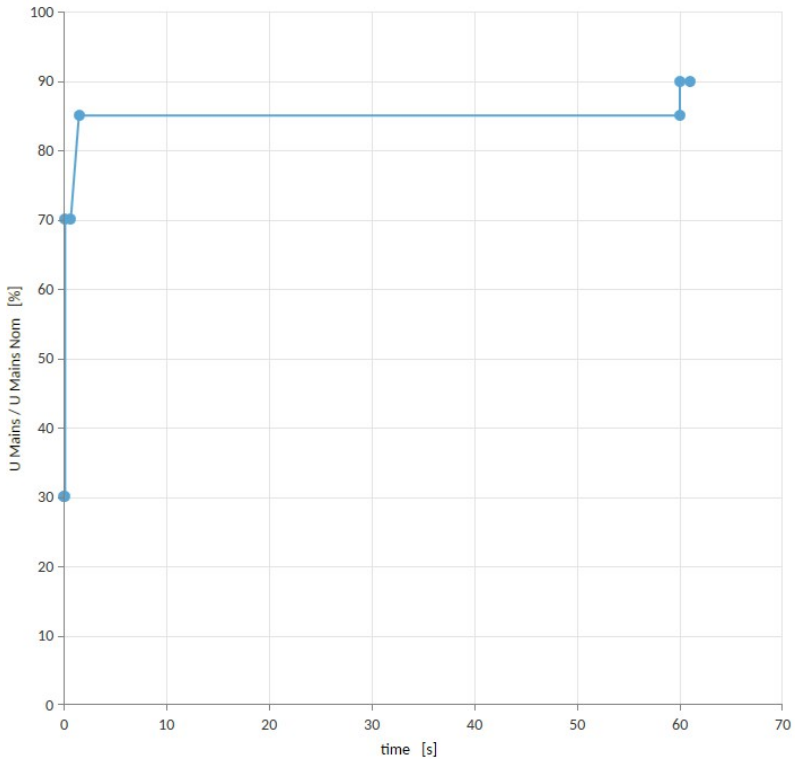
X-axe is time for which values have to be over the limit.

Y-axe is relative value of Umains to **Mains/Bus Nominal Voltage Ph-N**.

Default values

X-axe [s]	Y-axe [%]
0.00	30.0
0.15	30.0
0.70	70.0
1.50	70.0
60.00	85.0
60.00	90.0
61.00	90.0

Default appearance



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LVRT 2-phase

Related FW	2.2.0	**Related applications**	MPTM
App Curve ID	13		

Description

This curve is used during **Dynamic Support - VRT**. At least 2 of **Mains/Bus Voltage L1-N**, **Mains/Bus Voltage L2-N** and **Mains/Bus Voltage L3-N** has to be under **Mains/Bus Nominal Voltage Ph-N** to activate LVRT.

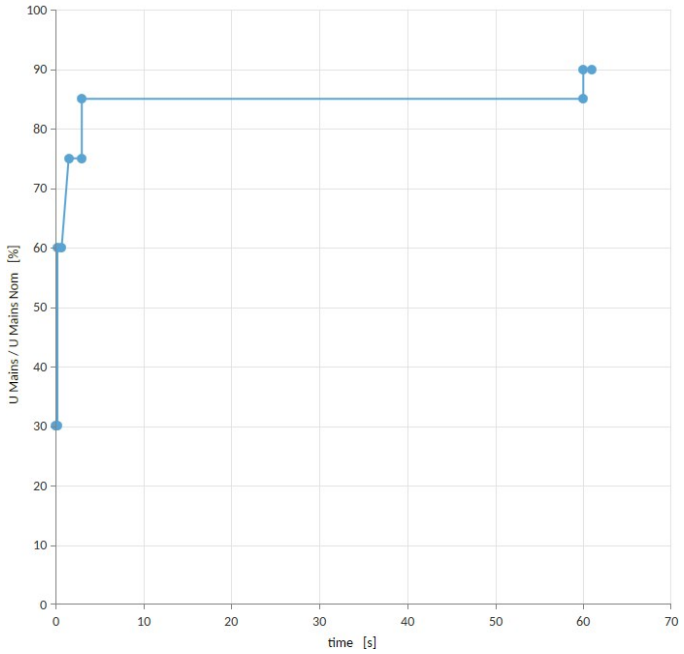
X-axe is time for which values have to be over the limit.

Y-axe is relative value of Umains to **Mains/Bus Nominal Voltage Ph-N**.

Default values

X-axe [s]	Y-axe [%]
0.00	30.0
0.22	30.0
0.22	60.0
0.70	60.0
1.50	75.0
3.00	75.0
3.00	85.0
60.00	85.0
60.00	90.0
61.00	90.0

Default appearance



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LVRT 1-phase

Related FW	2.2.0	**Related applications**	MPTM
App Curve ID	14		

Description

This curve is used during **Dynamic Support - VRT**. At least 1 of **Mains/Bus Voltage L1-N**, **Mains/Bus Voltage L2-N** and **Mains/Bus Voltage L3-N** has to be under **Mains/Bus Nominal Voltage Ph-N** to activate LVRT.

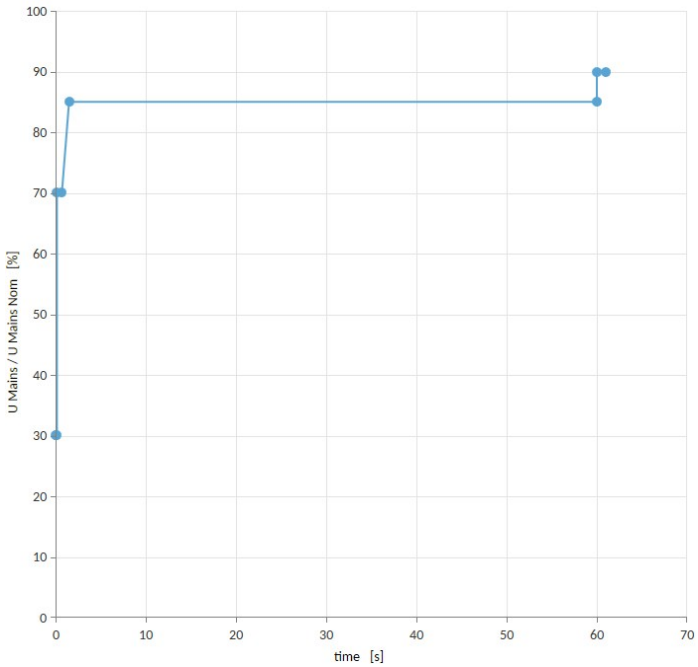
X-axe is time for which values have to be over the limit.

Y-axe is relative value of Umains to **Mains/Bus Nominal Voltage Ph-N**.

Default values

X-axe [s]	Y-axe [%]
0.00	30.0
0.15	30.0
0.15	70.0
0.70	70.0
1.50	85.0
60.00	85.0
60.00	90.0
61.00	90.0

Default appearance



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OVRT

Related FW	2.2.0	**Related applications**	MPTM
App Curve ID	15		

Description

This curve is used during **Dynamic Support - VRT**. At least 1 of **Mains/Bus Voltage L1-N**, **Mains/Bus Voltage L2-N** and **Mains/Bus Voltage L3-N** has to be over **Mains/Bus Nominal Voltage Ph-N** to activate LVRT.

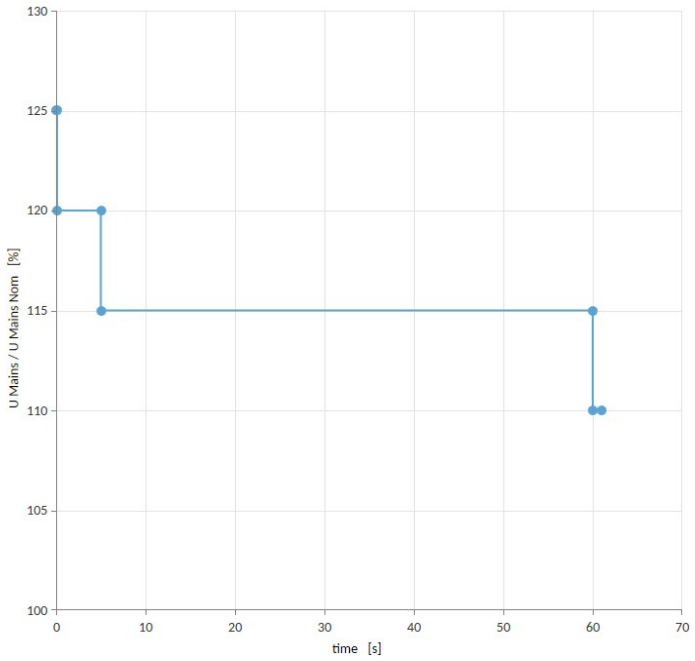
X-axe is time for which values have to be over the limit.

Y-axe is relative value of Umains to **Mains/Bus Nominal Voltage Ph-N**.

Default values

X-axe [s]	Y-axe [%]
0.00	125.0
0.10	125.0
0.10	120.0
5.00	120.0
5.00	115.0
60.00	115.0
60.00	110.0
61.00	110.0

Default appearance



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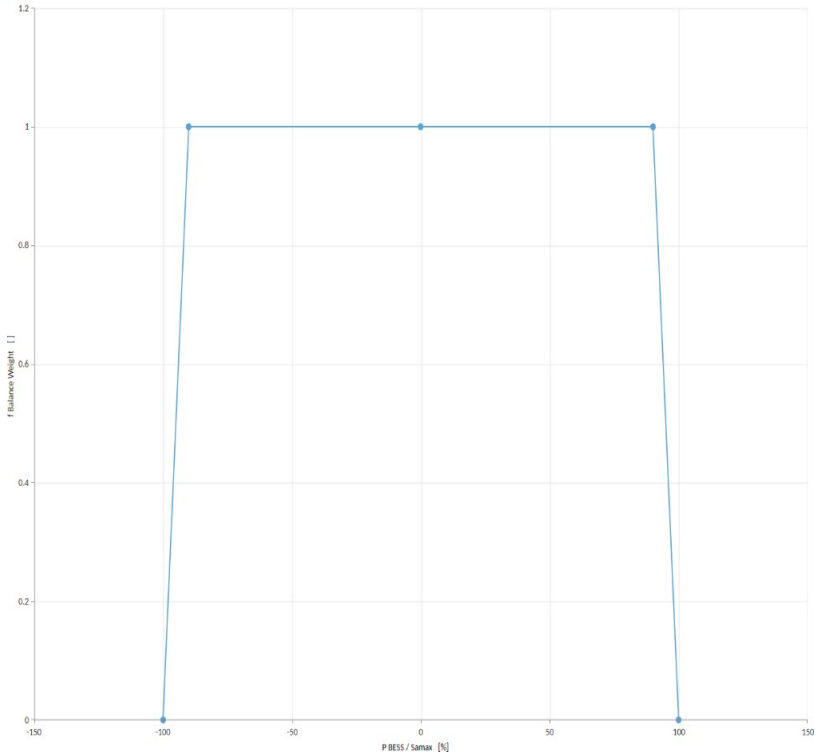
Dynamic f Balance Weight - P

Related FW	2.2.0	**Related applications**	MINT
App Curve ID	20		

Description

It expresses the dependency between the relative P of the BESS and the dynamic weight of isochronous frequency regulation in island operation. The resulting weight applied in the regulations is then the product of the coefficient corresponding to the curve and the setpoint **Frequency Balancing Weight**.

Default appearance



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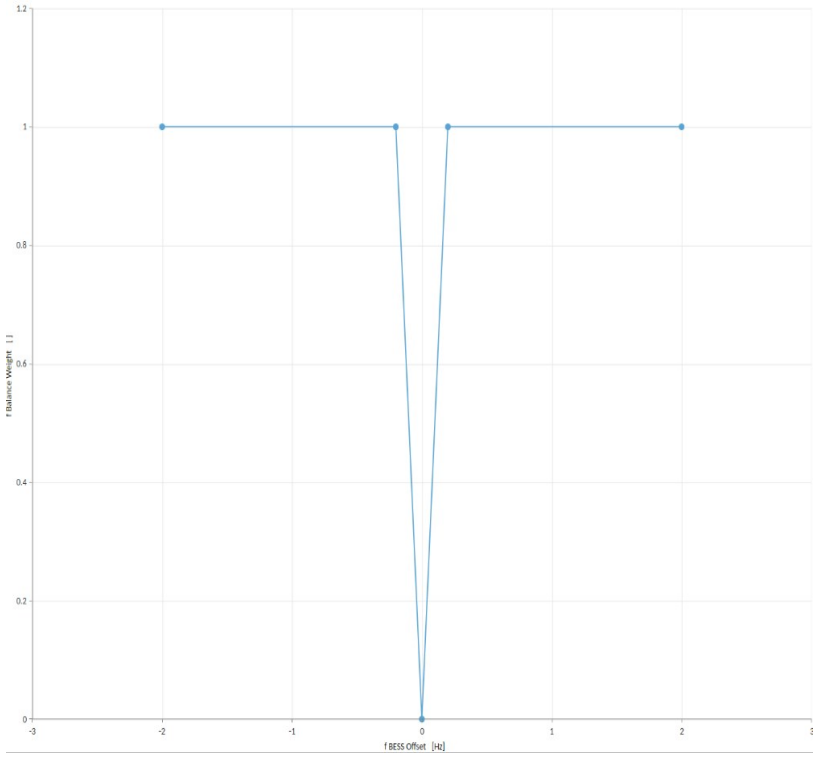
Dynamic f Balance Weight - f

Related FW	2.2.0	**Related applications**	MINT
App Curve ID	21		

Description

It expresses the dependency between the actual frequency of the BESS and the dynamic weight of isochronous frequency regulation in island operation. The resulting weight applied in the regulations is then the product of the coefficient corresponding to the curve and the setpoint **Frequency Balancing Weight**.

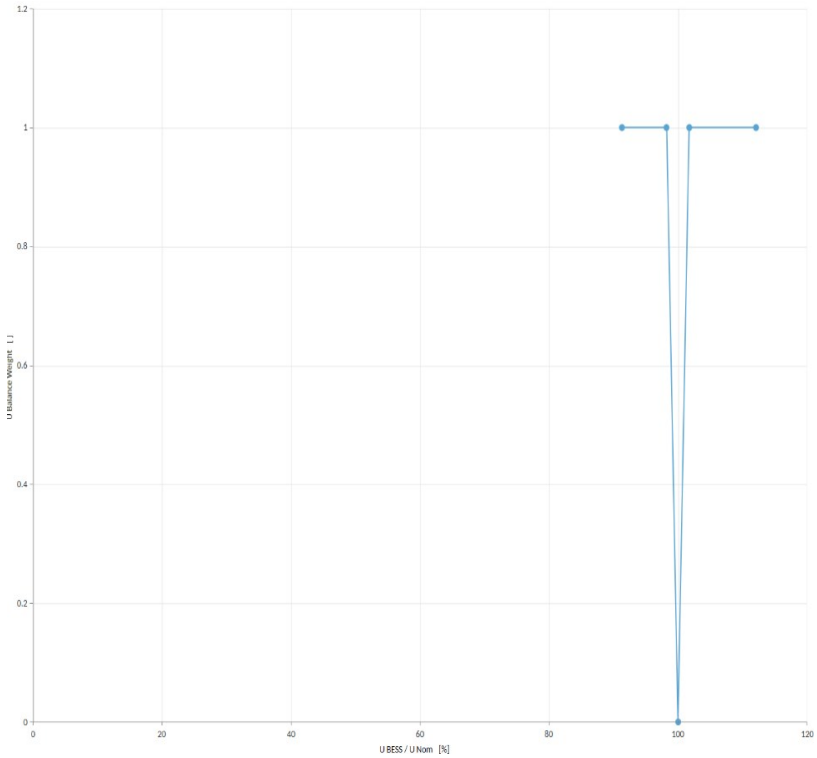
Default appearance



back to Application Curves

Dynamic U Balance Weight - U

Related FW	2.2.0	**Related applications**	MINT
App Curve ID	22		
Description			
It expresses the dependency between the relative Q of the BESS and the dynamic weight of isochronous voltage regulation in island operation. The resulting weight applied in the regulations is then the product of the coefficient corresponding to the curve and the setpoint **Voltage Balancing Weight**.			
Default appearance			



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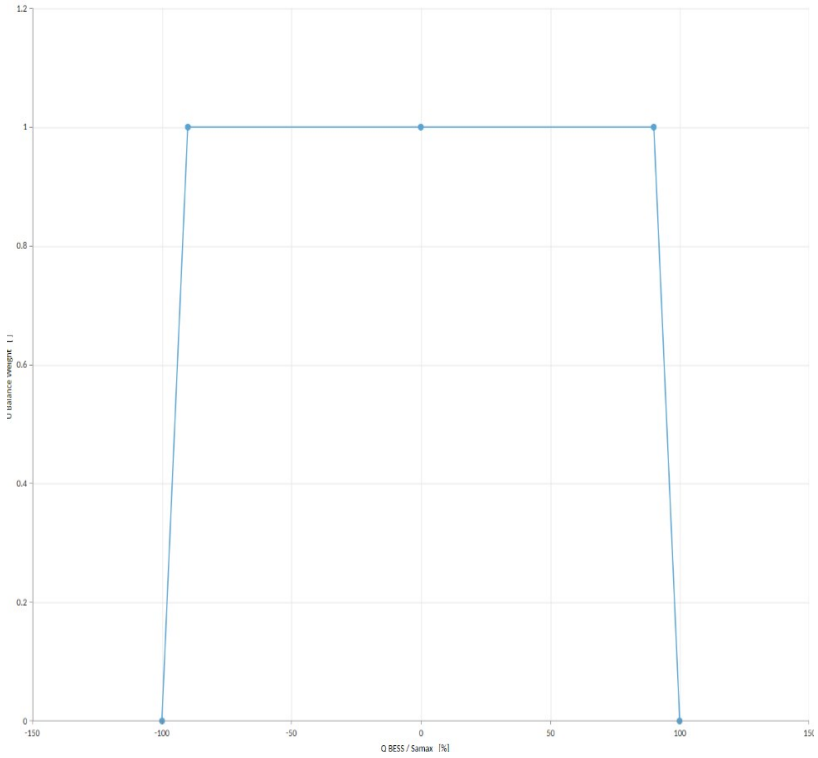
Dynamic U Balance Weight - Q

Related FW	2.2.0	**Related applications**	MINT
App Curve ID	23		

Description

It expresses the dependency between the voltage of the BESS and the dynamic weight of isochronous voltage regulation in island operation. The resulting weight applied in the regulations is then the product of the coefficient corresponding to the curve and the setpoint **Voltage Balancing Weight**.

Default appearance



back to Application Curves

11.1.6 Logical binary inputs

What Logical binary inputs are:

Internal functions of the controller may require some input values to be associated (configured). The binary values enter the controller via Logical Binary Inputs - LBIs..

Alphabetical groups of Logical binary inputs

LBI: A 1209
LBI: B 1209
LBI: C 1217
LBI: E 1217
LBI: F 1221
LBI: G 1228
LBI: H 1229
LBI: L 1230
LBI: M 1234
LBI: N 1239
LBI: P 1239
LBI: R 1250
LBI: S 1253
LBI: T 1254
LBI: U 1255
LBI: W 1271

For full list of Logical binary inputs go to the chapter **Logical binary inputs alphabetically**.

Logical binary inputs alphabetically

LBI: A 1209
Application MINT 1209
Application MPTM 1209
LBI: B 1209
BESS Discharge Enable 1209
BESS Charge Enable 1209
BCB Button 1210
BCB Disable 1210
BCB Feedback 1211
BCB Feedback Negative 1212
BCB Secondary Feedback Negative 1213
BCB Secondary Feedback 1214
BESS Output Control Mode U-f/P-Q 1215
BESS 01 Ready To Load 1216
BESS XY BCB Closed/Ready To Load ..1216
BESS Remote Start/Stop 1216
BESS Start Blocking 1216
LBI: C 1217
Universal Hours Counter 1 1217
Universal Hours Counter 2 1217
LBI: E 1217
ECU Key Switch 1217
ECU Communication Fail Block 1217
ECU Communication Fail Block 1 1217
ECU Communication Fail Block 2 1218
ECU Communication Fail Block 3 1218
ECU Communication Fail Block 4 1218
ECU Communication Fail 1218
Block 5 .....
ECU Communication Fail Block 6 1218
ECU Communication Fail Block 7 1219
ECU Communication Fail Block 8 1219
ECU Communication Fail Block 9 1219
ECU Communication Fail Block 10 1219
ECU Communication Fail Block 11 1219
ECU Communication Fail Block 12 1220
ECU Communication Fail Block 13 1220
ECU Communication Fail Block 14 1220
ECU Communication Fail Block 15 1220
ECU Communication Fail Block 16 1220
Emergency MAN 1221
Emergency Stop 1221
LBI: F 1221
Fault Reset Button 1221
Force Island 1221
Force Parallel 1222
Forced Value Input 01 ... 1222
Forced Value Input 02 ... 1222
Forced Value Input 03 ... 1222
Forced Value Input 04 ... 1222
Forced Value Input 05 ... 1223
Forced Value Input 06 ... 1223
Forced Value Input 07 ... 1223
Forced Value Input 08 ... 1223
Forced Value Input 09 ... 1223
Forced Value Input 10 ... 1224
Forced Value Input 11 ... 1224
Forced Value Input 12 ... 1224
Forced Value Input 13 ... 1224
Forced Value Input 14 ... 1224
Forced Value Input 15 ... 1225
Forced Value Input 16 ... 1225
Forced Value Input 17 ... 1225
Forced Value Input 18 ... 1225
Forced Value Input 19 ... 1225
Forced Value Input 20 ... 1226
Forced Value Input 21 ... 1226
Forced Value Input 22 ... 1226
Forced Value Input 23 ... 1226
Forced Value Input 24 ... 1226
Forced Value Input 25 ... 1227
Forced Value Input 26 ... 1227
Forced Value Input 27 ... 1227
Forced Value Input 28 ... 1227
Forced Value Input 29 ... 1227
Forced Value Input 30 ... 1228
Forced Value Input 31 ... 1228
Forced Value Input 32 ... 1228
LBI: G 1228
Group link 1228
Geo Home Position 1228
Geo-Fencing Enable 1229
LBI: H 1229
Horn Reset Button 1229
Hot Swap Ctrl Block 1229
Hot Swap Heartbeat Detect 1230
Hot Swap Recovery 1230
LBI: L 1230
Load Reduction 1 1230
Load Reduction 2 1231
Load Reduction 3 1231
Load Reduction 4 1231

Load Reduction Enable 1231
Load Res 2 Active 1232
Load Res 3 Active 1233
Load Res 4 Active 1234
LBI: M 1234
Mains Fail Block 1234
Manual Load Reconnection 1235
MCB Button 1235
MCB Disable 1235
MCB Feedback 1236
MCB Feedback Negative 1237
Min Run Power Act 1 1238
Min Run Power Act 2 1238
Min Run Power Act 3 1239
LBI: N 1239
NCB Feedback 1239
LBI: P 1239
PCS Start Disabled 1239
Post VRT 1240
Precharge Finished 1240
Protection Force Disable Block 1 1240
Protection Force Disable Block 2 1241
Protection Force Disable Block 3 1241
Pulse Counter 1 1242
Pulse Counter 2 1242
PV 01 Operable 1242
PV 02 Operable 1242
PV 03 Operable 1242
PV 04 Operable 1243
PV 05 Operable 1243
PV 06 Operable 1243
PV 07 Operable 1243
PV 08 Operable 1243
PV 09 Operable 1244
PV 10 Operable 1244
PV 11 Operable 1244
PV 12 Operable 1244
PV 13 Operable 1244
PV 14 Operable 1245
PV 15 Operable 1245
PV 16 Operable 1245
PV 17 Operable 1245
PV 18 Operable 1245
PV 19 Operable 1246
PV 20 Operable 1246
PV 21 Operable 1246
PV 22 Operable 1246
PV 23 Operable 1246
PV 24 Operable 1247
PV 25 Operable 1247
PV 26 Operable 1247
PV 27 Operable 1247
PV 28 Operable 1247
PV 29 Operable 1248
PV 30 Operable 1248
PV 31 Operable 1248
PV 32 Operable 1248
PVCB Button 1248
PVCB Disable 1249
PVCB Feedback 1249
PVCB Feedback Negative 1250
LBI: R 1250
Remote AUTO 1250
Remote MANRUN MODE 1251
Remote OFF MODE 1251
Remote TEST 1251
Remote TEST On Load 1252
LBI: S 1253
Sd Override 1253
Soft Unload Enable 1253
Start Button 1253
Stop Button 1253
Sunrise/Sunset Home Position 1254
Synchronization Disabled 1254
LBI: T 1254
TEST ROCOF 1254
Test Vector Shift 1254
Top Priority 1254
LBI: U 1255
Universal Genset Start/Stop 1255
Uni Gen 01 GCB Closed 1255
Uni Gen 01 GCB Closing 1255
Uni Gen 01 Loaded 1256
Uni Gen 01 Ready 1256
Uni Gen 02 GCB Closed 1256
Uni Gen 02 GCB Closing 1256
Uni Gen 02 Loaded 1257
Uni Gen 02 Ready 1257
Uni Gen 03 GCB Closed 1257
Uni Gen 03 GCB Closing 1257
Uni Gen 03 Loaded 1258
Uni Gen 03 Ready 1258
Uni Gen 04 GCB Closed 1258
Uni Gen 04 GCB Closing 1258
Uni Gen 04 Loaded 1259
Uni Gen 04 Ready 1259
Uni Gen 05 GCB Closed 1259
Uni Gen 05 GCB Closing 1259
Uni Gen 05 Loaded 1260
Uni Gen 05 Ready 1260
Uni Gen 06 GCB Closed 1260
Uni Gen 06 GCB Closing 1260
Uni Gen 06 Loaded 1261
Uni Gen 06 Ready 1261
Uni Gen 07 GCB Closed 1261
Uni Gen 07 GCB Closing 1261
Uni Gen 07 Loaded 1262
Uni Gen 07 Ready 1262
Uni Gen 08 GCB Closed 1262
Uni Gen 08 GCB Closing 1262
Uni Gen 08 Loaded 1263
Uni Gen 08 Ready 1263
Uni Gen 09 GCB Closed 1263

Uni Gen 09 GCB Closing 1263
Uni Gen 09 Loaded 1264
Uni Gen 09 Ready 1264
Uni Gen 10 GCB Closed 1264
Uni Gen 10 GCB Closing 1264
Uni Gen 10 Loaded 1265
Uni Gen 10 Ready 1265
Uni Gen 11 GCB Closed 1265
Uni Gen 11 GCB Closing 1265
Uni Gen 11 Loaded 1266
Uni Gen 11 Ready 1266
Uni Gen 12 GCB Closed 1266
Uni Gen 12 GCB Closing 1266
Uni Gen 12 Loaded 1267
Uni Gen 12 Ready 1267
Uni Gen 13 GCB Closed 1267
Uni Gen 13 GCB Closing 1267
Uni Gen 13 Loaded 1268
Uni Gen 13 Ready 1268
Uni Gen 14 GCB Closed 1268
Uni Gen 14 GCB Closing 1268
Uni Gen 14 Loaded 1269
Uni Gen 14 Ready 1269
Uni Gen 15 GCB Closed 1269
Uni Gen 15 GCB Closing 1269
Uni Gen 15 Loaded 1270
Uni Gen 15 Ready 1270
Uni Gen 16 GCB Closed 1270
Uni Gen 16 GCB Closing 1270
Uni Gen 16 Loaded 1271
Uni Gen 16 Ready 1271
LBI: W 1271
WT 01 Operable 1271
WT 02 Operable 1271
WT 03 Operable 1271
WT 04 Operable 1272
WT 05 Operable 1272
WT 06 Operable 1272
WT 07 Operable 1272
WT 08 Operable 1272

back to Controller objects

LBI: A

Application MINT

Related FW	2.2.0	**Related applications**	MINT, MPTM
LBI ID	1007		
Description			
Activation of this binary input switches the controller **Application Mode** to MINT. **IMPORTANT: The Controller Mode has to be OFF, otherwise controller application can not be changed.** ***Note:*** *This binary input has lower priority than LBI* ***APPLICATION MPTM****.*			

back to Logical binary inputs alphabetically

Application MPTM

Related FW	2.2.0	**Related applications**	MINT, MPTM
LBI ID	1006		
Description			
Activation of this binary input switches the controller **Application Mode** to MPTM. **IMPORTANT: The Controller Mode has to be OFF, otherwise controller application can not be changed.** ***Note:*** *This binary input has higher priority than LBI* ***APPLICATION MINT****.*			

back to Logical binary inputs alphabetically

LBI: B

BESS Discharge Enable

Related FW	2.2.0	**Related applications**	MINT, MPTM
LBI ID	1106		
Description			
This logical input enables discharging process of the battery.			

back to Logical binary inputs alphabetically

BESS Charge Enable

Related FW	2.2.0	**Related applications**	MINT, MPTM
LBI ID	1105		
Description			
This logical input enables charging process of the battery.			

back to Logical binary inputs alphabetically

BCB Button

Related FW	2.2.0	Related applications	MINT, MPTM
LBI ID	193		
Description			
Binary input has the same function as BCB button I/O on an **External display**Internal display.			

back to Logical binary inputs alphabetically

BCB Disable

Related FW	2.2.0	Related applications	MINT, MPTM
LBI ID	62		
Description			
This function is used to prevent BCB closing and opening. › If the input is active during synchronizing, the controller will continue synchronizing without issuing the BCB closing command until the input is deactivated or Sync timeout is elapsed. › If the input is active and the BCB button is pressed in MAN mode to close the BCB to dead bus, the BCB will not be closed until the input is deactivated and the BCB button pressed again. › If the input is active and the BCB should be closed to dead bus automatically, the BCB will not be closed until the input is deactivated. › If the input is active and the BCB is already closed, the breaker will not open automatically. BCB can be opened with BCB Button (or the corresponding command).			

back to Logical binary inputs alphabetically

BCB Feedback

Related FW	2.2.0	Related applications	MINT, MPTM
LBI ID	63		

Description

Use this input to indicate whether the BESSAC bus DC bus circuit breaker is opened or closed.

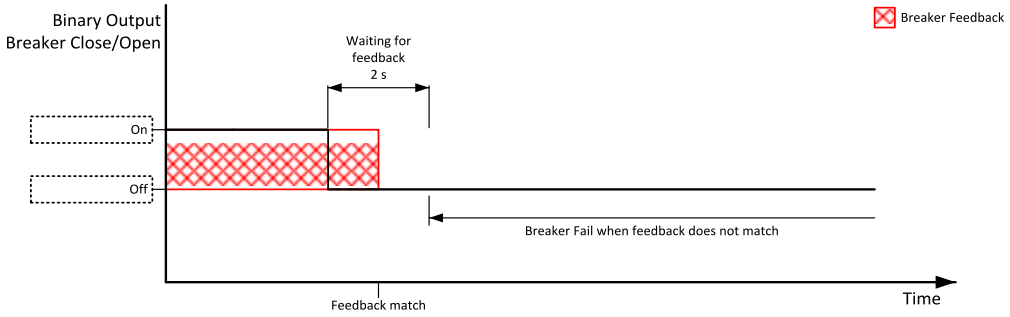


Image 22.9 BCB Feedback 1

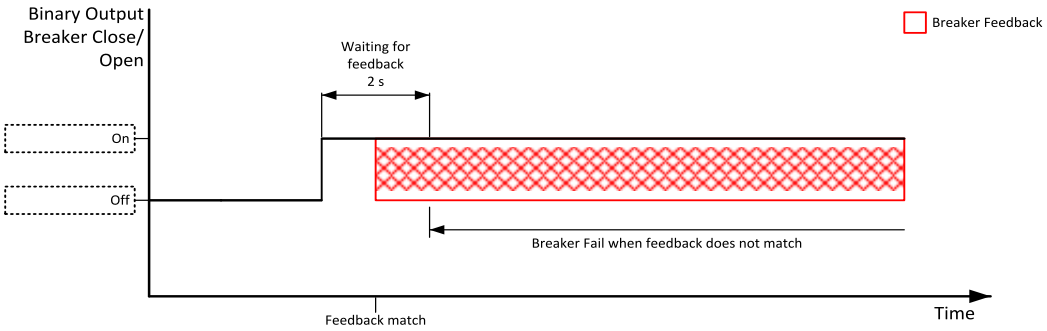


Image 22.10 BCB Feedback 2

This input is used for connection of the normally open feedback contact from the generator circuit breaker or contactor. If the input is active, the controller will consider the BCB as closed and vice versa.

- If the feedback does not respond to a change of the control output LBO **BCB CLOSE/OPEN**, and it was already last attempt the specific alarm based on current breaker position is issued.
- If the feedback changes it's position unexpectedly without any command given by the control output, the Alarm **Stp BCB Fail** will be issued immediately.

back to Logical binary inputs alphabetically

BCB Feedback Negative

Related FW	2.2.0	Related applications	MINT, MPTM
LBI ID	64		

Description

Use this input to indicate whether the BESS circuit breaker is opened or closed.

This input is used for connection of the normally closed feedback contact from the generator circuit breaker or contactor. This input is optional and if it is configured, it must be always in inverse position to the normally open input LBI **BCB FEEDBACK**. Maximal allowed time the both inputs are in the same position is 500ms, after this time the Alarm **Stp BCB Fail** is issued.

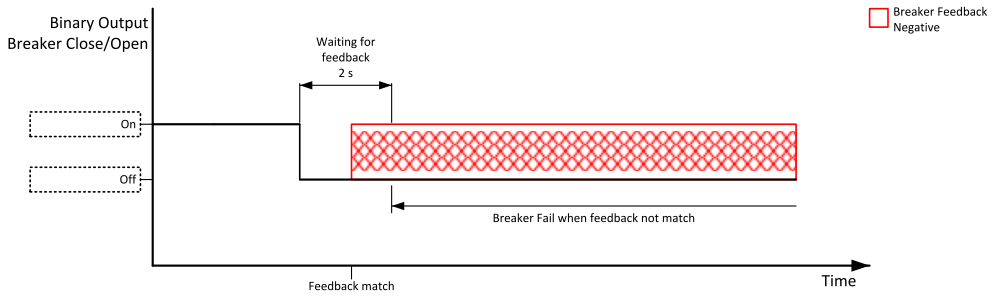


Image 22.11 BCB Feedback Negative 1

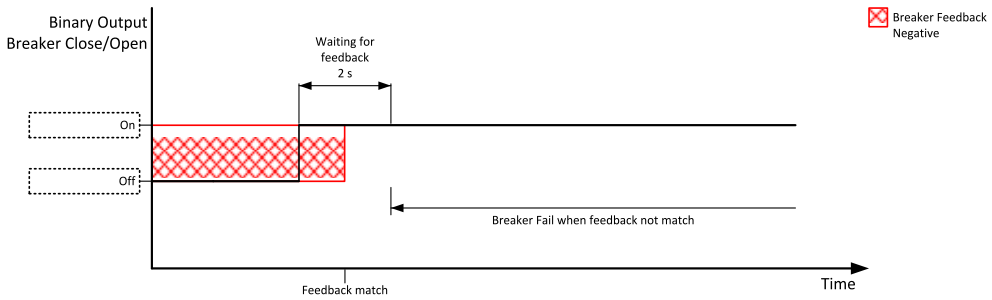


Image 22.12 BCB Feedback Negative 2

back to Logical binary inputs alphabetically

BCB Secondary Feedback Negative

Related FW	2.2.0	Related applications	MINT, MPTM
LBI ID	982		

Description

Use this input to indicate whether the BESS circuit breaker is opened or closed.

This input is logically inverted against LBI **BCB SECONDARY FEEDBACK**.

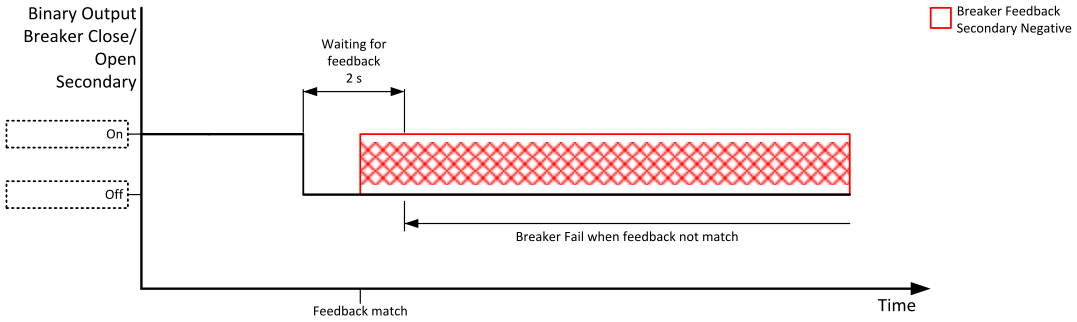


Image 22.13 BCB Feedback Secondary Negative 1

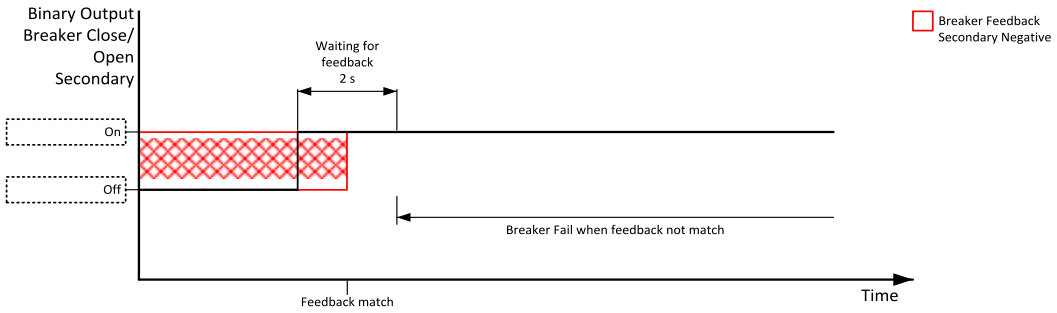


Image 22.14 BCB Feedback Secondary Negative 2

back to Logical binary inputs alphabetically

BCB Secondary Feedback

Related FW	2.2.0	Related applications	MINT, MPTM
LBI ID	548		

Description

Use this input to indicate whether the BESS circuit breaker is opened or closed.

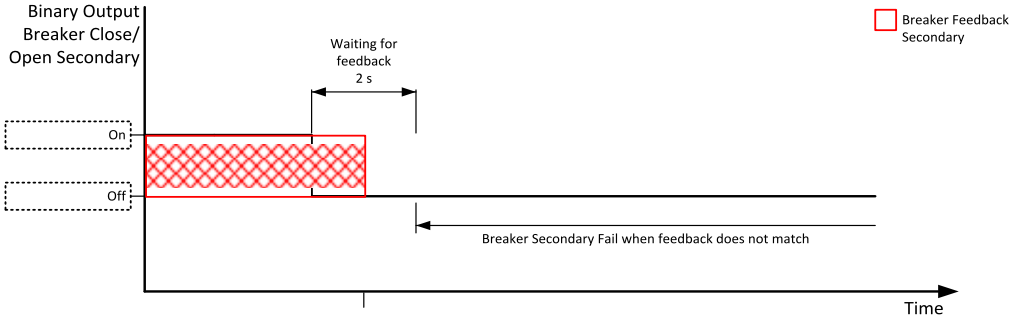


Image 22.15 BCB Feedback 1

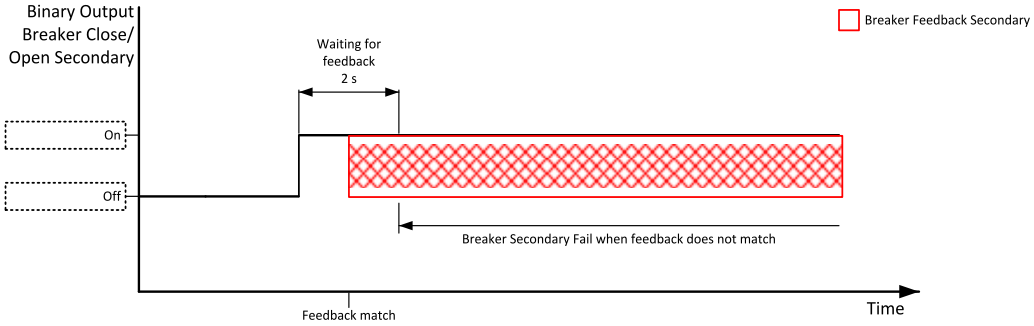


Image 22.16 BCB Feedback 2

back to Logical binary inputs alphabetically

BESS Output Control Mode U-f/P-Q

Related FW	2.2.0	Related applications	MINT, MPTM
LBI ID	1109		

Description

This logical input provides information to the controler on what type of regulation output control of the BESS is utilized. It is used to choose what BESS Output Control method will be used depending on its state. By default (log 0) the U-f option is used. The BESS is controlled in U-f mode also if the LBI is left unconfigured. This LBI activates the function of **HLC Control mode** making so that the control of PQ takes place. More info can be read **see BESS output control methods P-Q / U-f on page 235**

Note: *Having this LBI configured and active while the setpoint Start Sequence BCB Control = Start with Opened BCB the alarm* ***SD Wrong P-Q Control Settings*** *appears and does not allow the system to start.This setup would create a situation where a PQ source PCS would be attempting to create a grid based on the active LBI indication. When the controller is commanded to stop and the LBI is still active the* ***SD Wrong P-Q Control Settings*** *will appear and stay active until the LBI is deactivated.*

Note: *Function of Anti islanding can occur if the BESS is to be the only source on the AC bus and the LBI is active. Anytime when the BESS in P-Q mode stays on the bus alone without any other Grid Forming source (like Genset or Mains) the* ***BESS Anti Islanding*** *protection is tripped, BCB is opened, the BESS goes to Stop and Ready state while the DC circuit is to be yet opened.*

back to Logical binary inputs alphabetically

BESS 01 Ready To Load

Related FW	2.2.0	Related applications	MINT, MPTM
LBI ID	121		
Description			

Activation of this LBI signalizes that BESS is ready to be loaded. Once this LBI gets active and the BESS finished the stabilization phase, **BESS state** goes to Running .

- If this LBI is configured and it is not activated before **BESS Ready to Load TOBESS Ready to Load TO** elapsed the alarm **BESS Start Fail** is activated.
- If this LBI is **not** configured the BCB is closed after **BESS Ready to Load TO** elapsed.

Note: *There is no BCB control limitation when **BCB Control Mode** = External.*

BESS XY BCB Closed/Ready To Load

Related FW	2.2.0	Related applications	MINT, MPTM
Description			

The resulting value of MultiBESS Ready To Load is aggregated from individual instances of OR functions. It is displayed as a binary variable within the Total MultiBESS group. In the Master BESS, this aggregated signal serves as the source for the Ready To Load status.

If the MultiBESS function is active, this aggregated value is used exclusively as the Ready To Load signal source. This approach bypasses the standard mechanism where the Ready To Load status is either received as an LBI input or determined automatically based on a timeout.

Note: *The description is the same for each "BESS XY BCB Closed/Ready To Load" LBI, where XY stands for numbers 02 (LBI ID 1476) to 32 (LBI ID 1506).*

back to Logical binary inputs alphabetically

BESS Remote Start/Stop

Related FW	2.2.0	Related applications	MINT, MPTM
LBI ID	1396		
Description			

This LBI is accepted in AUT mode and it makes the BESS running and connected to the bus unconditionally in relation to power management.

back to Logical binary inputs alphabetically

BESS Start Blocking

Related FW	2.2.0	Related applications	MINT, MPTM
LBI ID	68		
Description			

Start of the BESS is blocked if this binary input gets active before Start command is issued. While start is blocked, alarm **ALI Start Blocking** is active.

Note: *Activation of this LBI while BESS is already running (or is about to be started) has no effect.*

back to Logical binary inputs alphabetically

LBI: C

Universal Hours Counter 1

Related FW	2.2.0	**Related applications**	MINT, MPTM
LBI ID	1094		
Description			
This binary input is used as customer condition for the value **Conditioned Running Hours 1**.			

back to Logical binary inputs alphabetically

Universal Hours Counter 2

Related FW	2.2.0	**Related applications**	MINT, MPTM
LBI ID	1095		
Description			
This binary input is used as customer condition for the value **Conditioned Running Hours 2**.			

back to Logical binary inputs alphabetically

LBI: E

ECU Key Switch

Related FW	2.2.0	**Related applications**	MINT, MPTM
LBI ID	951		
Description			
Activation of this binary input activates LBO **ECU Power Relay** without starting of the BESS. This can be used for reading electronic control unit values when BESS does not run.			

back to Logical binary inputs alphabetically

ECU Communication Fail Block

Related FW	2.2.0	**Related applications**	MINT, MPTM
LBI ID	141		
Description			
Activation of this binary input blocks all protections (including user protections) for every single configured ECU.			

back to Logical binary inputs alphabetically

ECU Communication Fail Block 1

Related FW	2.2.0	**Related applications**	MINT, MPTM
LBI ID	1020		
Description			
Activation of this binary input blocks all protections (including user protections) for ECU configured in ECU slot 1. Alarm **Wrn ECU 1 Comm Fail** is deactivated while this LBI is active.			

back to Logical binary inputs alphabetically

ECU Communication Fail Block 2

Related FW	2.2.0	**Related applications**	MINT, MPTM
LBI ID	1021		
Description			
Activation of this binary input blocks all protections (including user protections) for ECU configured in ECU slot 2. Alarm **Wrn ECU 2 Comm Fail** is deactivated while this LBI is active.			

back to Logical binary inputs alphabetically

ECU Communication Fail Block 3

Related FW	2.2.0	**Related applications**	MINT, MPTM
LBI ID	1022		
Description			
Activation of this binary input blocks all protections (including user protections) for ECU configured in ECU slot 3. Alarm **Wrn ECU 3 Comm Fail** is deactivated while this LBI is active.			

back to Logical binary inputs alphabetically

ECU Communication Fail Block 4

Related FW	2.2.0	**Related applications**	MINT, MPTM
LBI ID	1023		
Description			
Activation of this binary input blocks all protections (including user protections) for ECU configured in ECU slot 4. Alarm **Wrn ECU 4 Comm Fail** is deactivated while this LBI is active.			

back to Logical binary inputs alphabetically

ECU Communication Fail Block 5

Related FW	2.2.0	**Related applications**	MINT, MPTM
LBI ID	1024		
Description			
Activation of this binary input blocks all protections (including user protections) for ECU configured in ECU slot 5. Alarm **Wrn ECU 5 Comm Fail** is deactivated while this LBI is active.			

back to Logical binary inputs alphabetically

ECU Communication Fail Block 6

Related FW	2.2.0	**Related applications**	MINT, MPTM
LBI ID	1025		
Description			
Activation of this binary input blocks all protections (including user protections) for ECU configured in ECU slot 6. Alarm **Wrn ECU 6 Comm Fail** is deactivated while this LBI is active.			

back to Logical binary inputs alphabetically

ECU Communication Fail Block 7

Related FW	2.2.0	**Related applications**	MINT, MPTM
LBI ID	1026		
Description			
Activation of this binary input blocks all protections (including user protections) for ECU configured in ECU slot 7. Alarm **Wrn ECU 7 Comm Fail** is deactivated while this LBI is active.			

back to Logical binary inputs alphabetically

ECU Communication Fail Block 8

Related FW	2.2.0	**Related applications**	MINT, MPTM
LBI ID	1027		
Description			
Activation of this binary input blocks all protections (including user protections) for ECU configured in ECU slot 8. Alarm **Wrn ECU 8 Comm Fail** is deactivated while this LBI is active.			

back to Logical binary inputs alphabetically

ECU Communication Fail Block 9

Related FW	2.2.0	**Related applications**	MINT, MPTM
LBI ID	1028		
Description			
Activation of this binary input blocks all protections (including user protections) for ECU configured in ECU slot 9. Alarm **Wrn ECU 9 Comm Fail** is deactivated while this LBI is active.			

back to Logical binary inputs alphabetically

ECU Communication Fail Block 10

Related FW	2.2.0	**Related applications**	MINT, MPTM
LBI ID	1029		
Description			
Activation of this binary input blocks all protections (including user protections) for ECU configured in ECU slot 10. Alarm **Wrn ECU 10 Comm Fail** is deactivated while this LBI is active.			

back to Logical binary inputs alphabetically

ECU Communication Fail Block 11

Related FW	2.2.0	**Related applications**	MINT, MPTM
LBI ID	1030		
Description			
Activation of this binary input blocks all protections (including user protections) for ECU configured in ECU slot 11. Alarm **Wrn ECU 11 Comm Fail** is deactivated while this LBI is active.			

back to Logical binary inputs alphabetically

ECU Communication Fail Block 12

Related FW	2.2.0	**Related applications**	MINT, MPTM
LBI ID	1031		
Description			
Activation of this binary input blocks all protections (including user protections) for ECU configured in ECU slot 12. Alarm **Wrn ECU 12 Comm Fail** is deactivated while this LBI is active.			

back to Logical binary inputs alphabetically

ECU Communication Fail Block 13

Related FW	2.2.0	**Related applications**	MINT, MPTM
LBI ID	1032		
Description			
Activation of this binary input blocks all protections (including user protections) for ECU configured in ECU slot 13. Alarm **Wrn ECU 13 Comm Fail** is deactivated while this LBI is active.			

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ECU Communication Fail Block 14

Related FW	2.2.0	**Related applications**	MINT, MPTM
LBI ID	1033		
Description			
Activation of this binary input blocks all protections (including user protections) for ECU configured in ECU slot 14. Alarm **Wrn ECU 14 Comm Fail** is deactivated while this LBI is active.			

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ECU Communication Fail Block 15

Related FW	2.2.0	**Related applications**	MINT, MPTM
LBI ID	1034		
Description			
Activation of this binary input blocks all protections (including user protections) for ECU configured in ECU slot 15. Alarm **Wrn ECU 15 Comm Fail** is deactivated while this LBI is active.			

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ECU Communication Fail Block 16

Related FW	2.2.0	**Related applications**	MINT, MPTM
LBI ID	1035		
Description			
Activation of this binary input blocks all protections (including user protections) for ECU configured in ECU slot 16. Alarm **Wrn ECU 16 Comm Fail** is deactivated while this LBI is active.			

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Emergency MAN

Related FW	2.2.0	Related applications	MINT, MPTM
LBI ID	45		
Description			
This input is designed to allow the BESS and breakers to be controlled externally (not by the controller). This feature can be useful in case of some failure, which disables the BESS and breakers to be controlled by the controller, but the BESS itself is operational. The controller behaves in the following way: › Stops all functions regarding the BESS and breaker control, deactivates all outputs related to it. › Stop Fail alarm is not being evaluated and stop solenoid is not activated if nonzero speed is detected. › When the input is deactivated, the controller takes control according to the situation in the moment of deactivation, i.e. the BESS remains running loaded if it was running and BCB was closed in the moment the input was deactivated.			

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Emergency Stop

Related FW	2.2.0	Related applications	MINT, MPTM
LBI ID	40		
Description			
When this binary input is activated, BESS is immediately stopped, binary outputs are disconnected and alarm **Emergency Stop** is activated.			

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LBI: F

Fault Reset Button

Related FW	2.2.0	Related applications	MINT, MPTM
LBI ID	191		
Description			
Binary input has the same function as Fault Reset button on an **External display**Internal display.			

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Force Island

Related FW	2.2.0	Related applications	, MPTM
LBI ID	787		
Description			
Activation of this LBI starts the BESS and forces island operation. Transfer method of the load from Mains is adjusted via setpoint **Transfer Mains To BESS**.			

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Force Parallel

Related FW	2.2.0	**Related applications**	, MPTM
LBI ID	786		
Description			
Activation of this LBI starts the BESS and forces parallel operation if **Mains/Bus HealthyMains Healthy** is closed. Island operation is not allowed while this LBI is closed.			

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Forced Value Input 01

Related FW	2.2.0	**Related applications**	MINT, MPTM
LBI ID	19		
Description			
This LBI is used for activation of preconfigured **Forced Value** to setpoint. ***Note:*** *This LBI can be renamed during configuration.*			

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Forced Value Input 02

Related FW	2.2.0	**Related applications**	MINT, MPTM
LBI ID	20		
Description			
This LBI is used for activation of preconfigured **Forced Value** to setpoint. ***Note:*** *This LBI can be renamed during configuration.*			

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Forced Value Input 03

Related FW	2.2.0	**Related applications**	MINT, MPTM
LBI ID	21		
Description			
This LBI is used for activation of preconfigured **Forced Value** to setpoint. ***Note:*** *This LBI can be renamed during configuration.*			

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Forced Value Input 04

Related FW	2.2.0	**Related applications**	MINT, MPTM
LBI ID	22		
Description			
This LBI is used for activation of preconfigured **Forced Value** to setpoint. ***Note:*** *This LBI can be renamed during configuration.*			

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Forced Value Input 05

Related FW	2.2.0	**Related applications**	MINT, MPTM
LBI ID	23		
Description			
This LBI is used for activation of preconfigured **Forced Value** to setpoint. ***Note:*** *This LBI can be renamed during configuration.*			

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Forced Value Input 06

Related FW	2.2.0	**Related applications**	MINT, MPTM
LBI ID	24		
Description			
This LBI is used for activation of preconfigured **Forced Value** to setpoint. ***Note:*** *This LBI can be renamed during configuration.*			

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Forced Value Input 07

Related FW	2.2.0	**Related applications**	MINT, MPTM
LBI ID	25		
Description			
This LBI is used for activation of preconfigured **Forced Value** to setpoint. ***Note:*** *This LBI can be renamed during configuration.*			

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Forced Value Input 08

Related FW	2.2.0	**Related applications**	MINT, MPTM
LBI ID	26		
Description			
This LBI is used for activation of preconfigured **Forced Value** to setpoint. ***Note:*** *This LBI can be renamed during configuration.*			

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Forced Value Input 09

Related FW	2.2.0	**Related applications**	MINT, MPTM
LBI ID	27		
Description			
This LBI is used for activation of preconfigured **Forced Value** to setpoint. ***Note:*** *This LBI can be renamed during configuration.*			

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Forced Value Input 10

Related FW	2.2.0	**Related applications**	MINT, MPTM
LBI ID	28		
Description			
This LBI is used for activation of preconfigured **Forced Value** to setpoint. ***Note:*** *This LBI can be renamed during configuration.*			

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Forced Value Input 11

Related FW	2.2.0	**Related applications**	MINT, MPTM
LBI ID	29		
Description			
This LBI is used for activation of preconfigured **Forced Value** to setpoint. ***Note:*** *This LBI can be renamed during configuration.*			

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Forced Value Input 12

Related FW	2.2.0	**Related applications**	MINT, MPTM
LBI ID	30		
Description			
This LBI is used for activation of preconfigured **Forced Value** to setpoint. ***Note:*** *This LBI can be renamed during configuration.*			

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Forced Value Input 13

Related FW	2.2.0	**Related applications**	MINT, MPTM
LBI ID	31		
Description			
This LBI is used for activation of preconfigured **Forced Value** to setpoint. ***Note:*** *This LBI can be renamed during configuration.*			

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Forced Value Input 14

Related FW	2.2.0	**Related applications**	MINT, MPTM
LBI ID	32		
Description			
This LBI is used for activation of preconfigured **Forced Value** to setpoint. ***Note:*** *This LBI can be renamed during configuration.*			

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Forced Value Input 15

Related FW	2.2.0	Related applications	MINT, MPTM
LBI ID	33		
Description			
This LBI is used for activation of preconfigured **Forced Value** to setpoint. ***Note:*** *This LBI can be renamed during configuration.*			

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Forced Value Input 16

Related FW	2.2.0	Related applications	MINT, MPTM
LBI ID	34		
Description			
This LBI is used for activation of preconfigured **Forced Value** to setpoint. ***Note:*** *This LBI can be renamed during configuration.*			

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Forced Value Input 17

Related FW	2.2.0	Related applications	MINT, MPTM
LBI ID	839		
Description			
This LBI is used for activation of preconfigured **Forced Value** to setpoint. ***Note:*** *This LBI can be renamed during configuration.*			

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Forced Value Input 18

Related FW	2.2.0	Related applications	MINT, MPTM
LBI ID	840		
Description			
This LBI is used for activation of preconfigured **Forced Value** to setpoint. ***Note:*** *This LBI can be renamed during configuration.*			

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Forced Value Input 19

Related FW	2.2.0	Related applications	MINT, MPTM
LBI ID	841		
Description			
This LBI is used for activation of preconfigured **Forced Value** to setpoint. ***Note:*** *This LBI can be renamed during configuration.*			

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Forced Value Input 20

Related FW	2.2.0	**Related applications**	MINT, MPTM
LBI ID	842		
Description			
This LBI is used for activation of preconfigured **Forced Value** to setpoint. ***Note:*** *This LBI can be renamed during configuration.*			

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Forced Value Input 21

Related FW	2.2.0	**Related applications**	MINT, MPTM
LBI ID	843		
Description			
This LBI is used for activation of preconfigured **Forced Value** to setpoint. ***Note:*** *This LBI can be renamed during configuration.*			

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Forced Value Input 22

Related FW	2.2.0	**Related applications**	MINT, MPTM
LBI ID	844		
Description			
This LBI is used for activation of preconfigured **Forced Value** to setpoint. ***Note:*** *This LBI can be renamed during configuration.*			

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Forced Value Input 23

Related FW	2.2.0	**Related applications**	MINT, MPTM
LBI ID	845		
Description			
This LBI is used for activation of preconfigured **Forced Value** to setpoint. ***Note:*** *This LBI can be renamed during configuration.*			

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Forced Value Input 24

Related FW	2.2.0	**Related applications**	MINT, MPTM
LBI ID	846		
Description			
This LBI is used for activation of preconfigured **Forced Value** to setpoint. ***Note:*** *This LBI can be renamed during configuration.*			

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Forced Value Input 25

Related FW	2.2.0	**Related applications**	MINT, MPTM
LBI ID	847		
Description			
This LBI is used for activation of preconfigured **Forced Value** to setpoint. ***Note:*** *This LBI can be renamed during configuration.*			

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Forced Value Input 26

Related FW	2.2.0	**Related applications**	MINT, MPTM
LBI ID	848		
Description			
This LBI is used for activation of preconfigured **Forced Value** to setpoint. ***Note:*** *This LBI can be renamed during configuration.*			

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Forced Value Input 27

Related FW	2.2.0	**Related applications**	MINT, MPTM
LBI ID	849		
Description			
This LBI is used for activation of preconfigured **Forced Value** to setpoint. ***Note:*** *This LBI can be renamed during configuration.*			

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Forced Value Input 28

Related FW	2.2.0	**Related applications**	MINT, MPTM
LBI ID	850		
Description			
This LBI is used for activation of preconfigured **Forced Value** to setpoint. ***Note:*** *This LBI can be renamed during configuration.*			

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Forced Value Input 29

Related FW	2.2.0	**Related applications**	MINT, MPTM
LBI ID	851		
Description			
This LBI is used for activation of preconfigured **Forced Value** to setpoint. ***Note:*** *This LBI can be renamed during configuration.*			

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Forced Value Input 30

Related FW	2.2.0	**Related applications**	MINT, MPTM
LBI ID	852		
Description			
This LBI is used for activation of preconfigured **Forced Value** to setpoint. ***Note:*** *This LBI can be renamed during configuration.*			

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Forced Value Input 31

Related FW	2.2.0	**Related applications**	MINT, MPTM
LBI ID	853		
Description			
This LBI is used for activation of preconfigured **Forced Value** to setpoint. ***Note:*** *This LBI can be renamed during configuration.*			

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Forced Value Input 32

Related FW	2.2.0	**Related applications**	MINT, MPTM
LBI ID	854		
Description			
This LBI is used for activation of preconfigured **Forced Value** to setpoint. ***Note:*** *This LBI can be renamed during configuration.*			

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LBI: G

Group link

Related FW	2.2.0	**Related applications**	MINT, MPTM
LBI ID	59		
Description			
This input is used for logical connection and disconnection of two BESS groups selected with setpoints **Group Link L** and **Group Link R**. If the input is active, then the two selected groups will perform **Power Management**, load sharing and Var sharing together as one large group. ***Note:*** *This function is independent on the group which the particular controller belongs to, i.e. the controller can provide linking function e.g. for groups 3,4 although it belongs to group 2.*			

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Geo Home Position

Related FW	2.2.0	**Related applications**	MINT, MPTM
Comm object	219		

Description
This binary input can be used to adjust home position of BESS. In case that binary input is active, setpoints **Home Latitude** and **Home Longitude** are adjusted automatically from actual coordinates from GPS signal. ***Note:*** *Input has to be activated for at least 2 seconds.*

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Geo-Fencing Enable

Related FW	2.2.0	Related applications	MINT, MPTM
Comm object	218		
Description			
This binary input enables or disables **Fence 1 Protection** and **Fence 2 Protection** if **Geo-Fencing** is adjusted to value "LBI Enable".			

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LBI: H

Horn Reset Button

Related FW	2.2.0	Related applications	MINT, MPTM
LBI ID	192		
Description			
Binary input has the same function as Horn reset button on an **External display**Internal display.			

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Hot Swap Ctrl Block

Related FW	2.2.0	Related applications	MINT, MPTM
LBI ID	1047		
Description			
This LBI is used to detect if this controller is considered to be dead by the second **Hot Swap Redundancy** controller. If the LBI is activated this controller is considered to be dead and it is forced to the listening mode. The controller in listening mode does not send any messages to other controllers but only reads what is being transmitted. This LBI has to be physically wired to the LBO **Hot Swap Switch** of the second **Hot Swap Redundancy** controller. ***Note:*** *If both Master and Backup controllers are alive, the Master is in control and the Backup is automatically in the listening mode. This LBI is used only to force the listening mode on controller which is considered to be dead by the second controller.* **IMPORTANT: This input has to be configured to physical input of the controller.** **IMPORTANT: This input has to be configured on both Master and Backup controllers.**			

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Hot Swap Heartbeat Detect

Related FW	2.2.0	Related applications	MINT, MPTM
LBI ID	1037		
Description			
This LBI is used for detection that the second **Hot Swap Redundancy** is alive. This LBI has to be physically wired to the LBO **HOT SWAP HEARTBEAT** of the second **Hot Swap Redundancy** controller. If the Heartbeat signal is not received, this controller activates LBO **Hot Swap Switch**. **IMPORTANT: This input has to be configured to physical input of the controller.** **IMPORTANT: This input has to be configured on both Master and Backup controllers.**			

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Hot Swap Recovery

Related FW	2.2.0	Related applications	MINT, MPTM
LBI ID	1048		
Description			
This binary input is used to recover the **Hot Swap Redundancy** system in case of **Wrn Master Controller Failed** or **Wrn Backup Controller Failed** alarm is present in the Alarm list. ***Note:*** *If warnings remains after the recovery, the wiring and configuration should be checked.*			

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LBI: L

Load Reduction 1

Related FW	2.2.0	Related applications	MPTM
LBI ID	544		
Description			
This LBI activates **Load Reduction** if setpoint **Load Reduction** = Enabled and LBI **LOAD REDUCTION ENABLE** is closed. Load/power of the BESS is limited by the setpoint **Load Reduction 1**. ***Note:*** *If more than 1 Load Reduction LBIs are closed, Load Reduction with smallest value in setpoint is chosen.*			

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Load Reduction 2

Related FW	2.2.0	Related applications	MPTM
LBI ID	545		
Description			
This LBI activates **Load Reduction** if setpoint **Load Reduction** = Enabled and LBI **Load Reduction Enable** is closed. Load/power of the BESS is limited by the setpoint **Load Reduction 2**. ***Note:*** *If more than 1 Load Reduction LBIs are closed, Load Reduction with smallest value in setpoint is chosen.*			

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Load Reduction 3

Related FW	2.2.0	Related applications	MPTM
LBI ID	546		
Description			
This LBI activates **Load Reduction** if setpoint **Load Reduction** = Enabled and LBI **Load Reduction Enable** is closed. Load/power of the BESS is limited by the setpoint **Load Reduction 3**. ***Note:*** *If more than 1 Load Reduction LBIs are closed, Load Reduction with smallest value in setpoint is chosen.*			

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Load Reduction 4

Related FW	2.2.0	Related applications	MPTM
LBI ID	547		
Description			
This LBI activates **Load Reduction** if setpoint **Load Reduction** = Enabled and LBI **Load Reduction Enable** is closed. Load/power of the BESS is limited by the setpoint **Load Reduction 4**. ***Note:*** *If more than 1 Load Reduction LBIs are closed, Load Reduction with smallest value in setpoint is chosen.*			

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Load Reduction Enable

Related FW	2.2.0	Related applications	MPTM
LBI ID	615		
Description			
This LBI enables **Load Reduction** while it is closed. ***Note:*** *Setpoint **Load Reduction** has to be Enabled, otherwise this LBI has no effect.*			

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Load Res 2 Active

Related FW	2.2.0	Related applications	MINT, MPTM
LBI ID	49		

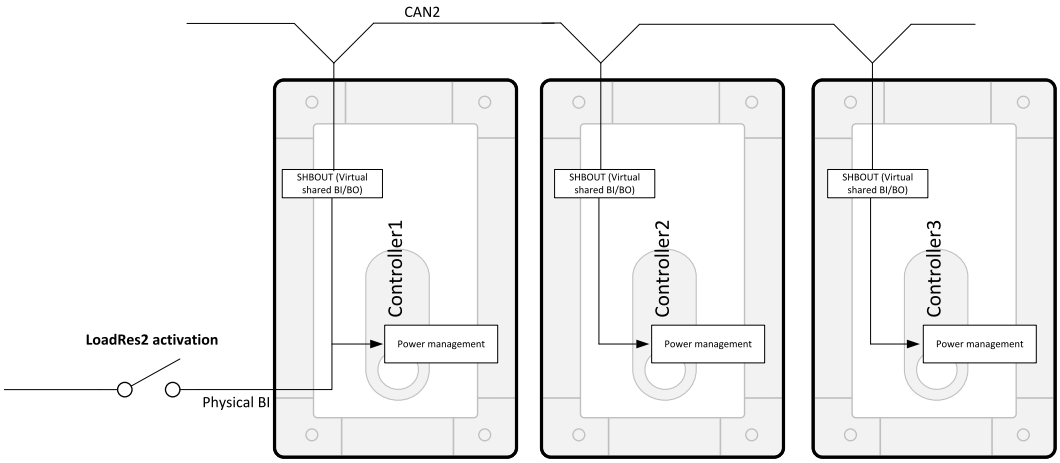
Description

This input is used to activate the load reserve set #2 (learn more about load reserve in the chapter **Power Management**) instead of the set #1, which is active by default. The set #2 is adjusted by setpoints:

- **#Starting Load Reserve 2** and **#Stopping Load Reserve 2** if the power management is switched to absolute mode
- **#Starting Rel Load Reserve 2** and **#Stopping Rel Load Reserve 2** if the power management is switched to relative mode.

IMPORTANT: All controllers cooperating together in Power management must have the same load reserve set selected.

Note: *It is possible to use virtual peripheries for distribution of the binary signal from one physical switch connected to one controller to all other controllers over the CAN bus.*



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Load Res 3 Active

Related FW	2.2.0	Related applications	MINT, MPTM
LBI ID	50		

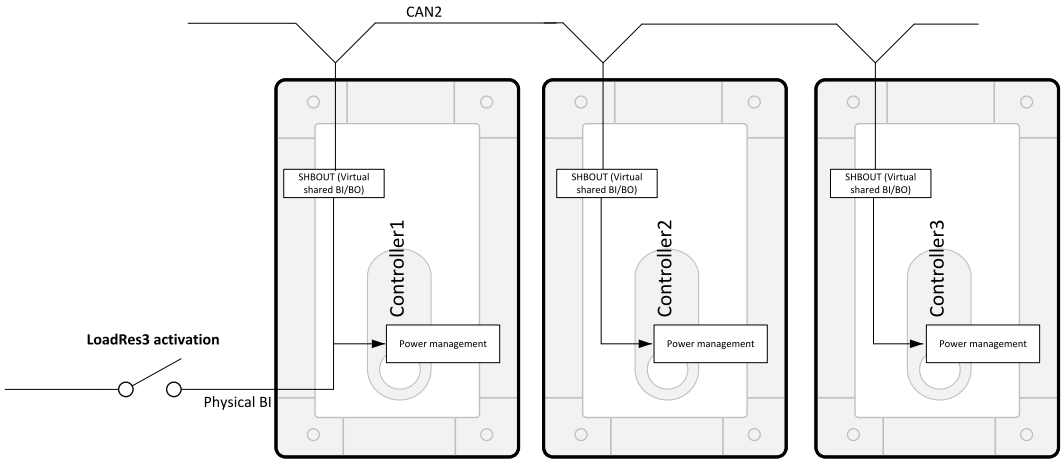
Description

This input is used to activate the load reserve set #3 (learn more about load reserve in the chapter **Power Management**) instead of the set #1, which is active by default. The set #3 is adjusted by setpoints:

- **#Starting Load Reserve 3** and **#Stopping Load Reserve 3** if the power management is switched to absolute mode
- **#Starting Rel Load Reserve 3** and **#Stopping Rel Load Reserve 3** if the power management is switched to relative mode.

IMPORTANT: All controllers cooperating together in Power management must have the same load reserve set selected.

Note: *It is possible to use virtual peripheries for distribution of the binary signal from one physical switch connected to one controller to all other controllers over the CAN bus.*



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Load Res 4 Active

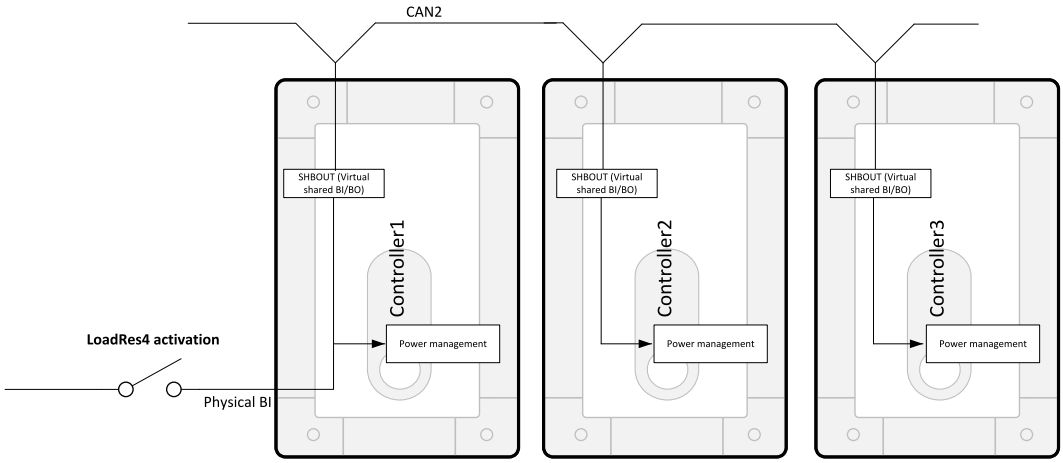
Related FW	2.2.0	Related applications	MINT, MPTM
LBI ID	51		
Description			

This input is used to activate the load reserve set #4 (learn more about load reserve in the chapter **Power Management**) instead of the set #1, which is active by default. The set #4 is adjusted by setpoints:

- **#Starting Load Reserve 4** and **#Stopping Load Reserve 4** if the power management is switched to absolute mode
- **#Starting Rel Load Reserve 4** and **#Stopping Rel Load Reserve 4** if the power management is switched to relative mode.

IMPORTANT: All controllers cooperating together in Power management must have the same load reserve set selected.

Note: *It is possible to use virtual peripheries for distribution of the binary signal from one physical switch connected to one controller to all other controllers over the CAN bus.*



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LBI: M

Mains Fail Block

Related FW	2.2.0	Related applications	MPTM
LBI ID	622		
Description			

This logical input simulates healthy Mains even if the Mains parameters are not OK.

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Manual Load Reconnection

Related FW	2.2.0	**Related applications**	MINT, MPTM
LBI ID	60		
Description			
This input is used for manual reconnection of the last disconnected part of the load, if the load has dropped below the setpoint **Power Load Reconnection Level**. This works only if automatic reconnection is disabled, i.e. the setpoint **Auto Load Reconnection** = Disabled.			

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MCB Button

Related FW	2.2.0	**Related applications**	MPTM
LBI ID	194		
Description			
This binary input has the same function as MCB button I/O on an **External display**Internal display.			

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MCB Disable

Related FW	2.2.0	**Related applications**	MPTM
LBI ID	124		
Description			

This binary input is used to prevent MCB closing and opening.

- If the input is active during synchronizing, the controller will continue synchronizing without issuing the MCB closing command until the input is deactivated or Sync timeout is elapsed.
- If the input is active and the MCB Button is pressed in MANSEM mode to close the MCB to dead bus, the MCB will not be closed until this input is deactivated and the MCB Button is pressed again.
- If the input is active and the MCB is to be closed to dead bus automatically, the MCB will not be closed until this input is deactivated.
- If the input is active and MCB is already closed, the breaker will not open.

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MCB Feedback

Related FW	2.2.0	Related applications	MINT, MPTM
LBI ID	65		

Description

Use this input to indicate whether the Mainsmains circuit breaker is opened or closed.

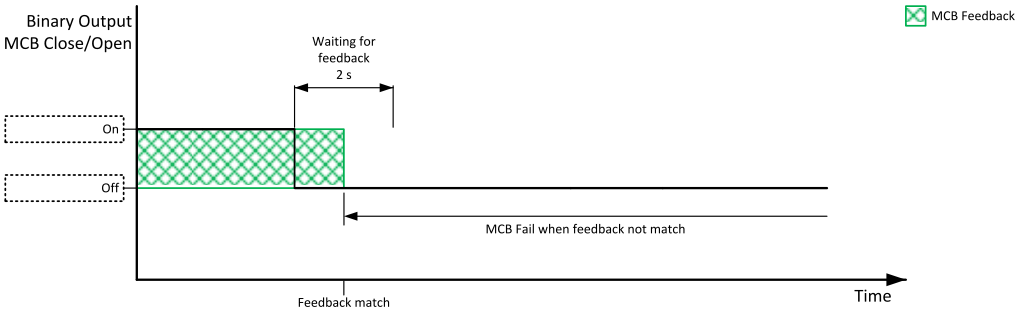

Image 22.17 MCB Feedback 1

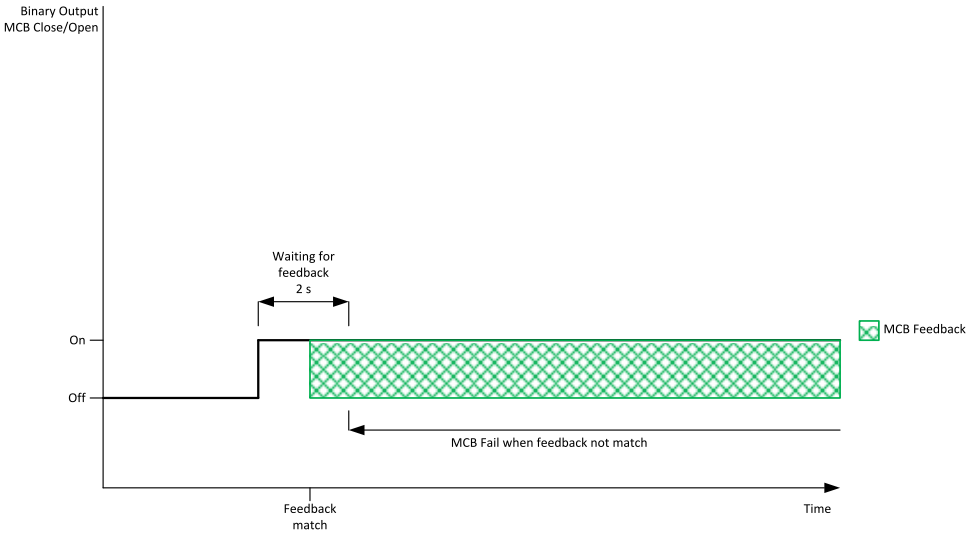

Image 22.18 MCB Feedback 2

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MCB Feedback Negative

Related FW	2.2.0	Related applications	MINT, MPTM
LBI ID	66		

Description

Use this input to indicate whether the Mainsmains circuit breaker is opened or closed.

This input is logically inverted against LBI **MCB FEEDBACK**.

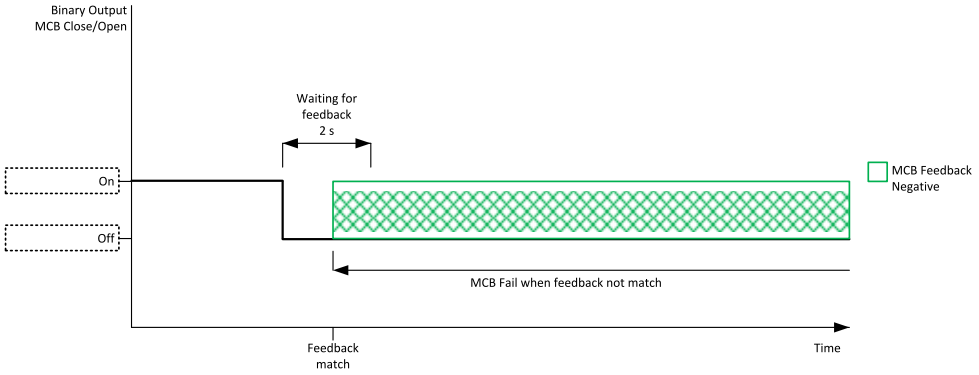

Image 22.19 MCB Feedback 1

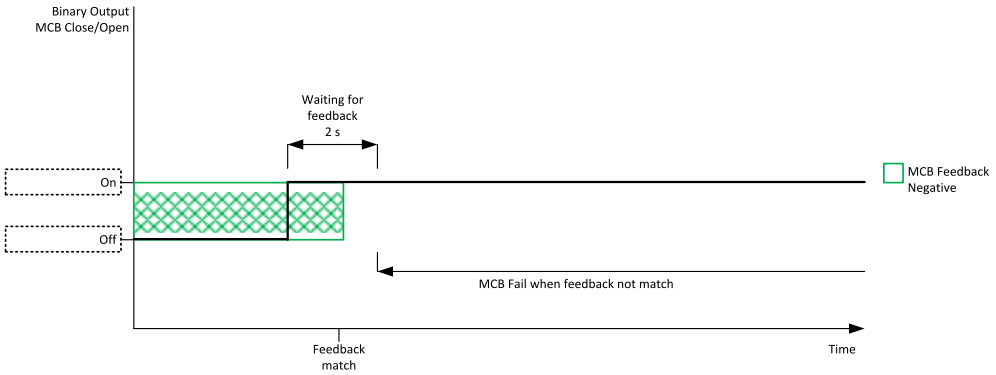

Image 22.20 MCB Feedback 2

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Min Run Power Act 1

Related FW	2.2.0	Related applications	MINT, MPTM
LBI ID	52		
Description			

This input is used to activate the function Minimal running power #1, which is adjusted by setpoint **#Min Run Power 1**.

Note: *The default value of minimal running power, which takes place while none of the inputs Min Run Power x Act, is 0 kW.*

Note: *If more then one binary input for Min Run Power is activated, the one with the higher index has higher priority and it is used.*

> **IMPORTANT: All controllers cooperating together in Power management must have the same minimal running power selected.**

Note: *It is possible to use virtual peripheries for distribution of the binary signal from one physical switch connected to one controller to all other controllers over the CAN bus. See the diagram of such distribution in the description of the input* ***Load Res 2 Active****.*

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Min Run Power Act 2

Related FW	2.2.0	Related applications	MINT, MPTM
LBI ID	53		
Description			

This input is used to activate the function Minimal running power #2, which is adjusted by setpoint **#Min Run Power 2**.

Note: *The default value of minimal running power, which takes place while none of the inputs Min Run Power x Act, is 0 kW.*

Note: *If more then one binary input for Min Run Power is activated, the one with the higher index has higher priority and it is used.*

> **IMPORTANT: All controllers cooperating together in Power management must have the same minimal running power selected.**

Note: *It is possible to use virtual peripheries for distribution of the binary signal from one physical switch connected to one controller to all other controllers over the CAN bus. See the diagram of such distribution in the description of the input* ***Load Res 2 Active****.*

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Min Run Power Act 3

Related FW	2.2.0	Related applications	MINT, MPTM
LBI ID	54		
Description			
This input is used to activate the function Minimal running power #3, which is adjusted by setpoint **#Min Run Power 3**. ***Note:*** *The default value of minimal running power, which takes place while none of the inputs Min Run Power x Act, is 0 kW.* ***Note:*** *If more then one binary input for Min Run Power is activated, the one with the higher index has higher priority and it is used.* **IMPORTANT: All controllers cooperating together in Power management must have the same minimal running power selected.** ***Note:*** *It is possible to use virtual peripheries for distribution of the binary signal from one physical switch connected to one controller to all other controllers over the CAN bus. See the diagram of such distribution in the description of the input* ***LOAD RES 2 ACTIVE****.*			

back to Logical binary inputs alphabetically

LBI: N

NCB Feedback

Related FW	2.2.0	Related applications	MINT, MPTM
LBI ID	67		
Description			
This input is used for connection of feedback contact from the neutral contactor. If the input is active, the controller will consider the neutral contactor as closed and vice versa. See also the setpoint **#Neutral Contactor Control** which is used for selecting of the NCB mode (Each / Common).			

back to Logical binary inputs alphabetically

LBI: P

PCS Start Disabled

Related FW	2.2.0	Related applications	MINT, MPTM
LBI ID	1185		
DescriptionThis LBI can be used to keep the BESS in idle operation.			
See chapter **BESS starting sequence and BESS states**			

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Post VRT

Related FW	2.2.0	Related applications	MPTM
LBI ID	955		
Description			
Activation of this LBI activates **Post VRT** if at least one of **BESS Current L1**, **BESS Current L2** or **BESS Current L3** is over **Nominal Current**. ***Note:*** *This is the only way to activate Post VRT function in MINT application, signal shall be sent from the IM controller.*			

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Precharge Finished

Related FW	2.2.0	Related applications	MINT, MPTM
LBI ID	1171		
Description			
This signal is to be used as a confirmation, that the DC circuit inside the BESS is closed (the battery is connected to the DC circuit of the inverter). It is actually the feedback of the DC relay situated between the battery and the inverter. State of this relay can be monitored using the LBO DC Circuit closed which just simply mirror the information about the DC circuit state. This LBI relates to the BESS start sequence decribed in **BESS starting sequence and BESS states**.			

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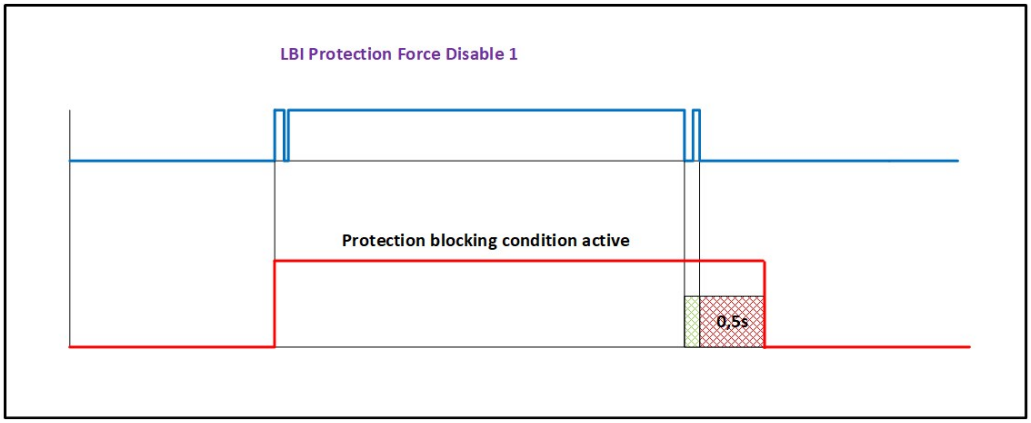
Protection Force Disable Block 1

Related FW	2.2.0	Related applications	MINT, MPTM
LBI ID	16		
Description			
Activation of this LBI disables blocks selected protections. Proper history record is written to the history log. › Protection Force Disable Block 1 active › Protection Force Disable Block 1 inactive  			

back to Logical binary inputs alphabetically

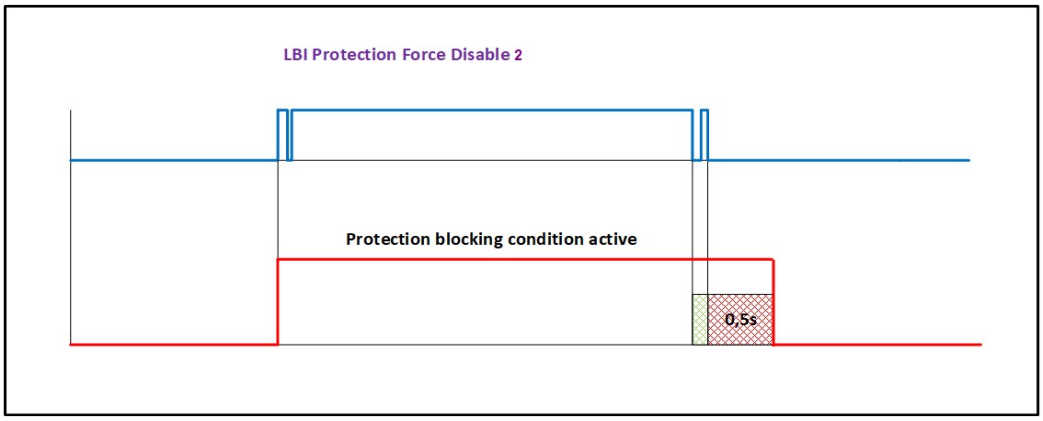
Protection Force Disable Block 2

Related FW	2.2.0	Related applications	MINT, MPTM
LBI ID	17		
Description			

Activation of this LBI disables blocks selected protections.

Proper history record is written to the history log.

- Protection Force Disable Block 2 active
- Protection Force Disable Block 2 inactive



back to Logical binary inputs alphabetically

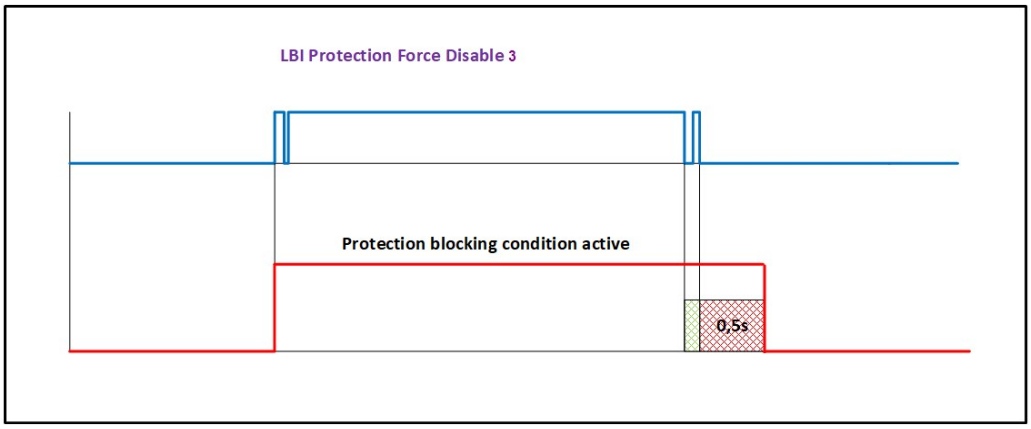
Protection Force Disable Block 3

Related FW	2.2.0	Related applications	MINT, MPTM
LBI ID	18		
Description			

Activation of this LBI disables blocks selected protections.

Proper history record is written to the history log.

- Protection Force Disable Block 3 active
- Protection Force Disable Block 3 inactive



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Pulse Counter 1

Related FW	2.2.0	Related applications	MINT, MPTM
LBI ID	87		
Description			
This is the input of the "slow" **Pulse Counters** function which is connected with LBI **PULSE COUNTER 1**.			

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Pulse Counter 2

Related FW	2.2.0	Related applications	MINT, MPTM
LBI ID	88		
Description			
This is the input of the "slow" **Pulse Counters** function which is connected with LBI **PULSE COUNTER 2**.			

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PV 01 Operable

Related FW	2.2.0	Related applications	MINT, MPTM
LBI ID	1103		
Description			
This logical input is used to detect whether the PV inverter is operable or not. If it is not activated the PVCB cannot be closed.			

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PV 02 Operable

Related FW	2.2.0	Related applications	MINT, MPTM
LBI ID	1121		
Description			
This logical input is used to detect whether the PV inverter is operable or not. If it is not activated the PVCB cannot be closed.			

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PV 03 Operable

Related FW	2.2.0	Related applications	MINT, MPTM
LBI ID	1122		
Description			
This logical input is used to detect whether the PV inverter is operable or not. If it is not activated the PVCB cannot be closed.			

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PV 04 Operable

Related FW	2.2.0	**Related applications**	MINT, MPTM
LBI ID	1123		
Description			
This logical input is used to detect whether the PV inverter is operable or not. If it is not activated the PVCB cannot be closed.			

back to Logical binary inputs alphabetically

PV 05 Operable

Related FW	2.2.0	**Related applications**	MINT, MPTM
LBI ID	1124		
Description			
This logical input is used to detect whether the PV inverter is operable or not. If it is not activated the PVCB cannot be closed.			

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PV 06 Operable

Related FW	2.2.0	**Related applications**	MINT, MPTM
LBI ID	1125		
Description			
This logical input is used to detect whether the PV inverter is operable or not. If it is not activated the PVCB cannot be closed.			

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PV 07 Operable

Related FW	2.2.0	**Related applications**	MINT, MPTM
LBI ID	1126		
Description			
This logical input is used to detect whether the PV inverter is operable or not. If it is not activated the PVCB cannot be closed.			

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PV 08 Operable

Related FW	2.2.0	**Related applications**	MINT, MPTM
LBI ID	1127		
Description			
This logical input is used to detect whether the PV inverter is operable or not. If it is not activated the PVCB cannot be closed.			

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PV 09 Operable

Related FW	2.2.0	**Related applications**	MINT, MPTM
LBI ID	1128		
Description			
This logical input is used to detect whether the PV inverter is operable or not. If it is not activated the PVCB cannot be closed.			

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PV 10 Operable

Related FW	2.2.0	**Related applications**	MINT, MPTM
LBI ID	1129		
Description			
This logical input is used to detect whether the PV inverter is operable or not. If it is not activated the PVCB cannot be closed.			

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PV 11 Operable

Related FW	2.2.0	**Related applications**	MINT, MPTM
LBI ID	1130		
Description			
This logical input is used to detect whether the PV inverter is operable or not. If it is not activated the PVCB cannot be closed.			

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PV 12 Operable

Related FW	2.2.0	**Related applications**	MINT, MPTM
LBI ID	1131		
Description			
This logical input is used to detect whether the PV inverter is operable or not. If it is not activated the PVCB cannot be closed.			

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PV 13 Operable

Related FW	2.2.0	**Related applications**	MINT, MPTM
LBI ID	1132		
Description			
This logical input is used to detect whether the PV inverter is operable or not. If it is not activated the PVCB cannot be closed.			

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PV 14 Operable

Related FW	2.2.0	**Related applications**	MINT, MPTM
LBI ID	1133		
Description			
This logical input is used to detect whether the PV inverter is operable or not. If it is not activated the PVCB cannot be closed.			

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PV 15 Operable

Related FW	2.2.0	**Related applications**	MINT, MPTM
LBI ID	1134		
Description			
This logical input is used to detect whether the PV inverter is operable or not. If it is not activated the PVCB cannot be closed.			

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PV 16 Operable

Related FW	2.2.0	**Related applications**	MINT, MPTM
LBI ID	1135		
Description			
This logical input is used to detect whether the PV inverter is operable or not. If it is not activated the PVCB cannot be closed.			

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PV 17 Operable

Related FW	2.2.0	**Related applications**	MINT, MPTM
LBI ID	1398		
Description			
This logical input is used to detect whether the PV inverter is operable or not. If it is not activated the PVCB cannot be closed.			

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PV 18 Operable

Related FW	2.2.0	**Related applications**	MINT, MPTM
LBI ID	1399		
Description			
This logical input is used to detect whether the PV inverter is operable or not. If it is not activated the PVCB cannot be closed.			

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PV 19 Operable

Related FW	2.2.0	**Related applications**	MINT, MPTM
LBI ID	1400		
Description			
This logical input is used to detect whether the PV inverter is operable or not. If it is not activated the PVCB cannot be closed.			

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PV 20 Operable

Related FW	2.2.0	**Related applications**	MINT, MPTM
LBI ID	1401		
Description			
This logical input is used to detect whether the PV inverter is operable or not. If it is not activated the PVCB cannot be closed.			

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PV 21 Operable

Related FW	2.2.0	**Related applications**	MINT, MPTM
LBI ID	1402		
Description			
This logical input is used to detect whether the PV inverter is operable or not. If it is not activated the PVCB cannot be closed.			

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PV 22 Operable

Related FW	2.2.0	**Related applications**	MINT, MPTM
LBI ID	1403		
Description			
This logical input is used to detect whether the PV inverter is operable or not. If it is not activated the PVCB cannot be closed.			

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PV 23 Operable

Related FW	2.2.0	**Related applications**	MINT, MPTM
LBI ID	1404		
Description			
This logical input is used to detect whether the PV inverter is operable or not. If it is not activated the PVCB cannot be closed.			

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PV 24 Operable

Related FW	2.2.0	**Related applications**	MINT, MPTM
LBI ID	1405		
Description			
This logical input is used to detect whether the PV inverter is operable or not. If it is not activated the PVCB cannot be closed.			

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PV 25 Operable

Related FW	2.2.0	**Related applications**	MINT, MPTM
LBI ID	1406		
Description			
This logical input is used to detect whether the PV inverter is operable or not. If it is not activated the PVCB cannot be closed.			

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PV 26 Operable

Related FW	2.2.0	**Related applications**	MINT, MPTM
LBI ID	1407		
Description			
This logical input is used to detect whether the PV inverter is operable or not. If it is not activated the PVCB cannot be closed.			

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PV 27 Operable

Related FW	2.2.0	**Related applications**	MINT, MPTM
LBI ID	1408		
Description			
This logical input is used to detect whether the PV inverter is operable or not. If it is not activated the PVCB cannot be closed.			

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PV 28 Operable

Related FW	2.2.0	**Related applications**	MINT, MPTM
LBI ID	1409		
Description			
This logical input is used to detect whether the PV inverter is operable or not. If it is not activated the PVCB cannot be closed.			

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PV 29 Operable

Related FW	2.2.0	**Related applications**	MINT, MPTM
LBI ID	1410		
Description			
This logical input is used to detect whether the PV inverter is operable or not. If it is not activated the PVCB cannot be closed.			

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PV 30 Operable

Related FW	2.2.0	**Related applications**	MINT, MPTM
LBI ID	1411		
Description			
This logical input is used to detect whether the PV inverter is operable or not. If it is not activated the PVCB cannot be closed.			

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PV 31 Operable

Related FW	2.2.0	**Related applications**	MINT, MPTM
LBI ID	1412		
Description			
This logical input is used to detect whether the PV inverter is operable or not. If it is not activated the PVCB cannot be closed.			

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PV 32 Operable

Related FW	2.2.0	**Related applications**	MINT, MPTM
LBI ID	1413		
Description			
This logical input is used to detect whether the PV inverter is operable or not. If it is not activated the PVCB cannot be closed.			

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PVCB Button

Related FW	2.2.0	**Related applications**	MINT, MPTM
LBI ID	1114		
Description			
Binary input has the same function as PVCB button.			

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PVCB Disable

Related FW	2.2.0	Related applications	MINT, MPTM
LBI ID	1104		
Description			

This function is used to prevent PVCB closing and opening.

- If the input is active during synchronizing, the controller will continue synchronizing without issuing the PVCB closing command until the input is deactivated or Sync timeout is elapsed.
- If the input is active and the PVCB button is pressed in MAN mode to close the PVCB to dead bus, the PVCB will not be closed until the input is deactivated and the PVCB button pressed again.
- If the input is active and the PVCB should be closed to dead bus automatically, the PVCB will not be closed until the input is deactivated.
- If the input is active and the PVCB is already closed, the breaker will not open.

back to Logical binary inputs alphabetically

PVCB Feedback

Related FW	2.2.0	Related applications	MINT, MPTM
LBI ID	1101		
Description			

Use this input to indicate whether the PV circuit breaker is opened or closed.

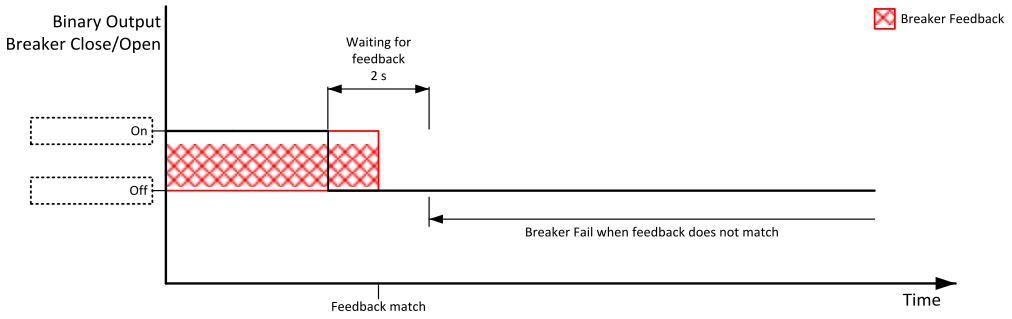

Image 22.21 PVCB Feedback 1

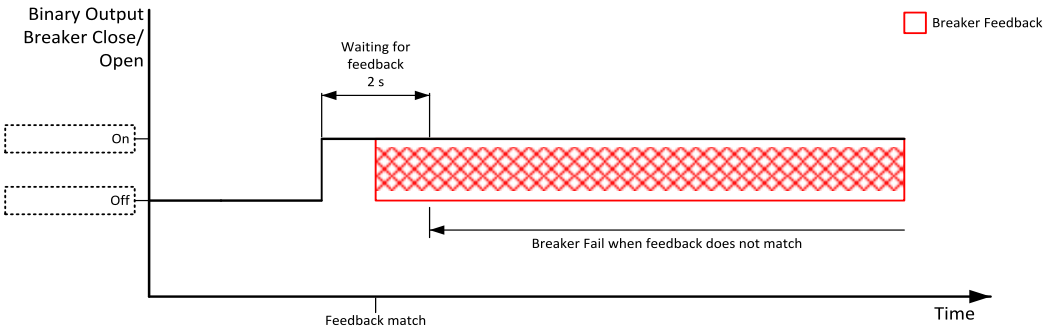

Image 22.22 PVCB Feedback 2

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PVCB Feedback Negative

Related FW	2.2.0	Related applications	MINT, MPTM
LBI ID	1102		

Description

Use this input to indicate whether the PV circuit breaker is opened or closed.

This input is logically inverted against LBI **PVCB FEEDBACK**.

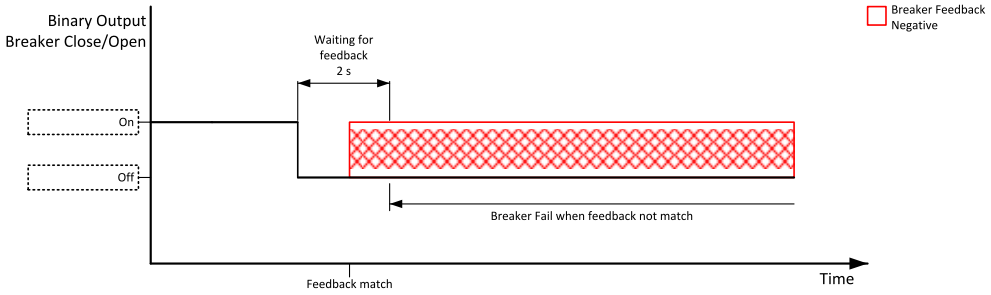

Image 22.23 PVCB Feedback Negative 1

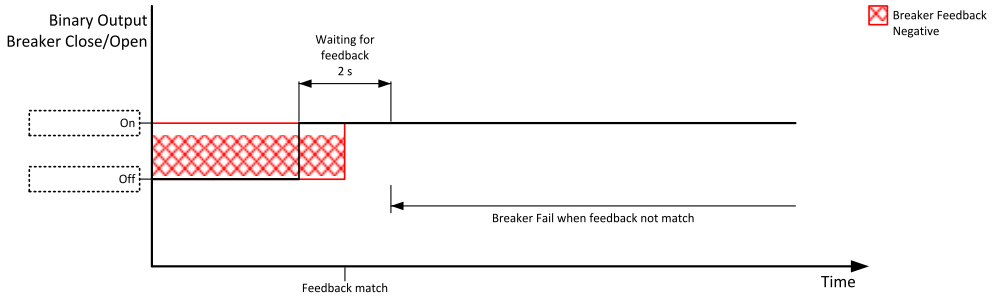

Image 22.24 PVCB Feedback Negative 2

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LBI: R

Remote AUTO

Related FW	2.2.0	Related applications	MINT, MPTM
LBI ID	620		

Description

The controller is switched to the AUTO mode when this binary input is closed. When opens controller is switched back to previous mode.

This binary input has the lowest priority from Remote OFF / SEM MAN / AUTO / MAN binary inputs

Remote control priority:

- Remote OFF (Highest priority)
- Remote MAN
- Remote AUTO (Lowest Priority)

back to Logical binary inputs alphabetically

Remote MANRUN MODE

Related FW	2.2.0	Related applications	MINT, MPTM
LBI ID	618		
Description			
The controller is switched to the MAN mode when this binary input is closed. When opens controller is switched back to previous mode. Remote control priority: › Remote OFF (Highest priority) › Remote MAN › Remote AUTO (Lowest Priority)			

back to Logical binary inputs alphabetically

Remote OFF MODE

Related FW	2.2.0	Related applications	MINT, MPTM
LBI ID	617		
Description			
The controller is switched to the OFF mode when this binary input is closed. When opens controller is switched back to previous mode. Remote control priority: › Remote OFF (Highest priority) › Remote MAN › Remote AUTO (Lowest Priority)			

back to Logical binary inputs alphabetically

Remote TEST

Related FW	2.2.0	Related applications	MINT, MPTM
LBI ID	621		
Description			
The controller is switched to the TEST mode when this binary input is closed. When opens controller is switched back to previous mode. Remote control priority: › Remote OFF (Highest priority) › Remote MAN › Remote AUTO (Lowest Priority)			

back to Logical binary inputs alphabetically

Remote TEST On Load

Related FW	2.2.0	Related applications	MINT, SPTM
LBI ID	61		
Description			

Activation of this LBI will start the BESS, close the BCB in MINT or transfer the load from the Mains to BESS in MPTM.

Activation of this LBI will start the Gen-sets, close their GCBs and transfer the load from the Mains to the Gen-sets. The MGCB is also closed if selected application mode is MGCB.

The behavior is the same like if the LBI **FORCE ISLAND** is activated. The load transfer according to the settings is performed.

Application	TEST	Remote TEST On Load
MPTM	Gen-set is started and running until the TEST mode is deactivated.	**Active:** Gen-set is put to TEST mode. On the top of it the load is transfered to the genset. The same behavior like the LBI **FORCE ISLAND**. The load transfer according to the settings is performed. ***Note:*** *Whenever the LBI **UNIVERSAL GENSET START/STOP** is active, the LBI **REMOTE TEST ON LOAD** has higher priority because it takes the same action like LBI **FORCE ISLAND**.* **Inactive:** Gen-set comes back to the original mode and behaves accordingly to this mode and other conditions. (the load can be transferred back to the mains (OFF, AUTO) or stay on the gen-set (MAN).
MINT		**Active:** Gen-set is put to TEST mode. On the top of it the GCB is closed (synchronized if the common bus bar is not dead). The same behavior like the LBI **UNIVERSAL GENSET START/STOP**. **Inactive:** Gen-set comes back to the original mode and behaves accordingly to this mode and other conditions.

IMPORTANT: Do not activate this LBI if the controller is in the OFF mode. When the LBI is deactivated the controller will switch to the OFF mode and the BESS will be immediately stoppedBCB will be opened without load transfer.

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LBI: S

Sd Override

Related FW	2.2.0	Related applications	MINT, MPTM
LBI ID	44		
Description			

If this input is active, all alarms except **Emergency Stop**and **E-STOP** are suppressed. The suppressed alarms will be displayed in the alarm list, but they will not take effect regarding the BESS control.

Note: *Wrn Override All Sd is indicated in the alarm list if Sd Override mode is active to inform the operator that the BESS is not protected.*

Note: *User protections with protection type **Shutdown Override** are also **NOT** suppressed.*

> **IMPORTANT: MISUSE OF THIS INPUT CAN CAUSE DAMAGE TO THE BESS!**

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Soft Unload Enable

Related FW	2.2.0	Related applications	MINT,
LBI ID	1049		
Description			

In case the communication with other controllers is lost, the soft unload is being proceeded only if this logical binary input is active. If this input is not active the BCB is opened immediately after the stop request is detected or the BCB button is pressed.

Note: *This function is used when there is any non-detected unit which is able to take over the load of the BESS which is being unloaded.*

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Start Button

Related FW	2.2.0	Related applications	MINT, MPTM
LBI ID	189		
Description			

Binary input has the same function as Start Button I on an **External display**Internal display.

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Stop Button

Related FW	2.2.0	Related applications	MINT, MPTM
LBI ID	190		
Description			

Binary input has the same function as Stop Button O on an **External display**Internal display.

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Sunrise/Sunset Home Position

Related FW	2.2.0	Related applications	MINT, MPTM
LBI ID	1120		
Description			
Rising edge on this input make the setpoint Sunrise/sunset Latitude and Sunrise/Sunset Longitude synchronized with the current position received from the GPS plug-in module (only if valid and available).			

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Synchronization Disabled

Related FW	2.2.0	Related applications	MINT, MPTM
LBI ID	277		
Description			
This binary input is used to disable the forward and reverse synchronization process so the controller won't attempt to close breaker(s) if synchronization would be needed.This LBI is useful if user want to set the additional condition for start of the synchronization.			

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LBI: T

TEST ROCOF

Related FW	2.2.0	Related applications	MINT
LBI ID	1116		
Description			
A rising edge on this LBI triggers the same event in the controller as the actual ROCOF 1 protection trip.			

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Test Vector Shift

Related FW	2.2.0	Related applications	MINT
LBI ID	1117		
Description			
A rising edge on this LBI triggers the same event in the controller as the actual Vector Shift protection trip.			

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Top Priority

Related FW	2.2.0	Related applications	MINT
LBI ID	199		
Description			
If this input is active, the controller will have the highest priority in the group independent of the setpoint **Priority**. **IMPORTANT: This binary input can be used only if setpoint #Priority Auto Swap = Disabled.**			

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LBI: U

Universal Genset Start/Stop

Related FW	2.2.0	Related applications	MINT
LBI ID	38		
Description			
Use this input to start and stop the BESS in AUTO and MAN mode. This information is shared to all controllers in the same group connected to the master controller via CAN. The LBI **Generic Genset Start/Stop** is accepted in the MAN or in the AUT mode and is distributed to all channels as **Uni Gen 1 Binary Outputs**..**Uni Gen 16 Binary Outputs** value. The Run Request is conditioned by the Power management function. If this signal is not used in configuration, the internal command shared via intercontroller line is taken in account (e.g. System Start/Stop issued by InteliMains).			

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Uni Gen 01 GCB Closed

Related FW	2.2.0	Related applications	MINT
LBI ID	1335		
Description			
This is information about the UniGen´s GCB status. This signal is supposed to be active anytime when the GCB is closed.			

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Uni Gen 01 GCB Closing

Related FW	2.2.0	Related applications	MINT
LBI ID	1351		
Description			
This signal is crucial for safe operation if the Uni Gen is supposed to perform energizing of the dead bus. In InteliNeo it is used as signal blocking closing of the BCB to the dead bus. InteliNeo propagates this information to all other controllers in the system. The closing of the breaker to the dead bus is blocked in all the controllers within the system until the signals is active. **IMPORTANT: InteliNeo does not propagate this information towards to other Uni Gens. Uni Gens has to manage this function themselves. It is strongly recommended to use the hard wiring of this signal between InteliNeo and Uni Gen.**			

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Uni Gen 01 Loaded

Related FW	2.2.0	**Related applications**	MINT
LBI ID	1372		
Description			
This signal is important to say to the InteliNeo that Uni Gen loading process has finished or is not in unloading process. If this information is not available and can't be directly read from the Uni Gen it has to be constructed in the internal PLC as result of inverse logic based on readings Uni Gen in Soft Loading / Soft Unloading.			

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Uni Gen 01 Ready

Related FW	2.2.0	**Related applications**	MINT
LBI ID	1319		
Description			
Currently not associated with any specific logic. It is not expected to be used in configuration.			

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Uni Gen 02 GCB Closed

Related FW	2.2.0	**Related applications**	MINT
LBI ID	1336		
Description			
This is information about the UniGen´s GCB status. This signal is supposed to be active anytime when the GCB is closed..			

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Uni Gen 02 GCB Closing

Related FW	2.2.0	**Related applications**	MINT
LBI ID	1352		
Description			
This signal is crucial for safe operation if the Uni Gen is supposed to perform energizing of the dead bus. In InteliNeo it is used as signal blocking closing of the BCB to the dead bus. InteliNeo propagates this information to all other controllers in the system. The closing of the breaker to the dead bus is blocked in all the controllers within the system until the signals is active. > **IMPORTANT: InteliNeo does not propagate this information towards to other Uni Gens. Uni Gens has to manage this function themselves. It is strongly recommended to use the hard wiring of this signal between InteliNeo and Uni Gen.**			

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Uni Gen 02 Loaded

Related FW	2.2.0	**Related applications**	MINT
LBI ID	1373		
Description			
This signal is important to say to the InteliNeo that Uni Gen loading process has finished or is not in unloading process. If this information is not available and can't be directly read from the Uni Gen it has to be constructed in the internal PLC as result of inverse logic based on readings Uni Gen in Soft Loading / Soft Unloading.			

back to Logical binary inputs alphabetically

Uni Gen 02 Ready

Related FW	2.2.0	**Related applications**	MINT
LBI ID	1320		
Description			
Currently not associated with any specific logic. It is not expected to be used in configuration.			

back to Logical binary inputs alphabetically

Uni Gen 03 GCB Closed

Related FW	2.2.0	**Related applications**	MINT
LBI ID	1337		
Description			
This is information about the UniGen´s GCB status. This signal is supposed to be active anytime when the GCB is closed..			

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Uni Gen 03 GCB Closing

Related FW	2.2.0	**Related applications**	MINT
LBI ID	1353		
Description			
This signal is crucial for safe operation if the Uni Gen is supposed to perform energizing of the dead bus. In InteliNeo it is used as signal blocking closing of the BCB to the dead bus. InteliNeo propagates this information to all other controllers in the system. The closing of the breaker to the dead bus is blocked in all the controllers within the system until the signals is active. > **IMPORTANT: InteliNeo does not propagate this information towards to other Uni Gens. Uni Gens has to manage this function themselves. It is strongly recommended to use the hard wiring of this signal between InteliNeo and Uni Gen.**			

back to Logical binary inputs alphabetically

Uni Gen 03 Loaded

Related FW	2.2.0	**Related applications**	MINT
LBI ID	1374		
Description			
This signal is important to say to the InteliNeo that Uni Gen loading process has finished or is not in unloading process. If this information is not available and can't be directly read from the Uni Gen it has to be constructed in the internal PLC as result of inverse logic based on readings Uni Gen in Soft Loading / Soft Unloading.			

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Uni Gen 03 Ready

Related FW	2.2.0	**Related applications**	MINT
LBI ID	1321		
Description			
Currently not associated with any specific logic. It is not expected to be used in configuration.			

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Uni Gen 04 GCB Closed

Related FW	2.2.0	**Related applications**	MINT
LBI ID	1338		
Description			
This is information about the UniGen´s GCB status. This signal is supposed to be active anytime when the GCB is closed..			

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Uni Gen 04 GCB Closing

Related FW	2.2.0	**Related applications**	MINT
LBI ID	1354		
Description			
This signal is crucial for safe operation if the Uni Gen is supposed to perform energizing of the dead bus. In InteliNeo it is used as signal blocking closing of the BCB to the dead bus. InteliNeo propagates this information to all other controllers in the system. The closing of the breaker to the dead bus is blocked in all the controllers within the system until the signals is active. > **IMPORTANT: InteliNeo does not propagate this information towards to other Uni Gens. Uni Gens has to manage this function themselves. It is strongly recommended to use the hard wiring of this signal between InteliNeo and Uni Gen.**			

back to Logical binary inputs alphabetically

Uni Gen 04 Loaded

Related FW	2.2.0	**Related applications**	MINT
LBI ID	1375		
Description			
This signal is important to say to the InteliNeo that Uni Gen loading process has finished or is not in unloading process. If this information is not available and can't be directly read from the Uni Gen it has to be constructed in the internal PLC as result of inverse logic based on readings Uni Gen in Soft Loading / Soft Unloading.			

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Uni Gen 04 Ready

Related FW	2.2.0	**Related applications**	MINT
LBI ID	1322		
Description			
Currently not associated with any specific logic. It is not expected to be used in configuration.			

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Uni Gen 05 GCB Closed

Related FW	2.2.0	**Related applications**	MINT
LBI ID	1339		
Description			
This is information about the UniGen´s GCB status. This signal is supposed to be active anytime when the GCB is closed..			

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Uni Gen 05 GCB Closing

Related FW	2.2.0	**Related applications**	MINT
LBI ID	1355		
Description			
This signal is crucial for safe operation if the Uni Gen is supposed to perform energizing of the dead bus. In InteliNeo it is used as signal blocking closing of the BCB to the dead bus. InteliNeo propagates this information to all other controllers in the system. The closing of the breaker to the dead bus is blocked in all the controllers within the system until the signals is active. > **IMPORTANT: InteliNeo does not propagate this information towards to other Uni Gens. Uni Gens has to manage this function themselves. It is strongly recommended to use the hard wiring of this signal between InteliNeo and Uni Gen.**			

back to Logical binary inputs alphabetically

Uni Gen 05 Loaded

Related FW	2.2.0	**Related applications**	MINT
LBI ID	1376		
Description			
This signal is important to say to the InteliNeo that Uni Gen loading process has finished or is not in unloading process. If this information is not available and can't be directly read from the Uni Gen it has to be constructed in the internal PLC as result of inverse logic based on readings Uni Gen in Soft Loading / Soft Unloading.			

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Uni Gen 05 Ready

Related FW	2.2.0	**Related applications**	MINT
LBI ID	1323		
Description			
Currently not associated with any specific logic. It is not expected to be used in configuration.			

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Uni Gen 06 GCB Closed

Related FW	2.2.0	**Related applications**	MINT
LBI ID	1340		
Description			
This is information about the UniGen´s GCB status. This signal is supposed to be active anytime when the GCB is closed..			

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Uni Gen 06 GCB Closing

Related FW	2.2.0	**Related applications**	MINT
LBI ID	1356		
Description			
This signal is crucial for safe operation if the Uni Gen is supposed to perform energizing of the dead bus. In InteliNeo it is used as signal blocking closing of the BCB to the dead bus. InteliNeo propagates this information to all other controllers in the system. The closing of the breaker to the dead bus is blocked in all the controllers within the system until the signals is active. > **IMPORTANT: InteliNeo does not propagate this information towards to other Uni Gens. Uni Gens has to manage this function themselves. It is strongly recommended to use the hard wiring of this signal between InteliNeo and Uni Gen.**			

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Uni Gen 06 Loaded

Related FW	2.2.0	**Related applications**	MINT
LBI ID	1377		
Description			
This signal is important to say to the InteliNeo that Uni Gen loading process has finished or is not in unloading process. If this information is not available and can't be directly read from the Uni Gen it has to be constructed in the internal PLC as result of inverse logic based on readings Uni Gen in Soft Loading / Soft Unloading.			

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Uni Gen 06 Ready

Related FW	2.2.0	**Related applications**	MINT
LBI ID	1324		
Description			
Currently not associated with any specific logic. It is not expected to be used in configuration.			

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Uni Gen 07 GCB Closed

Related FW	2.2.0	**Related applications**	MINT
LBI ID	1341		
Description			
This is information about the UniGen´s GCB status. This signal is supposed to be active anytime when the GCB is closed..			

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Uni Gen 07 GCB Closing

Related FW	2.2.0	**Related applications**	MINT
LBI ID	1357		
Description			
This signal is crucial for safe operation if the Uni Gen is supposed to perform energizing of the dead bus. In InteliNeo it is used as signal blocking closing of the BCB to the dead bus. InteliNeo propagates this information to all other controllers in the system. The closing of the breaker to the dead bus is blocked in all the controllers within the system until the signals is active. > **IMPORTANT: InteliNeo does not propagate this information towards to other Uni Gens. Uni Gens has to manage this function themselves. It is strongly recommended to use the hard wiring of this signal between InteliNeo and Uni Gen.**			

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Uni Gen 07 Loaded

Related FW	2.2.0	**Related applications**	MINT
LBI ID	1378		
Description			
This signal is important to say to the InteliNeo that Uni Gen loading process has finished or is not in unloading process. If this information is not available and can't be directly read from the Uni Gen it has to be constructed in the internal PLC as result of inverse logic based on readings Uni Gen in Soft Loading / Soft Unloading.			

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Uni Gen 07 Ready

Related FW	2.2.0	**Related applications**	MINT
LBI ID	1325		
Description			
Currently not associated with any specific logic. It is not expected to be used in configuration.			

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Uni Gen 08 GCB Closed

Related FW	2.2.0	**Related applications**	MINT
LBI ID	1342		
Description			
This is information about the UniGen´s GCB status. This signal is supposed to be active anytime when the GCB is closed..			

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Uni Gen 08 GCB Closing

Related FW	2.2.0	**Related applications**	MINT
LBI ID	1358		
Description			
This signal is crucial for safe operation if the Uni Gen is supposed to perform energizing of the dead bus. In InteliNeo it is used as signal blocking closing of the BCB to the dead bus. InteliNeo propagates this information to all other controllers in the system. The closing of the breaker to the dead bus is blocked in all the controllers within the system until the signals is active. **IMPORTANT: InteliNeo does not propagate this information towards to other Uni Gens. Uni Gens has to manage this function themselves. It is strongly recommended to use the hard wiring of this signal between InteliNeo and Uni Gen.**			

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Uni Gen 08 Loaded

Related FW	2.2.0	**Related applications**	MINT
LBI ID	1379		
Description			
This signal is important to say to the InteliNeo that Uni Gen loading process has finished or is not in unloading process. If this information is not available and can't be directly read from the Uni Gen it has to be constructed in the internal PLC as result of inverse logic based on readings Uni Gen in Soft Loading / Soft Unloading.			

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Uni Gen 08 Ready

Related FW	2.2.0	**Related applications**	MINT
LBI ID	1326		
Description			
Currently not associated with any specific logic. It is not expected to be used in configuration.			

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Uni Gen 09 GCB Closed

Related FW	2.2.0	**Related applications**	MINT
LBI ID	1343		
Description			
This is information about the UniGen´s GCB status. This signal is supposed to be active anytime when the GCB is closed.			

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Uni Gen 09 GCB Closing

Related FW	2.2.0	**Related applications**	MINT
LBI ID	1359		
Description			
This signal is crucial for safe operation if the Uni Gen is supposed to perform energizing of the dead bus. In InteliNeo it is used as signal blocking closing of the BCB to the dead bus. InteliNeo propagates this information to all other controllers in the system. The closing of the breaker to the dead bus is blocked in all the controllers within the system until the signals is active. **IMPORTANT: InteliNeo does not propagate this information towards to other Uni Gens. Uni Gens has to manage this function themselves. It is strongly recommended to use the hard wiring of this signal between InteliNeo and Uni Gen.**			

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Uni Gen 09 Loaded

Related FW	2.2.0	**Related applications**	MINT
LBI ID	1380		
Description			
This signal is important to say to the InteliNeo that Uni Gen loading process has finished or is not in unloading process. If this information is not available and can't be directly read from the Uni Gen it has to be constructed in the internal PLC as result of inverse logic based on readings Uni Gen in Soft Loading / Soft Unloading.			

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Uni Gen 09 Ready

Related FW	2.2.0	**Related applications**	MINT
LBI ID	1327		
Description			
Currently not associated with any specific logic. It is not expected to be used in configuration.			

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Uni Gen 10 GCB Closed

Related FW	2.2.0	**Related applications**	MINT
LBI ID	1344		
Description			
This is information about the UniGen´s GCB status. This signal is supposed to be active anytime when the GCB is closed..			

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Uni Gen 10 GCB Closing

Related FW	2.2.0	**Related applications**	MINT
LBI ID	1360		
Description			
This signal is crucial for safe operation if the Uni Gen is supposed to perform energizing of the dead bus. In InteliNeo it is used as signal blocking closing of the BCB to the dead bus. InteliNeo propagates this information to all other controllers in the system. The closing of the breaker to the dead bus is blocked in all the controllers within the system until the signals is active. > **IMPORTANT: InteliNeo does not propagate this information towards to other Uni Gens. Uni Gens has to manage this function themselves. It is strongly recommended to use the hard wiring of this signal between InteliNeo and Uni Gen.**			

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Uni Gen 10 Loaded

Related FW	2.2.0	**Related applications**	MINT
LBI ID	1381		
Description			
This signal is important to say to the InteliNeo that Uni Gen loading process has finished or is not in unloading process. If this information is not available and can't be directly read from the Uni Gen it has to be constructed in the internal PLC as result of inverse logic based on readings Uni Gen in Soft Loading / Soft Unloading.			

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Uni Gen 10 Ready

Related FW	2.2.0	**Related applications**	MINT
LBI ID	1328		
Description			
Currently not associated with any specific logic. It is not expected to be used in configuration.			

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Uni Gen 11 GCB Closed

Related FW	2.2.0	**Related applications**	MINT
LBI ID	1345		
Description			
This is information about the UniGen´s GCB status. This signal is supposed to be active anytime when the GCB is closed..			

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Uni Gen 11 GCB Closing

Related FW	2.2.0	**Related applications**	MINT
LBI ID	1361		
Description			
This signal is crucial for safe operation if the Uni Gen is supposed to perform energizing of the dead bus. In InteliNeo it is used as signal blocking closing of the BCB to the dead bus. InteliNeo propagates this information to all other controllers in the system. The closing of the breaker to the dead bus is blocked in all the controllers within the system until the signals is active. > **IMPORTANT: InteliNeo does not propagate this information towards to other Uni Gens. Uni Gens has to manage this function themselves. It is strongly recommended to use the hard wiring of this signal between InteliNeo and Uni Gen.**			

back to Logical binary inputs alphabetically

Uni Gen 11 Loaded

Related FW	2.2.0	**Related applications**	MINT
LBI ID	1382		
Description			
This signal is important to say to the InteliNeo that Uni Gen loading process has finished or is not in unloading process. If this information is not available and can't be directly read from the Uni Gen it has to be constructed in the internal PLC as result of inverse logic based on readings Uni Gen in Soft Loading / Soft Unloading.			

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Uni Gen 11 Ready

Related FW	2.2.0	**Related applications**	MINT
LBI ID	1329		
Description			
Currently not associated with any specific logic. It is not expected to be used in configuration.			

back to Logical binary inputs alphabetically

Uni Gen 12 GCB Closed

Related FW	2.2.0	**Related applications**	MINT
LBI ID	1346		
Description			
This is information about the UniGen´s GCB status. This signal is supposed to be active anytime when the GCB is closed..			

back to Logical binary inputs alphabetically

Uni Gen 12 GCB Closing

Related FW	2.2.0	**Related applications**	MINT
LBI ID	1362		
Description			
This signal is crucial for safe operation if the Uni Gen is supposed to perform energizing of the dead bus. In InteliNeo it is used as signal blocking closing of the BCB to the dead bus. InteliNeo propagates this information to all other controllers in the system. The closing of the breaker to the dead bus is blocked in all the controllers within the system until the signals is active. > **IMPORTANT: InteliNeo does not propagate this information towards to other Uni Gens. Uni Gens has to manage this function themselves. It is strongly recommended to use the hard wiring of this signal between InteliNeo and Uni Gen.**			

back to Logical binary inputs alphabetically

Uni Gen 12 Loaded

Related FW	2.2.0	**Related applications**	MINT
LBI ID	1383		
Description			
This signal is important to say to the InteliNeo that Uni Gen loading process has finished or is not in unloading process. If this information is not available and can't be directly read from the Uni Gen it has to be constructed in the internal PLC as result of inverse logic based on readings Uni Gen in Soft Loading / Soft Unloading.			

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Uni Gen 12 Ready

Related FW	2.2.0	**Related applications**	MINT
LBI ID	1330		
Description			
Currently not associated with any specific logic. It is not expected to be used in configuration.			

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Uni Gen 13 GCB Closed

Related FW	2.2.0	**Related applications**	MINT
LBI ID	1347		
Description			
This is information about the UniGen´s GCB status. This signal is supposed to be active anytime when the GCB is closed..			

back to Logical binary inputs alphabetically

Uni Gen 13 GCB Closing

Related FW	2.2.0	**Related applications**	MINT
LBI ID	1363		
Description			
This signal is crucial for safe operation if the Uni Gen is supposed to perform energizing of the dead bus. In InteliNeo it is used as signal blocking closing of the BCB to the dead bus. InteliNeo propagates this information to all other controllers in the system. The closing of the breaker to the dead bus is blocked in all the controllers within the system until the signals is active. > **IMPORTANT: InteliNeo does not propagate this information towards to other Uni Gens. Uni Gens has to manage this function themselves. It is strongly recommended to use the hard wiring of this signal between InteliNeo and Uni Gen.**			

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Uni Gen 13 Loaded

Related FW	2.2.0	Related applications	MINT
LBI ID	1384		
Description			
This signal is important to say to the InteliNeo that Uni Gen loading process has finished or is not in unloading process. If this information is not available and can't be directly read from the Uni Gen it has to be constructed in the internal PLC as result of inverse logic based on readings Uni Gen in Soft Loading / Soft Unloading.			

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Uni Gen 13 Ready

Related FW	2.2.0	Related applications	MINT
LBI ID	1331		
Description			
Currently not associated with any specific logic. It is not expected to be used in configuration.			

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Uni Gen 14 GCB Closed

Related FW	2.2.0	Related applications	MINT
LBI ID	1348		
Description			
This is information about the UniGen´s GCB status. This signal is supposed to be active anytime when the GCB is closed..			

back to Logical binary inputs alphabetically

Uni Gen 14 GCB Closing

Related FW	2.2.0	Related applications	MINT
LBI ID	1364		
Description			
This signal is crucial for safe operation if the Uni Gen is supposed to perform energizing of the dead bus. In InteliNeo it is used as signal blocking closing of the BCB to the dead bus. InteliNeo propagates this information to all other controllers in the system. The closing of the breaker to the dead bus is blocked in all the controllers within the system until the signals is active. **IMPORTANT: InteliNeo does not propagate this information towards to other Uni Gens. Uni Gens has to manage this function themselves. It is strongly recommended to use the hard wiring of this signal between InteliNeo and Uni Gen.**			

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Uni Gen 14 Loaded

Related FW	2.2.0	**Related applications**	MINT
LBI ID	1385		
Description			
This signal is important to say to the InteliNeo that Uni Gen loading process has finished or is not in unloading process. If this information is not available and can't be directly read from the Uni Gen it has to be constructed in the internal PLC as result of inverse logic based on readings Uni Gen in Soft Loading / Soft Unloading.			

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Uni Gen 14 Ready

Related FW	2.2.0	**Related applications**	MINT
LBI ID	1332		
Description			
Currently not associated with any specific logic. It is not expected to be used in configuration.			

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Uni Gen 15 GCB Closed

Related FW	2.2.0	**Related applications**	MINT
LBI ID	1349		
Description			
This is information about the UniGen´s GCB status. This signal is supposed to be active anytime when the GCB is closed..			

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Uni Gen 15 GCB Closing

Related FW	2.2.0	**Related applications**	MINT
LBI ID	1365		
Description			
This signal is crucial for safe operation if the Uni Gen is supposed to perform energizing of the dead bus. In InteliNeo it is used as signal blocking closing of the BCB to the dead bus. InteliNeo propagates this information to all other controllers in the system. The closing of the breaker to the dead bus is blocked in all the controllers within the system until the signals is active. > **IMPORTANT: InteliNeo does not propagate this information towards to other Uni Gens. Uni Gens has to manage this function themselves. It is strongly recommended to use the hard wiring of this signal between InteliNeo and Uni Gen.**			

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Uni Gen 15 Loaded

Related FW	2.2.0	**Related applications**	MINT
LBI ID	1386		
Description			
This signal is important to say to the InteliNeo that Uni Gen loading process has finished or is not in unloading process. If this information is not available and can't be directly read from the Uni Gen it has to be constructed in the internal PLC as result of inverse logic based on readings Uni Gen in Soft Loading / Soft Unloading.			

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Uni Gen 15 Ready

Related FW	2.2.0	**Related applications**	MINT
LBI ID	1333		
Description			
Currently not associated with any specific logic. It is not expected to be used in configuration.			

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Uni Gen 16 GCB Closed

Related FW	2.2.0	**Related applications**	MINT
LBI ID	1350		
Description			
This is information about the UniGen´s GCB status. This signal is supposed to be active anytime when the GCB is closed..			

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Uni Gen 16 GCB Closing

Related FW	2.2.0	**Related applications**	MINT
LBI ID	1366		
Description			
This signal is crucial for safe operation if the Uni Gen is supposed to perform energizing of the dead bus. In InteliNeo it is used as signal blocking closing of the BCB to the dead bus. InteliNeo propagates this information to all other controllers in the system. The closing of the breaker to the dead bus is blocked in all the controllers within the system until the signals is active. > **IMPORTANT: InteliNeo does not propagate this information towards to other Uni Gens. Uni Gens has to manage this function themselves. It is strongly recommended to use the hard wiring of this signal between InteliNeo and Uni Gen.**			

back to Logical binary inputs alphabetically

Uni Gen 16 Loaded

Related FW	2.2.0	**Related applications**	MINT
LBI ID	1387		
Description			
This signal is important to say to the InteliNeo that Uni Gen loading process has finished or is not in unloading process. If this information is not available and can't be directly read from the Uni Gen it has to be constructed in the internal PLC as result of inverse logic based on readings Uni Gen in Soft Loading / Soft Unloading.			

back to Logical binary inputs alphabetically

Uni Gen 16 Ready

Related FW	2.2.0	**Related applications**	MINT
LBI ID	1334		
Description			
Currently not associated with any specific logic. It is not expected to bue used in configuration.			

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LBI: W

WT 01 Operable

Related FW	2.2.0	**Related applications**	MINT, MPTM
LBI ID	1136		
Description			
This logical input is used to detect whether the WT inverter is operable or not. If it is not activated the PVCB cannot be closed.			

back to Logical binary inputs alphabetically

WT 02 Operable

Related FW	2.2.0	**Related applications**	MINT, MPTM
LBI ID	1137		
Description			
This logical input is used to detect whether the WT inverter is operable or not. If it is not activated the PVCB cannot be closed.			

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WT 03 Operable

Related FW	2.2.0	**Related applications**	MINT, MPTM
LBI ID	1138		
Description			
This logical input is used to detect whether the WT inverter is operable or not. If it is not activated the PVCB cannot be closed.			

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WT 04 Operable

Related FW	2.2.0	**Related applications**	MINT, MPTM
LBI ID	1139		
Description			
This logical input is used to detect whether the WT inverter is operable or not. If it is not activated the PVCB cannot be closed.			

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WT 05 Operable

Related FW	2.2.0	**Related applications**	MINT, MPTM
LBI ID	1140		
Description			
This logical input is used to detect whether the WT inverter is operable or not. If it is not activated the PVCB cannot be closed.			

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WT 06 Operable

Related FW	2.2.0	**Related applications**	MINT, MPTM
LBI ID	1141		
Description			
This logical input is used to detect whether the WT inverter is operable or not. If it is not activated the PVCB cannot be closed.			

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WT 07 Operable

Related FW	2.2.0	**Related applications**	MINT, MPTM
LBI ID	1142		
Description			
This logical input is used to detect whether the WT inverter is operable or not. If it is not activated the PVCB cannot be closed.			

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WT 08 Operable

Related FW	2.2.0	**Related applications**	MINT, MPTM
LBI ID	1143		
Description			
This logical input is used to detect whether the WT inverter is operable or not. If it is not activated the PVCB cannot be closed.			

back to Logical binary inputs alphabetically

11.1.7 Logical binary outputs

What Logical binary outputs are:

Logical binary outputs are outputs for binary values and functions.

Alphabetical groups of Logical binary outputs

LBO: A 1277
LBO: B 1280
LBO: C 1290
LBO: D 1293
LBO: E 1293
LBO: F 1311
LBO: G 1312
LBO: H 1312
LBO: I 1314
LBO: K 1315
LBO: L 1315
LBO: M 1320
LBO: N 1325
LBO: O 1326
LBO: P 1326
LBO: R 1336
LBO: S 1337
LBO: U 1340
LBO: V 1341
LBO: W 1341

For full list of Logical binary outputs go to the chapter **Logical binary outputs alphabetically**.

Logical binary outputs alphabetically

LBO: A 1277
Access Locked 1277
AL Maintenance 1 1277
AL Maintenance 2 1277
AL Maintenance 3 1277
AL Maintenance 4 1277
Alarm 1278
Alarm BESS Frequency . 1278
Alarm BESS Overcurrent 1278
Alarm BESS Voltage 1278
Alarm Flashing 1278
Alarm BESSAl Mains Fail 1279
Alarm BESS FrequencyAl Mains Frequency 1279
Alarm BESS VoltageAl Mains Voltage 1279
All Available Gen-sets Run 1279
Any GCB Closed 1279
Any Other GCB Closed .. 1280
LBO: B 1280
BCB Button Echo 1280
BCB Close/Open 1280
BCB Close/Open Secondary 1281
BCB OFF Coil 1282
BCB OFF Coil Secondary 1283
BCB ON Coil 1284
BCB ON Coil Secondary 1285
BCB Status 1285
BCB Primary Status 1286
BCB Secondary Status .. 1286
BCB UV Coil 1286
BCB UV Coil Secondary 1288
BESSSource Active 1288
BESS Capability C LimitGenerator Capability C Limit 1289
BESS Capability L LimitGenerator Capability L Limit 1289
BESS Healthy 1289
BESS In Loadsharing 1289
BESS Parallel Oper 1289
BESS Ready To Load ... 1290
LBO: C 1290
Common Alarm Active Level 1 1290
Common Alarm Active Level 2 1290
Common Alarm Level 1 . 1290
Common Alarm Level 2 . 1290
Common Alarm Only 1291
Common History Record 1291
Common Mains ProtectionCommon Mains Protection 1291
Common PVCB Open ... 1291
Common Shutdown + FltRes 1291
Common Shutdown Override 1292
Common SlowSystem Stop Protection 1292
Common Warning 1292
Curtailment Enable 1292
LBO: D 1293
Daily Batt Cycles Reached 1293
DC Circuit Closed 1293
Deadbus 1293
Day/Night 1293
LBO: E 1293
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LBO: A

Access Locked

Related FW	2.2.0	**Related applications**	MINT, MPTM
LBO ID	2480		
Description			
This output is closed when the function **Access lock** is activated and it can be used to block any LBIs which are required to be locked.			

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AL Maintenance 1

Related FW	2.2.0	**Related applications**	MINT, MPTM
LBO ID	2211		
Description			
This output is active when alarm **Maintenance Timer 1 RunHours** or **Maintenance 1 Interval** is present in the alarm list.			

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AL Maintenance 2

Related FW	2.2.0	**Related applications**	MINT, MPTM
LBO ID	2212		
Description			
This output is active when alarm **Maintenance 2 RunHours** or **Maintenance 2 Interval** is present in the alarm list.			

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AL Maintenance 3

Related FW	2.2.0	**Related applications**	MINT, MPTM
LBO ID	2213		
Description			
This output is active when alarm **Maintenance 3 RunHours** or **Maintenance 3 Interval** is present in the alarm list.			

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AL Maintenance 4

Related FW	2.2.0	**Related applications**	MINT, MPTM
LBO ID	2650		
Description			
This output is active when alarm **Maintenance 4 RunHours** or **Maintenance 4 Interval** is present in the alarm list.			

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Alarm

Related FW	2.2.0	Related applications	MINT, MPTM
LBO ID	2		
Description			
The output is designed to be used as external alarm indication such as a red bulb in the control room etc. The output is active when at least one unconfirmed alarm is present in the alarmlist and remains active until confirmation of alarm.			

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Alarm BESS Frequency

Related FW	2.2.0	Related applications	MINT, MPTM
LBO ID	1266		
Description			
This output is active when at least 1 protection caused by **BESS >f Protection** or **BESS <f Protection** is active.			

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Alarm BESS Overcurrent

Related FW	2.2.0	Related applications	MINT, MPTM
LBO ID	109		
Description			
This output is active while at least one of the following overcurrent protection is active **Short Circuit Protection** or **IDMT BESS >A Protection**.			

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Alarm BESS Voltage

Related FW	2.2.0	Related applications	MINT, MPTM
LBO ID	1263		
Description			
This output is active when at least 1 alarm caused by **BESS >>V Protection**, **BESS >V** or **BESS <V Protection**is present in the alarmlist.			

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Alarm Flashing

Related FW	2.2.0	Related applications	MINT, MPTM
LBO ID	28		
Description			
This is the flashing alternative of the output **ALARM**, i.e. the output flashes with 1 Hz period while the output Alarm is closed.			

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Alarm BESSAI Mains Fail

Related FW	2.2.0	**Related applications**	MPTM
LBO ID	197		
Description			
This output is active when at least 1 protection caused by **Mains >>V Protection**, **Mains >V Protection** or **Mains <V Protection**, **Mains <V Protection**, **Mains >>f Protection**, **Mains >f Protection**, **Mains <f Protection**, **Mains <<f Protection** is active.			

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Alarm BESS FrequencyAI Mains Frequency

Related FW	2.2.0	**Related applications**	MPTM
LBO ID	1271		
Description			
This output is closed when at least 1 protection caused by **Mains >>f Protection Mains >f Protection**, **Mains <f Protection** or **Mains <<f Protection** is active.			

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Alarm BESS VoltageAI Mains Voltage

Related FW	2.2.0	**Related applications**	MPTM
LBO ID	1270		
Description			
This output is closed when at least 1 protection caused by **Mains >>V Protection Mains >V Protection**, **Mains <V Protection** or **Mains <V Protection** is active.			

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All Available Gen-sets Run

Related FW	2.2.0	**Related applications**	MINT
LBO ID	122		
Description			
This output is closed when all available BESSs within the **Control Group** are loaded. ***Note:*** *BESS is available if **Power Management**Power Management = Enabled, **Controller Mode** = AUTO and there is not present **Alarms level 2** in the alarmlist.*			

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Any GCB Closed

Related FW	2.2.0	**Related applications**	MINT
LBO ID	222		
Description			
This output is active when a GCB of any controller connected via CAN2A and/or CAN2B is closed. ***Note:*** *This function works on **CAN16 - CAN64CAN32** values, therefore it ignores **Control Groups**.*			

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Any Other GCB Closed

Related FW	2.2.0	Related applications	MINT
LBO ID	1827		
Description			
This output is active when a GCB of any other controller connected via CAN2A and/or CAN2B is closed. ***Note:*** *This function works on* ***CAN16 - CAN64CAN32*** *values, therefore it ignores* ***Control Groups****.*			

back to Logical binary outputs alphabetically

LBO: B

BCB Button Echo

Related FW	2.2.0	Related applications	MINT, MPTM
LBO ID	35		
Description			
This output is closed for 1s every time BCB Button is pressed. That means: BCB button is pressed on the controller front panel or BCB button is pressed on any of external local/remote terminals or BCB close/open command is received via communication line			

back to Logical binary outputs alphabetically

BCB Close/Open

Related FW	2.2.0	Related applications	MINT, MPTM
LBO ID	41		
Description			

The output controls the **primary** BESS circuit breaker. Its state represents the breaker position requested by the controller.

If the feedback does not respond to a change within 2 seconds to a close or open command and it was already the last attempt, an specific alarm based on the current breaker position is issued.

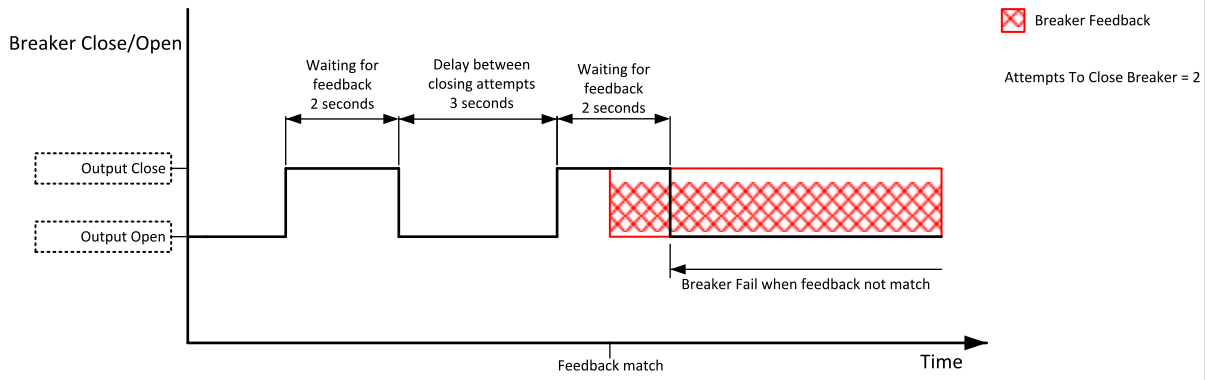

Image 22.25 BCB Close command

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BCB Close/Open Secondary

Related FW	2.2.0	Related applications	MINT, MPTM
LBO ID	1058		

Description

The output controls the **secondary** BESS circuit breaker. Its state represents the breaker position requested by the controller.

If the feedback does not respond to a change within time adjusted in 2 seconds to a close or open command and it was already the last attempt, an specific alarm based on the current breaker position is issued.

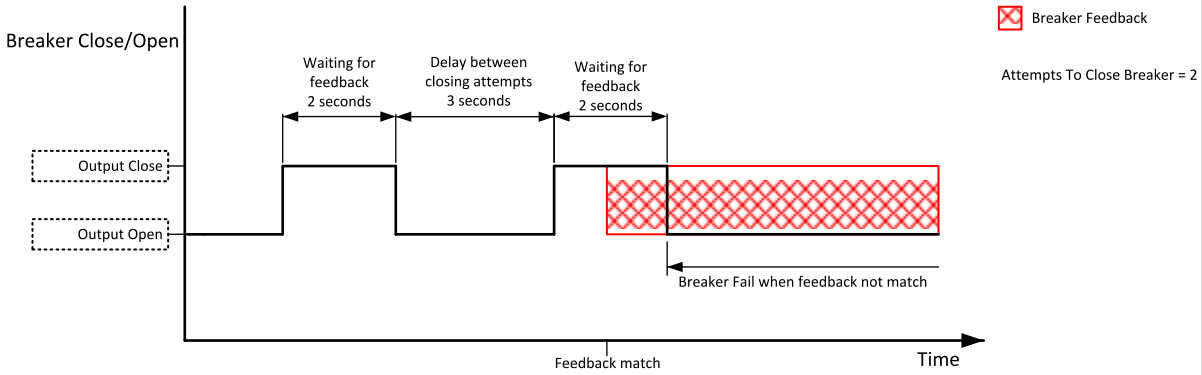

Image 22.26 BCB Close command

back to Logical binary outputs alphabetically

BCB OFF Coil

Related FW	2.2.0	Related applications	MINT, MPTM
LBO ID	43		

Description

The output is intended for opening of **primary** BESS circuit breaker.

The output gives a pulse in the moment the breaker has to be opened. The pulse lasts until the feedback deactivates, but at least for 2 seconds, when circuit breaker has to open with pause 1 second between each pulse. If the LBI **BCB FEEDBACK** does not match after second pulse elapses, Alarm **Sd BCB Fail To Open** **Wrn MCB Fail To Open** is issued.

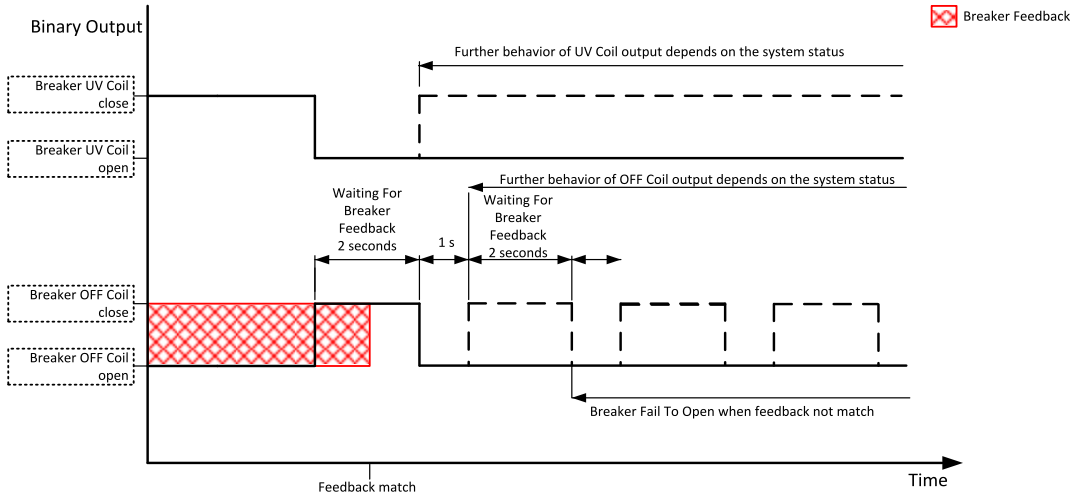

Image 22.27 BCB OFF Coil command

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BCB OFF Coil Secondary

Related FW	2.2.0	Related applications	MINT, MPTM
LBO ID	1068		

Description

The output is intended for opening of **secondary** BESS circuit breaker.

The output gives a pulse in the moment the breaker has to be opened. The pulse lasts until the feedback deactivates, but at least for 2 seconds, when circuit breaker has to open with pause 1 second between each pulse. If the LBI **BCB SECONDARY FEEDBACK NEGATIVE** does not match after second pulse elapses, Alarm **Stp BCB Secondary Fail To Open** is issued.

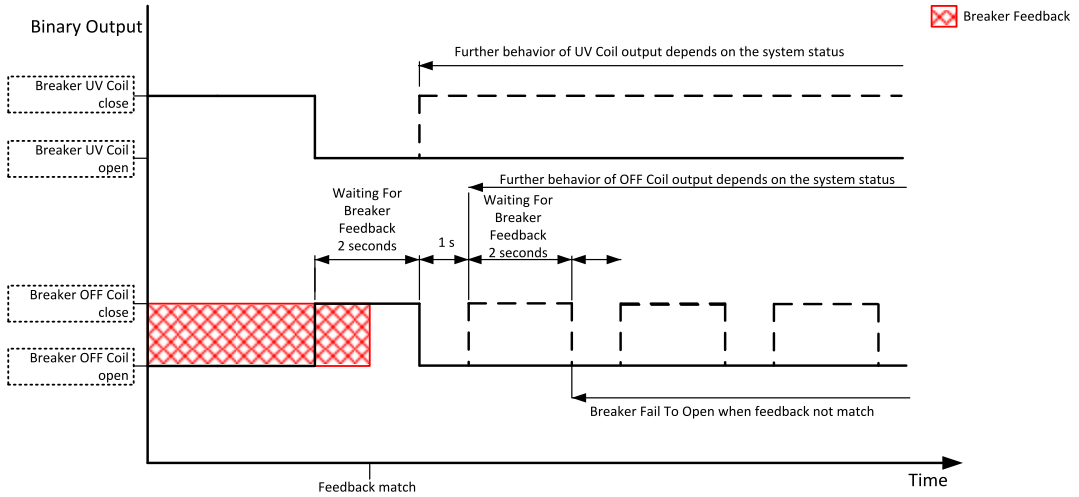

Image 22.28 BCB OFF Coil command

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BCB ON Coil

Related FW	2.2.0	Related applications	MINT, MPTM
LBO ID	42		

Description

The output is intended for control of close coil of **primary** BESS circuit breaker.

The output gives at least 2 second pulse in the moment the breaker has to be closed. The pause between attempts is 3 seconds.

When the last attempt elapses and LBI **BCB FEEDBACK** does not match Alarm **Sd BCB Fail To Close** is issued.

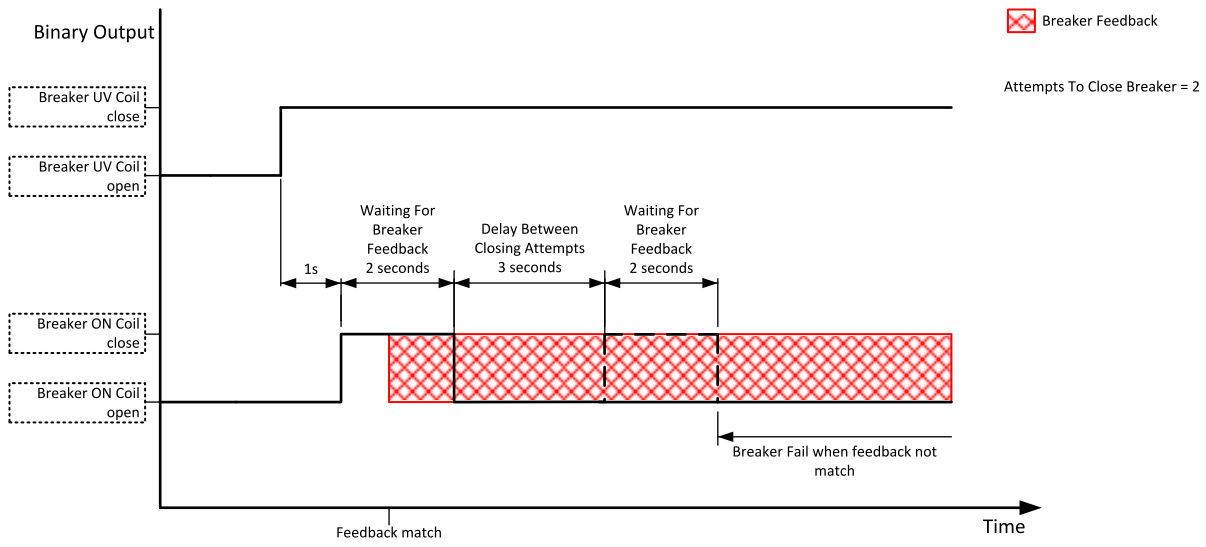

Image 22.29 BCB ON Coil close command

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BCB ON Coil Secondary

Related FW	2.2.0	Related applications	MINT, MPTM
LBO ID	1067		

Description

The output is intended for control of close coil of **secondary** BESS circuit breaker.

The output gives at least 2 second pulse in the moment the breaker has to be closed. The pause between attempts is 3 seconds

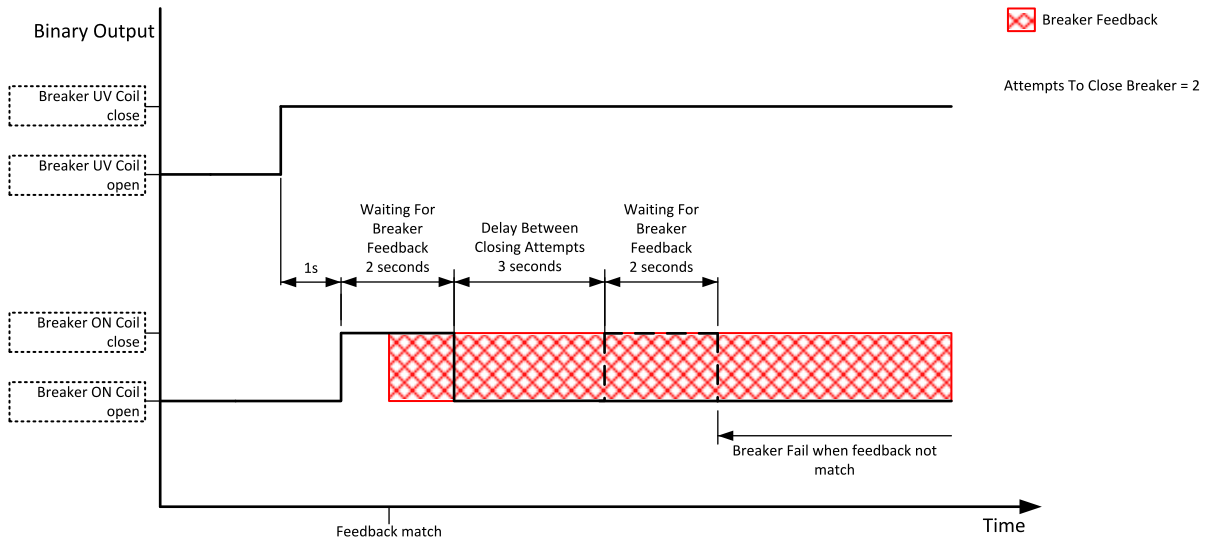

Image 22.30 BCB ON Coil close command

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BCB Status

Related FW	2.2.0	Related applications	MINT, MPTM
LBO ID	84		

Description

This output indicates the BCB position as it is internally considered by the controller.

The position is based on **BCB FEEDBACK** and **BCB FEEDBACK NEGATIVE**.

- In case that only positive feedback is used, this output mirrors the feedback.
- In case that both feedbacks are used and
  - Feedbacks match each other - the output indicates BCB position according to feedbacks.
  - Feedbacks do not match each other - output indicates last position when feedbacks matched.

back to Logical binary outputs alphabetically

BCB Primary Status

Related FW	2.2.0	Related applications	MINT, MPTM
LBO ID	2541		
Description			

This output indicates the Primary BCB position as it is internally considered by the controller.

The position is based on **BCB FEEDBACK** and **BCB FEEDBACK NEGATIVE**.

- In case that only **BCB FEEDBACK** is used, this output mirrors the input.
- In case that both **BCB FEEDBACK** and **BCB FEEDBACK NEGATIVE** are used and
  - Feedbacks match - output indicates BCB position according to feedbacks.
  - Feedbacks do not match - output indicates last position when feedbacks matched.

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BCB Secondary Status

Related FW	2.2.0	Related applications	MINT, MPTM
LBO ID	2542		
Description			

This output indicates the Secondary BCB position as it is internally considered by the controller.

The position is based on **BCB SECONDARY FEEDBACK** and **BCB SECONDARY FEEDBACK NEGATIVE**.

- In case that only **BCB SECONDARY FEEDBACK** is used, this output mirrors the input.
- In case that both **BCB SECONDARY FEEDBACK** and **BCB SECONDARY FEEDBACK NEGATIVE** are used and
  - Feedbacks match - output indicates BCB position according to feedbacks.
  - Feedbacks do not match - output indicates last position when feedbacks matched.

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BCB UV Coil

Related FW	2.2.0	Related applications	MINT, MPTM
LBO ID	44		
Description			

The output is intended for control of undervoltage coil of **primary** BESS circuit breaker.

The output is closed after the BESShas been started, min stab time has elapsed and the BESS voltage and frequency have got into limits.The output is active the whole time when the controller is switched on.BCB closing command is blocked for 1 sec after the UV coil has been closed to allow the breaker's mechanical system to get ready for closing. The output is opened for 2 seconds when the BCB has to open.

The output is closed again and remains closed while the BESS voltage and frequency are within limits if the Running phase follows after the opening of the BCB (e.g. in MAN). The output remains open if the Cooling phase follows after the opening of the BCB.

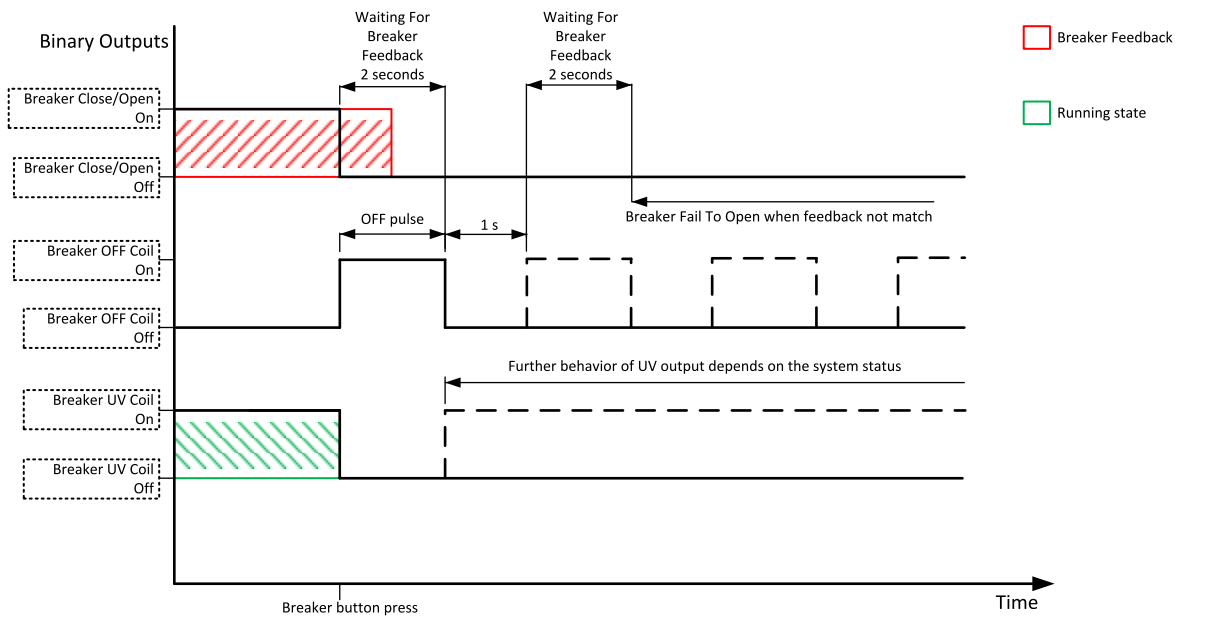

Image 22.31 BCB UV Coil close command

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BCB UV Coil Secondary

Related FW	2.2.0	Related applications	MINT, MPTM
LBO ID	1069		
Description			

The output is intended for control of undervoltage coil of **secondary** BESS circuit breaker.

The output is closed after the BESShas been started, min stab time has elapsed and the BESS voltage and frequency have got into limits.The output is active the whole time when the controller is switched on.BCB closing command is blocked for 1 sec after the UV coil has been closed to allow the breaker's mechanical system to get ready for closing. The output is opened for 2 seconds when the BCB has to open.

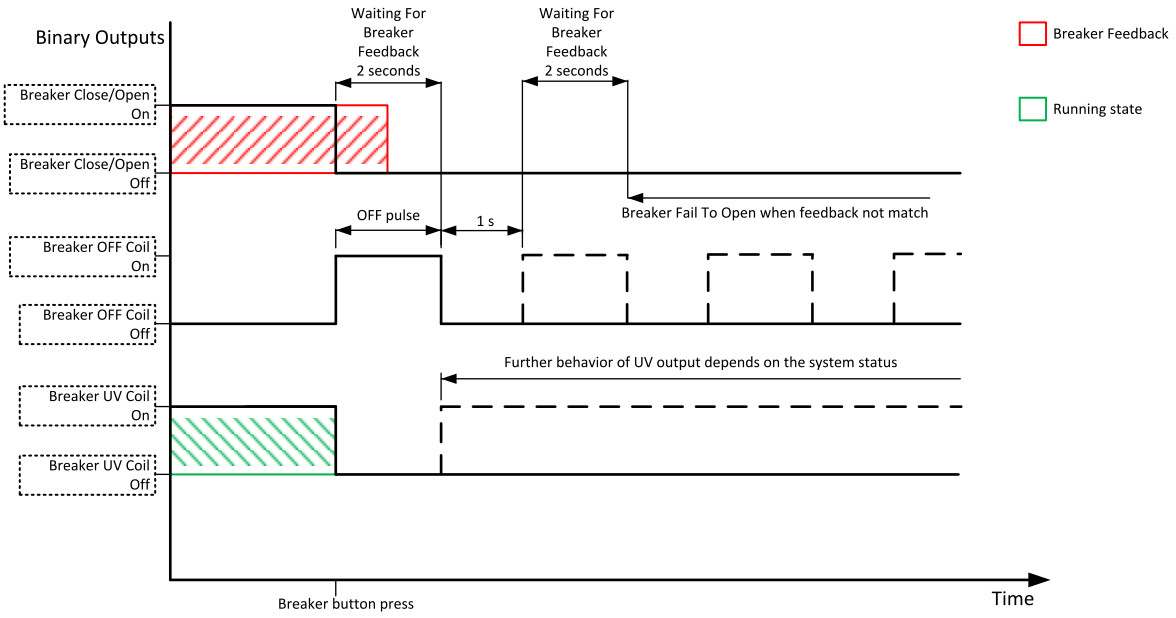

Image 22.32 BCB UV Coil close command

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BESSSource Active

Related FW	2.2.0	Related applications	MINT, MPTM
LBO ID	60		
Description			

This output is closed after start command and opens when BESS is stopped.

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BESS Capability C LimitGenerator Capability C Limit

Related FW	2.2.0	**Related applications**	MINT, MPTM
LBO ID	1427		
Description			
This output is closed when the **BESS Required PF** (while **BESS Required PF Character** = C) or **BESS Required Q** is out of capacitive limits in which is the BESS allowed to run. Limits are given by adjusting the **CAPABILITY C**.			

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BESS Capability L LimitGenerator Capability L Limit

Related FW	2.2.0	**Related applications**	MINT, MPTM
LBO ID	1428		
Description			
This output is closed when the **BESS Required PF** (while **BESS Required PF Character** = L) or **BESS Required Q** is out of inductive limits in which is the BESS allowed to run. Limits are given by adjusting the **CAPABILITY L**.			

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BESS Healthy

Related FW	2.2.0	**Related applications**	MINT, MPTM
LBO ID	77		
Description			
This output is closed while BESS is running and its parameters (voltage & frequency) are considered as healthy, i.e. within limits.			

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BESS In Loadsharing

Related FW	2.2.0	**Related applications**	MINT, MPTM
LBO ID	2699		
Description			
This output is active always when the BESS is forced to join the Load Sharing due to Forced power condition.			

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BESS Parallel Oper

Related FW	2.2.0	**Related applications**	MINT, MPTM
LBO ID	459		
Description			
This output is active always when the BESS is running in parallel operation with any Gen-set, Mains, or PV (renewable source of energy).			

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BESS Ready To Load

Related FW	2.2.0	**Related applications**	MINT, MPTM
LBO ID	58		
Description			
Through this output, BESS (PCS) confirms that the initialization process has taken place and that BESS can be loaded. In the case of a start with an open BCB, the controller can use this information to close the BCB to a dead bus or initiate synchronization to an energized bus. In the case of a start with a closed BCB, the controller will use this signal to initiate the BESS loading process."			

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LBO: C

Common Alarm Active Level 1

Related FW	2.2.0	**Related applications**	MINT, MPTM
LBO ID	13		
Description			
This output is closed when there is at least one **Alarms level 1** in the alarmlist.			

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Common Alarm Active Level 2

Related FW	2.2.0	**Related applications**	MINT, MPTM
LBO ID	15		
Description			
This output is closed when there is at least one **Alarms level 2** in the alarmlist.			

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Common Alarm Level 1

Related FW	2.2.0	**Related applications**	MINT, MPTM
LBO ID	14		
Description			
This output is closed when there is at least one **unconfirmed Alarms level 1** in the alarmlist.			

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Common Alarm Level 2

Related FW	2.2.0	**Related applications**	MINT, MPTM
LBO ID	16		
Description			
This output is closed when there is at least one **unconfirmed Alarms level 2** in the alarmlist.			

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Common Alarm Only

Related FW	2.2.0	Related applications	MINT, MPTM
LBO ID	11		
Description			
This output is closed when there is at least one alarm of type **Alarm Only** present in the alarmlist.			

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Common History Record

Related FW	2.2.0	Related applications	MINT, MPTM
LBO ID	12		
Description			
This output is closed for 1 second every time alarm of type **History Record Only** occurs. ***Note:*** *When any History Record alarm is activated the history record is logged into history.*			

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Common Mains ProtectionCommon Mains Protection

Related FW	2.2.0	Related applications	MINT, MPTM
LBO ID	10		
Description			
This output is closed when there is at least one active alarm of type **Mains Protection**. ***Note:*** *When any Mains Protection alarm is activated the Mains fail is signalized and **AMF Function** is started if it is enabled.*			

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Common PVCB Open

Related FW	2.2.0	Related applications	MINT, MPTM
LBO ID	187		
Description			
This output is closed when there is at least one alarm of type **PV Breaker Open** present in the alarmlist.			

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Common Shutdown + FltRes

Related FW	2.2.0	Related applications	MINT, MPTM
LBO ID	4		
Description			
This output is closed when there is at least one active alarm of type **Shutdown** present in the alarmlist. ***Note:*** *When any Mains Shutdown or Mains Protection Breaker Open + FltRes alarm is activated the **MCB,** BCB opens and BESS stops immediately.*			

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Common Shutdown Override

Related FW	2.2.0	Related applications	MINT, MPTM
LBO ID	251		
Description			
This output is closed 2 seconds after there is at least one alarm of type **Shutdown Override** present in the alarmlist. ***Note:*** *When any Sd Override alarm is activated the BCB opens and BESS stops immediately. This protection type can not be blocked (overridden) by active LBI (function)* ***Sd Override****.*			

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Common SlowSystem Stop Protection

Related FW	2.2.0	Related applications	MINT, MPTM
LBO ID	5		
Description			
This output is closed when there is at least one alarm of type **SlowSystem Stop Offload System Protection** present in the alarmlist. ***Note:*** *When any Stp alarm is activated and there is another BESS that is currently not running loaded and it is Ready for Power management the controller will wait for* ***#Slow Stop Delay*** *and than starts unloading if it is possible. If there is no other BESS in such state the controller starts unloading immediately without the delay.* ***Note:*** *When any Offload alarm is activated and there is another BESS in Load Shar, the BESS will be unloaded and GCB opened. If there is no other BESS in Load Shar the GCB is opened immediately.* ***Note:*** *When any SP alarm is activated the IM sends command to all BESSs in Load Shar in the same group or connected via BTB to do soft unload and open their GCBs.*			

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Common Warning

Related FW	2.2.0	Related applications	MINT, MPTM
LBO ID	3		
Description			
This output is closed when there is at least one alarm of type **Warning** present in the alarmlist.			

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Curtailment Enable

Related FW	2.2.0	Related applications	MPTM
LBO ID	2691		
Description			
This output is active when the function curtailment is used to regulate power of the PV.			

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LBO: D

Daily Batt Cycles Reached

Related FW	2.2.0	**Related applications**	MINT, MPTM
LBO ID	2704		
Description			
This output is active always when the number of daily battery cycles is reached.			

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DC Circuit Closed

Related FW	2.2.0	**Related applications**	MINT, MPTM
LBO ID	2784		
Description			
This LBO is a miror of the LBI **PRECHARGE FINISHED**. It is active all the time when DC circuit of the BESS is closed.			

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Deadbus

Related FW	2.2.0	**Related applications**	MINT,
LBO ID	2675		
Description			
This output is active when the AC Bus is considered to be dead. AC Bus voltage is below relative value set by the setpoint **Bus Dead Level**.			

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Day/Night

Related FW	2.2.0	**Related applications**	MINT,
LBO ID	5931		
Description			
This LBO is active during the day.(If the current time is between Sunrise Time and Sunset Time)			

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LBO: E

ECU Comm Fail

Related FW	2.2.0	**Related applications**	MINT, MPTM
LBO ID	114		
Description			
This output is closed when there is no communication with at least one configured ECU.			

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ECU 1 Comm Fail

Related FW	2.2.0	**Related applications**	MINT, MPTM
LBO ID	1998		
Description			
This output is closed when there is no communication with ECU configured in ECU slot 1.			

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ECU 2 Comm Fail

Related FW	2.2.0	**Related applications**	MINT, MPTM
LBO ID	1999		
Description			
This output is closed when there is no communication with ECU configured in ECU slot 2.			

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ECU 3 Comm Fail

Related FW	2.2.0	**Related applications**	MINT, MPTM
LBO ID	2000		
Description			
This output is closed when there is no communication with ECU configured in ECU slot 3.			

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ECU 4 Comm Fail

Related FW	2.2.0	**Related applications**	MINT, MPTM
LBO ID	2001		
Description			
This output is closed when there is no communication with ECU configured in ECU slot 4.			

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ECU 5 Comm Fail

Related FW	2.2.0	**Related applications**	MINT, MPTM
LBO ID	2002		
Description			
This output is closed when there is no communication with ECU configured in ECU slot 5.			

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ECU 6 Comm Fail

Related FW	2.2.0	**Related applications**	MINT, MPTM
LBO ID	2003		
Description			
This output is closed when there is no communication with ECU configured in ECU slot 6.			

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ECU 7 Comm Fail

Related FW	2.2.0	**Related applications**	MINT, MPTM
LBO ID	2004		
Description			
This output is closed when there is no communication with ECU configured in ECU slot 7.			

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ECU 8 Comm Fail

Related FW	2.2.0	**Related applications**	MINT, MPTM
LBO ID	2005		
Description			
This output is closed when there is no communication with ECU configured in ECU slot 8.			

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ECU 9 Comm Fail

Related FW	2.2.0	**Related applications**	MINT, MPTM
LBO ID	2006		
Description			
This output is closed when there is no communication with ECU configured in ECU slot 9.			

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ECU 10 Comm Fail

Related FW	2.2.0	**Related applications**	MINT, MPTM
LBO ID	2007		
Description			
This output is closed when there is no communication with ECU configured in ECU slot 10.			

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ECU 11 Comm Fail

Related FW	2.2.0	**Related applications**	MINT, MPTM
LBO ID	2008		
Description			
This output is closed when there is no communication with ECU configured in ECU slot 11.			

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ECU 12 Comm Fail

Related FW	2.2.0	**Related applications**	MINT, MPTM
LBO ID	2009		
Description			
This output is closed when there is no communication with ECU configured in ECU slot 12.			

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ECU 13 Comm Fail

Related FW	2.2.0	**Related applications**	MINT, MPTM
LBO ID	2010		
Description			
This output is closed when there is no communication with ECU configured in ECU slot 13.			

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ECU 14 Comm Fail

Related FW	2.2.0	**Related applications**	MINT, MPTM
LBO ID	2011		
Description			
This output is closed when there is no communication with ECU configured in ECU slot 14.			

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ECU 15 Comm Fail

Related FW	2.2.0	**Related applications**	MINT, MPTM
LBO ID	2012		
Description			
This output is closed when there is no communication with ECU configured in ECU slot 15.			

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ECU 16 Comm Fail

Related FW	2.2.0	**Related applications**	MINT, MPTM
LBO ID	2013		
Description			
This output is closed when there is no communication with ECU configured in ECU slot 16.			

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ECU 17 Comm Fail

Related FW	2.2.0	**Related applications**	MINT, MPTM
LBO ID	5766		
Description			
This output is closed when there is no communication with ECU configured in ECU slot 17.			

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ECU 18 Comm Fail

Related FW	2.2.0	**Related applications**	MINT, MPTM
LBO ID	5768		
Description			
This output is closed when there is no communication with ECU configured in ECU slot 18.			

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ECU 19 Comm Fail

Related FW	2.2.0	**Related applications**	MINT, MPTM
LBO ID	5769		
Description			
This output is closed when there is no communication with ECU configured in ECU slot 19.			

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ECU 20 Comm Fail

Related FW	2.2.0	**Related applications**	MINT, MPTM
LBO ID	5770		
Description			
This output is closed when there is no communication with ECU configured in ECU slot 20.			

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ECU 21 Comm Fail

Related FW	2.2.0	**Related applications**	MINT, MPTM
LBO ID	5771		
Description			
This output is closed when there is no communication with ECU configured in ECU slot 21.			

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ECU 22 Comm Fail

Related FW	2.2.0	**Related applications**	MINT, MPTM
LBO ID	5772		
Description			
This output is closed when there is no communication with ECU configured in ECU slot 22.			

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ECU 23 Comm Fail

Related FW	2.2.0	**Related applications**	MINT, MPTM
LBO ID	5773		
Description			
This output is closed when there is no communication with ECU configured in ECU slot 23.			

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ECU 24 Comm Fail

Related FW	2.2.0	**Related applications**	MINT, MPTM
LBO ID	5774		
Description			
This output is closed when there is no communication with ECU configured in ECU slot 24.			

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ECU 25 Comm Fail

Related FW	2.2.0	**Related applications**	MINT, MPTM
LBO ID	5775		
Description			
This output is closed when there is no communication with ECU configured in ECU slot 25.			

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ECU 26 Comm Fail

Related FW	2.2.0	**Related applications**	MINT, MPTM
LBO ID	5776		
Description			
This output is closed when there is no communication with ECU configured in ECU slot 26.			

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ECU 27 Comm Fail

Related FW	2.2.0	**Related applications**	MINT, MPTM
LBO ID	5777		
Description			
This output is closed when there is no communication with ECU configured in ECU slot 27.			

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ECU 28 Comm Fail

Related FW	2.2.0	**Related applications**	MINT, MPTM
LBO ID	5778		
Description			
This output is closed when there is no communication with ECU configured in ECU slot 28.			

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ECU Comm OK

Related FW	2.2.0	**Related applications**	MINT, MPTM
LBO ID	347		
Description			
This output is closed when all configured ECUs are communicating without any issue.			

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ECU Power Relay

Related FW	2.2.0	Related applications	MINT, MPTM
LBO ID	116		
Description			

This output should be used for control of “keyswitch” input of an ECU. If the particular ECU does not have keyswitch or a similar input, it can be used for control of DC power for the ECU.

The output closes together with PRESTART and remains closed for the entire duration that the BESS is running. It is opened at the moment that the BESS is stopped.

> **IMPORTANT: This LBO also affects evaluation of ECU Communication Fail alarms. With configured LBO ECU Power Relay, these alarms are evaluated only when this LBO is active. Without configured LBO ECU Power Relay, these alarm are evaluated all the time.**

Note: *This output can be also activated by LBI* ***ECU KEY SWITCH****. In that case alarms related to ECU Communication Fail alarms are not evaluated.*

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ECU Run Stop

Related FW	2.2.0	Related applications	MINT, MPTM
LBO ID	958		
Description			

Signal for starting and stopping of ECU.

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Energized

Related FW	2.2.0	Related applications	MINT, MPTM
LBO ID	67		
Description			

The output is designed to be used as an indication that the BESS is running. The out remains closed until BESS stop.

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Engines Swapped

Related FW	2.2.0	Related applications	MINT
LBO ID	208		
Description			

When the master controller (controller with the lowest Controller Address) swaps priority of two Controllers, the master controller generates 100 ms pulse with the output. The output works with the setpoint **#Priority Auto Swap** if it is setup to Run Hours Equal.

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Event Load Reduction

Related FW	2.2.0	**Related applications**	MPTM
LBO ID	1434		
Description			
This output is closed when **Load Reduction Ramp** is in use. See **Load Reduction** for more information.			

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Event Mains Frequency Fall

Related FW	2.2.0	**Related applications**	MPTM
LBO ID	1433		
Description			
This output is closed when **Mains Frequency Fall Ramp** is in use. See **Power increase by under frequency - PuF** for more information.			

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Event Mains Frequency Rise

Related FW	2.2.0	**Related applications**	MPTM
LBO ID	1432		
Description			
This output is closed when **Mains Frequency Rise Ramp** is in use. See **Power reduction by over frequency - PoF** for more information.			

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Event Mains Trip

Related FW	2.2.0	**Related applications**	MPTM
LBO ID	1435		
Description			
This output is closed when the Grid Code function After Mains Trip Period is in an active state. It is closed once the timer **After MP Synchronization Period** is elapsed until the timer **After Mains Trip Period** is elapsed. Once the BESS starts to being unloaded and this output is closed the Mains will be loaded slowly according to the **After Mains Trip Period Ramp**.			

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Event P for Q

Related FW	2.2.0	**Related applications**	MPTM
LBO ID	1436		
Description			
This output is closed when **P For Q Ramp** is in use. See **P For Q** for more information.			

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Event P(Um)

Related FW	2.2.0	**Related applications**	MPTM
LBO ID	1786		
Description			
This output is closed when **BESS PTotal Running P** and **BESS Required P Target** are limited due to **Power Regulation Based On Actual Mains Voltage**.			

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Event Post VRT

Related FW	2.2.0	**Related applications**	MINT, MPTM
LBO ID	1438		
Description			
This output is closed when **Post VRT Ramp** is in use. See **Dynamic Support - VRT** for more information.			

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Event Return Over/Under Frequency

Related FW	2.2.0	**Related applications**	MPTM
LBO ID	1785		
Description			
This output is closed when **Return From Over/Under Frequency Ramp** is in use. See **Return from over/under frequency** for more information.			

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Event Soft Unload

Related FW	2.2.0	**Related applications**	MINT, MPTM
LBO ID	1437		
Description			
This output is closed when **Soft Unload Ramp** is in use.			

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Exercise Timer 1

Related FW	2.2.0	**Related applications**	MINT, MPTM
LBO ID	1250		
Description			
This output is closed when the Exercise timer 1 is activated. The output can be used to make periodic tests of the BESS, breakers, any external logic etc. and its activation depends on the setpoints in the **Subgroup: Timer 1** subgroup. ***Note:*** *If more than one timer is active at the same time, timer with selected higher priority function is applied.*			

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Exercise Timer 2

Related FW	2.2.0	Related applications	MINT, MPTM
LBO ID	1251		
Description			
This output is closed when the Exercise timer 2 is activated. The output can be used to make periodic tests of the BESS, breakers, any external logic etc. and its activation depends on the setpoints in the **Subgroup: Timer 2** subgroup. ***Note:*** *If more than one timer is active at the same time, timer with selected higher priority function is applied.*			

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Exercise Timer 3

Related FW	2.2.0	Related applications	MINT, MPTM
LBO ID	1946		
Description			
This output is closed when the Exercise timer 3 is activated. The output can be used to make periodic tests of the BESS, breakers, any external logic etc. and its activation depends on the setpoints in the **Subgroup: Timer 3** subgroup. ***Note:*** *If more than one timer is active at the same time, timer with selected higher priority function is applied.*			

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Exercise Timer 4

Related FW	2.2.0	Related applications	MINT, MPTM
LBO ID	1947		
Description			
This output is closed when the Exercise timer 4 is activated. The output can be used to make periodic tests of the BESS, breakers, any external logic etc. and its activation depends on the setpoints in the **Subgroup: Timer 4** subgroup. ***Note:*** *If more than one timer is active at the same time, timer with selected higher priority function is applied.*			

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Exercise Timer 5

Related FW	2.2.0	Related applications	MINT, MPTM
LBO ID	1948		
Description			
This output is closed when the Exercise timer 5 is activated. The output can be used to make periodic tests of the BESS, breakers, any external logic etc. and its activation depends on the setpoints in the **Subgroup: Timer 5** subgroup.			

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Exercise Timer 6

Related FW	2.2.0	Related applications	MINT, MPTM
LBO ID	1949		
Description			
This output is closed when the Exercise timer 6 is activated. The output can be used to make periodic tests of the BESS, breakers, any external logic etc. and its activation depends on the setpoints in the **Subgroup: Timer 6** subgroup. ***Note:*** *If more than one timer is active at the same time, timer with selected higher priority function is applied.*			

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Exercise Timer 7

Related FW	2.2.0	Related applications	MINT, MPTM
LBO ID	1950		
Description			
This output is closed when the Exercise timer 7 is activated. The output can be used to make periodic tests of the BESS, breakers, any external logic etc. and its activation depends on the setpoints in the **Subgroup: Timer 7** subgroup. ***Note:*** *If more than one timer is active at the same time, timer with selected higher priority function is applied.*			

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Exercise Timer 8

Related FW	2.2.0	Related applications	MINT, MPTM
LBO ID	1951		
Description			
This output is closed when the Exercise timer 8 is activated. The output can be used to make periodic tests of the BESS, breakers, any external logic etc. and its activation depends on the setpoints in the **Subgroup: Timer 8** subgroup. ***Note:*** *If more than one timer is active at the same time, timer with selected higher priority function is applied.*			

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Exercise Timer 9

Related FW	2.2.0	Related applications	MINT, MPTM
LBO ID	2630		
Description			
This output is closed when the Exercise timer 9 is activated. The output can be used to make periodic tests of the BESS, breakers, any external logic etc. and its activation depends on the setpoints in the **Subgroup: Timer 9** subgroup. ***Note:*** *If more than one timer is active at the same time, timer with selected higher priority function is applied.*			

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Exercise Timer 10

Related FW	2.2.0	Related applications	MINT, MPTM
LBO ID	2631		
Description			
This output is closed when the Exercise timer 10 is activated. The output can be used to make periodic tests of the BESS, breakers, any external logic etc. and its activation depends on the setpoints in the **Subgroup: Timer 10** subgroup. ***Note:*** *If more than one timer is active at the same time, timer with selected higher priority function is applied.*			

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Exercise Timer 11

Related FW	2.2.0	Related applications	MINT, MPTM
LBO ID	2632		
Description			
This output is closed when the Exercise timer 11 is activated. The output can be used to make periodic tests of the BESS, breakers, any external logic etc. and its activation depends on the setpoints in the **Subgroup: Timer 11** subgroup. ***Note:*** *If more than one timer is active at the same time, timer with selected higher priority function is applied.*			

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Exercise Timer 12

Related FW	2.2.0	Related applications	MINT, MPTM
LBO ID	2633		
Description			
This output is closed when the Exercise timer 12 is activated. The output can be used to make periodic tests of the BESS, breakers, any external logic etc. and its activation depends on the setpoints in the **Subgroup: Timer 12** subgroup. ***Note:*** *If more than one timer is active at the same time, timer with selected higher priority function is applied.*			

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Exercise Timer 13

Related FW	2.2.0	Related applications	MINT, MPTM
LBO ID	2634		
Description			
This output is closed when the Exercise timer 13 is activated. The output can be used to make periodic tests of the BESS, breakers, any external logic etc. and its activation depends on the setpoints in the **Subgroup: Timer 13** subgroup. ***Note:*** *If more than one timer is active at the same time, timer with selected higher priority function is applied.*			

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Exercise Timer 14

Related FW	2.2.0	Related applications	MINT, MPTM
LBO ID	2635		
Description			
This output is closed when the Exercise timer 14 is activated. The output can be used to make periodic tests of the BESS, breakers, any external logic etc. and its activation depends on the setpoints in the **Subgroup: Timer 14** subgroup. ***Note:*** *If more than one timer is active at the same time, timer with selected higher priority function is applied.*			

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Exercise Timer 15

Related FW	2.2.0	Related applications	MINT, MPTM
LBO ID	2636		
Description			
This output is closed when the Exercise timer 15 is activated. The output can be used to make periodic tests of the BESS, breakers, any external logic etc. and its activation depends on the setpoints in the **Subgroup: Timer 15** subgroup. ***Note:*** *If more than one timer is active at the same time, timer with selected higher priority function is applied.*			

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Exercise Timer 16

Related FW	2.2.0	Related applications	MINT, MPTM
LBO ID	2637		
Description			
This output is closed when the Exercise timer 16 is activated. The output can be used to make periodic tests of the BESS, breakers, any external logic etc. and its activation depends on the setpoints in the **Subgroup: Timer 16** subgroup. ***Note:*** *If more than one timer is active at the same time, timer with selected higher priority function is applied.*			

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Exercise Timer 17

Related FW	2.2.0	Related applications	MINT, MPTM
LBO ID	6466		
Description			
This output is closed when the Exercise timer 17 is activated. The output can be used to make periodic tests of the BESS, breakers, any external logic etc. and its activation depends on the setpoints in the **Subgroup: Timer 17** subgroup. ***Note:*** *If more than one timer is active at the same time, timer with selected higher priority function is applied.*			

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Exercise Timer 18

Related FW	2.2.0	Related applications	MINT, MPTM
LBO ID	6467		
Description			
This output is closed when the Exercise timer 18 is activated. The output can be used to make periodic tests of the BESS, breakers, any external logic etc. and its activation depends on the setpoints in the **Subgroup: Timer 18** subgroup. ***Note:*** *If more than one timer is active at the same time, timer with selected higher priority function is applied.*			

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Exercise Timer 19

Related FW	2.2.0	Related applications	MINT, MPTM
LBO ID	6468		
Description			
This output is closed when the Exercise timer 19 is activated. The output can be used to make periodic tests of the BESS, breakers, any external logic etc. and its activation depends on the setpoints in the **Subgroup: Timer 19** subgroup. ***Note:*** *If more than one timer is active at the same time, timer with selected higher priority function is applied.*			

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Exercise Timer 20

Related FW	2.2.0	Related applications	MINT, MPTM
LBO ID	6469		
Description			
This output is closed when the Exercise timer 20 is activated. The output can be used to make periodic tests of the BESS, breakers, any external logic etc. and its activation depends on the setpoints in the **Subgroup: Timer 20** subgroup. ***Note:*** *If more than one timer is active at the same time, timer with selected higher priority function is applied.*			

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Exercise Timer 21

Related FW	2.2.0	Related applications	MINT, MPTM
LBO ID	6470		
Description			
This output is closed when the Exercise timer 21 is activated. The output can be used to make periodic tests of the BESS, breakers, any external logic etc. and its activation depends on the setpoints in the **Subgroup: Timer 21** subgroup. ***Note:*** *If more than one timer is active at the same time, timer with selected higher priority function is applied.*			

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Exercise Timer 22

Related FW	2.2.0	Related applications	MINT, MPTM
LBO ID	6471		
Description			
This output is closed when the Exercise timer 22 is activated. The output can be used to make periodic tests of the BESS, breakers, any external logic etc. and its activation depends on the setpoints in the **Subgroup: Timer 22** subgroup. ***Note:*** *If more than one timer is active at the same time, timer with selected higher priority function is applied.*			

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Exercise Timer 23

Related FW	2.2.0	Related applications	MINT, MPTM
LBO ID	6472		
Description			
This output is closed when the Exercise timer 23 is activated. The output can be used to make periodic tests of the BESS, breakers, any external logic etc. and its activation depends on the setpoints in the **Subgroup: Timer 23** subgroup. ***Note:*** *If more than one timer is active at the same time, timer with selected higher priority function is applied.*			

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Exercise Timer 24

Related FW	2.2.0	Related applications	MINT, MPTM
LBO ID	6473		
Description			
This output is closed when the Exercise timer 24 is activated. The output can be used to make periodic tests of the BESS, breakers, any external logic etc. and its activation depends on the setpoints in the **Subgroup: Timer 24** subgroup. ***Note:*** *If more than one timer is active at the same time, timer with selected higher priority function is applied.*			

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Exercise Timer 25

Related FW	2.2.0	Related applications	MINT, MPTM
LBO ID	6474		
Description			
This output is closed when the Exercise timer 25 is activated. The output can be used to make periodic tests of the BESS, breakers, any external logic etc. and its activation depends on the setpoints in the **Subgroup: Timer 25** subgroup. ***Note:*** *If more than one timer is active at the same time, timer with selected higher priority function is applied.*			

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Exercise Timer 26

Related FW	2.2.0	Related applications	MINT, MPTM
LBO ID	6475		
Description			
This output is closed when the Exercise timer 26 is activated. The output can be used to make periodic tests of the BESS, breakers, any external logic etc. and its activation depends on the setpoints in the **Subgroup: Timer 26** subgroup. ***Note:*** *If more than one timer is active at the same time, timer with selected higher priority function is applied.*			

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Exercise Timer 27

Related FW	2.2.0	Related applications	MINT, MPTM
LBO ID	6476		
Description			
This output is closed when the Exercise timer 27 is activated. The output can be used to make periodic tests of the BESS, breakers, any external logic etc. and its activation depends on the setpoints in the **Subgroup: Timer 27** subgroup. ***Note:*** *If more than one timer is active at the same time, timer with selected higher priority function is applied.*			

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Exercise Timer 28

Related FW	2.2.0	Related applications	MINT, MPTM
LBO ID	6477		
Description			
This output is closed when the Exercise timer 28 is activated. The output can be used to make periodic tests of the BESS, breakers, any external logic etc. and its activation depends on the setpoints in the **Subgroup: Timer 28** subgroup. ***Note:*** *If more than one timer is active at the same time, timer with selected higher priority function is applied.*			

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Exercise Timer 29

Related FW	2.2.0	Related applications	MINT, MPTM
LBO ID	6478		
Description			
This output is closed when the Exercise timer 29 is activated. The output can be used to make periodic tests of the BESS, breakers, any external logic etc. and its activation depends on the setpoints in the **Subgroup: Timer 29** subgroup. ***Note:*** *If more than one timer is active at the same time, timer with selected higher priority function is applied.*			

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Exercise Timer 30

Related FW	2.2.0	Related applications	MINT, MPTM
LBO ID	6479		
Description			
This output is closed when the Exercise timer 30 is activated. The output can be used to make periodic tests of the BESS, breakers, any external logic etc. and its activation depends on the setpoints in the **Subgroup: Timer 30** subgroup. ***Note:*** *If more than one timer is active at the same time, timer with selected higher priority function is applied.*			

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LBO: F

FltRes Button Echo

Related FW	2.2.0	Related applications	MINT, MPTM
LBO ID	30		
Description			
This output provides 1 s pulse when: › Fault Reset button is pressed on an **External display**Internal display. › Fault Reset command is received via communication line › LBI **Fault Reset Button** is activated.			

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Forward Synchronization

Related FW	2.2.0	Related applications	MINT, MPTM
LBO ID	68		
Description			
This output is closed when forward synchronization is active (synchronization via BCB breaker) and opens when LBO **BCB Status** closes.			

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FrequencyFrequency Down

Related FW	2.2.0	Related applications	MINT, MPTM
LBO ID	57		
Description			
This output together with the complementary output **Frequency Up** are designed for frequency and power control of the BESS where the BESS inverter regulator does not support analogue control.			

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Frequency Up

Related FW	2.2.0	Related applications	MINT, MPTM
LBO ID	56		
Description			
This output together with the complementary output FREQUENCYFREQUENCY DOWN are designed for frequency and power control of the BESS where the BESS inverter regulator does not support analogue control.			

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LBO: G

GPS Coordinates Detected

Related FW	2.2.0	Related applications	MINT,
LBO ID	5930		
Description			
This LBO is active if the GPS coordinates obtained from the GPS module are valid..			

back to Logical binary outputs alphabetically

GridCodes Power Limitation

Related FW	2.2.0	Related applications	MINT, MPTM
LBO ID	2365		
Description			
This output is closed when power is reduced due to Grid Codes requirements: - **Power reduction by over frequency - PoF** - **Load Reduction** - **P For Q** - **Dynamic Support - VRT**			

back to Logical binary outputs alphabetically

LBO: H

Heartbeat

Related FW	2.2.0	Related applications	MINT, MPTM
LBO ID	81		
Description			
This output toggles on/off in a period of 500 ms whenever the controller is switched on and functional.			

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Horn

Related FW	2.2.0	Related applications	MINT, MPTM
LBO ID	1		
Description			
This output is closed when any **Alarms** is activated and stays closed until: › Fault reset is pressed › Horn reset is pressed › **Horn Timeout** elapses			

back to Logical binary outputs alphabetically

Horn Flashing

Related FW	2.2.0	Related applications	MINT, MPTM
LBO ID	29		
Description			
This is the flashing alternative of the output **HORN**, i.e. the output flashes with 1 Hz period while the output Horn is closed.			

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HornRes Button Echo

Related FW	2.2.0	Related applications	MINT, MPTM
LBO ID	31		
Description			
This output is closed for 1 s every time Horn Reset Button is pressed.			

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Hot Swap Heartbeat

Related FW	2.2.0	Related applications	MINT, MPTM
LBO ID	2447		
Description			
This output is used to inform the second **Hot Swap Redundancy** controller about the fact that this controller is alive. This LBO has to be physically wired to the LBI **HOT SWAP HEARTBEAT DETECT** of the second **Hot Swap Redundancy** controller. If the signal is not sent, the second controller activates LBO **HOT SWAP SWITCH**. **IMPORTANT: This output has to be configured to physical output of the controller.** **IMPORTANT: This output has to be configured on both Master and Backup controllers.**			

back to Logical binary outputs alphabetically

Hot Swap Switch

Related FW	2.2.0	Related applications	MINT, MPTM
LBO ID	2469		
Description			
This output is activated when the LBI **Hot Swap Heartbeat Detect** of this controller do not receive the LBO **Hot Swap Heartbeat** signal from the second **Hot Swap Redundancy** controller. This output is used as control signal for switches / switch disconnectors that are used to disconnect specific terminals of the second **Hot Swap Redundancy** controller. It is also used as physical input for LBI **Hot Swap Ctrl Block** of the second controller. **IMPORTANT: This output has to be configured to physicall output of the controller.** **IMPORTANT: This output has to be configured on both Master and Backup controllers.**			

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HW AC Voltage Measurement Error

Related FW	2.2.0	Related applications	MINT, MPTM
LBO ID	2560		
Description			
This logical binary output is activated once the wrong 3V3 reference voltage is detected. It is recommended to use it to activate user protection which will open MCB/BCB and turn off the BESS to prevent any damage to the BESS, load or Mains. **IMPORTANT: This LBO only works on HW revision D and higher.**			

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LBO: I

In Synchronism

Related FW	2.2.0	Related applications	MINT, MPTM
LBO ID	80		
Description			
This output is closed during synchronization when Slip Angle, Slip Frequency and Voltages are inside required windows. Required windows are: - **Slip Angle** between BESS and Bus Voltage is within range given by **Phase Window** for time longer than **Dwell Time**. Required if **Synchronization Type** = PhaseMatch. - **Slip Frequency** between between BESS and Bus Frequency is withing range given by **Slip Frequency Window** for time longer than **Dwell Time**. Required if **Synchronization Type** = SlipSynchr. - Voltage difference between BESS and Bus voltage in all phases must be lower or equal to **Voltage Window** for time longer than **Dwell Time**. Required always.			

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Initialized

Related FW	2.2.0	Related applications	MINT, MPTM
LBO ID	1222		
Description			
This output is activated after the controller is initialized. It can be used to block some PLC logic blocks while controller initialization is being proceeded.			

back to Logical binary outputs alphabetically

LBO: K

kWh Pulse

Related FW	2.2.0	Related applications	MINT, MPTM
LBO ID	206		
Description			
This output is active for 100 ms every time the Genset kWh is increased by one.			

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LBO: L

Load Reduction Active

Related FW	2.2.0	Related applications	MINT, MPTM
LBO ID	1245		
Description			
This output is closed when **Load Reduction** is active.			

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Load Shedding Stage 1

Related FW	2.2.0	Related applications	MINT, MPTM
LBO ID	51		
Description			
This is an output of **Load Shedding**. › The load shedding outputs are activated in the order 1, 2, 3, …, X. › The load shedding outputs are deactivated in the order X, …, 3, 2, 1. › The load disconnected by this LBO is the least essential load. ***Note:*** *X is the highest configured* ***Load shedding outputs****.*			

back to Logical binary outputs alphabetically

Load Shedding Stage 2

Related FW	2.2.0	Related applications	MINT, MPTM
LBO ID	52		
Description			

This is an output of **Load Shedding**.

- The load shedding outputs are activated in the order 1, 2, 3, …, X.
- The load shedding outputs are deactivated in the order X, …, 3, 2, 1.
- The load disconnected by LBO **Load Shedding Stage 1** is the least essential load.

Note: *X is the highest configured* ***Load shedding outputs****.*

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Load Shedding Stage 3

Related FW	2.2.0	Related applications	MINT, MPTM
LBO ID	53		
Description			

This is an output of **Load Shedding**.

- The load shedding outputs are activated in the order 1, 2, 3, …, X.
- The load shedding outputs are deactivated in the order X, …, 3, 2, 1.
- The load disconnected by LBO **Load Shedding Stage 1** is the least essential load.

Note: *X is the highest configured* ***Load shedding outputs****.*

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Load Shedding Stage 4

Related FW	2.2.0	Related applications	MINT, MPTM
LBO ID	452		
Description			

This is an output of **Load Shedding**.

- The load shedding outputs are activated in the order 1, 2, 3, …, X.
- The load shedding outputs are deactivated in the order X, …, 3, 2, 1.
- The load disconnected by LBO **Load Shedding Stage 1** is the least essential load.

Note: *X is the highest configured* ***Load shedding outputs****.*

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Load Shedding Stage 5

Related FW	2.2.0	Related applications	MINT, MPTM
LBO ID	453		
Description			

This is an output of **Load Shedding**.

- The load shedding outputs are activated in the order 1, 2, 3, …, X.
- The load shedding outputs are deactivated in the order X, …, 3, 2, 1.
- The load disconnected by LBO **Load Shedding Stage 1** is the least essential load.

Note: *X is the highest configured **Load shedding outputs**.*

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Load Shedding Stage 6

Related FW	2.2.0	Related applications	MINT, MPTM
LBO ID	454		
Description			

This is an output of **Load Shedding**.

- The load shedding outputs are activated in the order 1, 2, 3, …, X.
- The load shedding outputs are deactivated in the order X, …, 3, 2, 1.
- The load disconnected by LBO **Load Shedding Stage 1** is the least essential load.

Note: *X is the highest configured **Load shedding outputs**.*

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Load Shedding Stage 7

Related FW	2.2.0	Related applications	MINT, MPTM
LBO ID	455		
Description			

This is an output of **Load Shedding**.

- The load shedding outputs are activated in the order 1, 2, 3, …, X.
- The load shedding outputs are deactivated in the order X, …, 3, 2, 1.
- The load disconnected by LBO **Load Shedding Stage 1** is the least essential load.

Note: *X is the highest configured **Load shedding outputs**.*

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Load Shedding Stage 8

Related FW	2.2.0	Related applications	MINT, MPTM
LBO ID	456		
Description			
This is an output of **Load Shedding**. › The load shedding outputs are activated in the order 1, 2, 3, …, X. › The load shedding outputs are deactivated in the order X, …, 3, 2, 1. › The load disconnected by LBO **Load Shedding Stage 1** is the least essential load. ***Note:*** *X is the highest configured **Load shedding outputs**.*			

back to Logical binary outputs alphabetically

Loaded

Related FW	2.2.0	Related applications	MINT, MPTM
LBO ID	72		
Description			
This output is closed while the BESS is loaded. ***Note:*** *Output is opened when BESS starts unloading or opens the BCB without of unloading.*			

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Logical 0

Related FW	2.2.0	Related applications	MINT, MPTM
LBO ID	26		
Description			
Logical binary output which is still in logical 0.			

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Logical 1

Related FW	2.2.0	Related applications	MINT, MPTM
LBO ID	27		
Description			
Logical binary output which is still in logical 1.			

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LVRT 1-phase Invalid

Related FW	2.2.0	Related applications	MPTM
LBO ID	2352		
Description			
This output is closed if any value on the y-axis of the **LVRT 1-PHASE** curve is equal to or higher than 100% or when the curve is not configured.			

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LVRT 2-phase Invalid

Related FW	2.2.0	**Related applications**	MPTM
LBO ID	2353		
Description			
This output is closed if any value on the y-axis of the **LVRT 2-PHASE** curve is equal to or higher than 100% or when the curve is not configured.			

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LVRT 3-phase Invalid

Related FW	2.2.0	**Related applications**	MPTM
LBO ID	2354		
Description			
This output is closed if any value on the y-axis of the **LVRT 3-PHASE** curve is equal to or higher than 100% or when the curve is not configured.			

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LVRT Active

Related FW	2.2.0	**Related applications**	MPTM
LBO ID	2313		
Description			
This output is closed while LVRT Protection is active and stays closed for at least 500 ms. See **Dynamic Support - VRT** for more information.			

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LVRT Severe

Related FW	2.2.0	**Related applications**	MPTM
LBO ID	2317		
Description			
This output is closed while BESS Voltage drops under level adjusted by **LVRT Level Severe** and stays closed for at least 500 ms. See **Dynamic Support - VRT** for more information. ***Note:*** *BESS Voltage L1-N, BESS Voltage L2-N and BESS Voltage L3-N is considered.*			

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LVRTCurveTrip

Related FW	2.2.0	Related applications	MPTM
LBO ID	2315		
Description			
This output is closed when the BESS Voltage drops below the line of LVRT curve and opens when the BESS Voltage rises above the line of LVRT curve. This output is always closed at least for 3 seconds. ***Note:*** *LVRT 1-PHASE, LVRT 2-PHASE and LVRT 3-PHASE are considered.* ***Note:*** *BESS Voltage L1-N, BESS Voltage L2-N and BESS Voltage L3-N are considered.*			

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LBO: M

Mains/Bus HealthyMains Healthy

Related FW	2.2.0	Related applications	MINT, MPTM
LBO ID	78		
Description			
This output is closed while Mains/Bus parameters (voltage & frequency) are considered as healthy, i. e. within limits.			

Application Mode	Setting of Limits	
MINT	**BESS >>V** **BESS >V** **BESS <V**	**BESS >f** **BESS <f**
MPTM	**Mains >>V** **Mains >V** **Mains <<V** **Mains <V**	**Mains >>f** **Mains >f** **Mains <<f** **Mains <f**

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Manual Ready

Related FW	2.2.0	Related applications	MINT, MPTM
LBO ID	1258		
Description			
This output is active when **Controller Mode** = MAN and the BESS is stopped and it is possible to start it. i.e. no red alarm is activated or **SD OVERRIDE** is active (Output **READY** is active).			

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MCB Button Echo

Related FW	2.2.0	Related applications	MPTM
LBO ID	34		
Description			
This output is closed for 1 s every time MCB Button is pressed.			

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MCB Close/Open

Related FW	2.2.0	Related applications	MPTM
LBO ID	45		
Description			

The output controls the Mainsmains circuit breaker. Its state represents the breaker position requested by the controller.

If the feedback does not respond in 2 seconds and it was already the last attempt the specific alarm based on the current breaker position is issued.

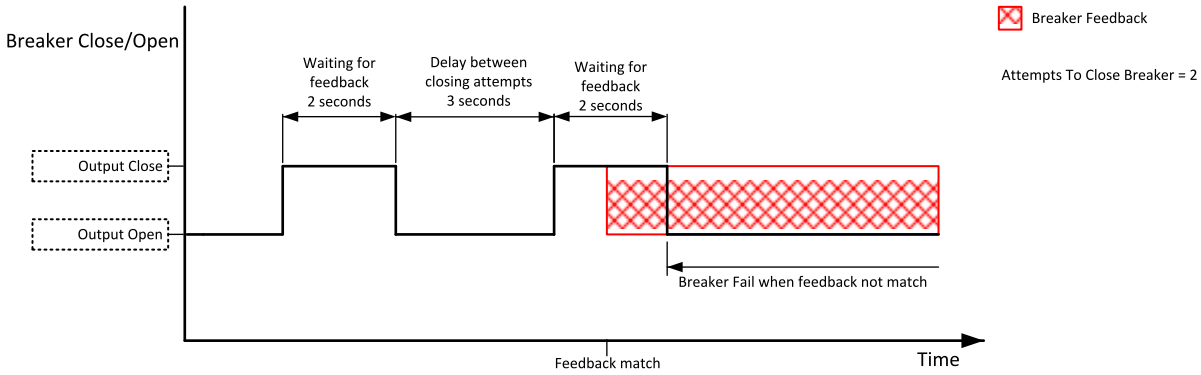

Image 22.33 MCB Close command

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MCB OFF Coil

Related FW	2.2.0	Related applications	MPTM
LBO ID	47		

Description

The output is intended for opening of Mainsmains circuit breaker.

The output provides pulses, which length is 2 seconds when breaker has to open with pause 1 second between each pulse. If the LBI **MCB FEEDBACK** does not match after second pulse elapses Alarm **Wrn MCB Fail To Open** is issued.

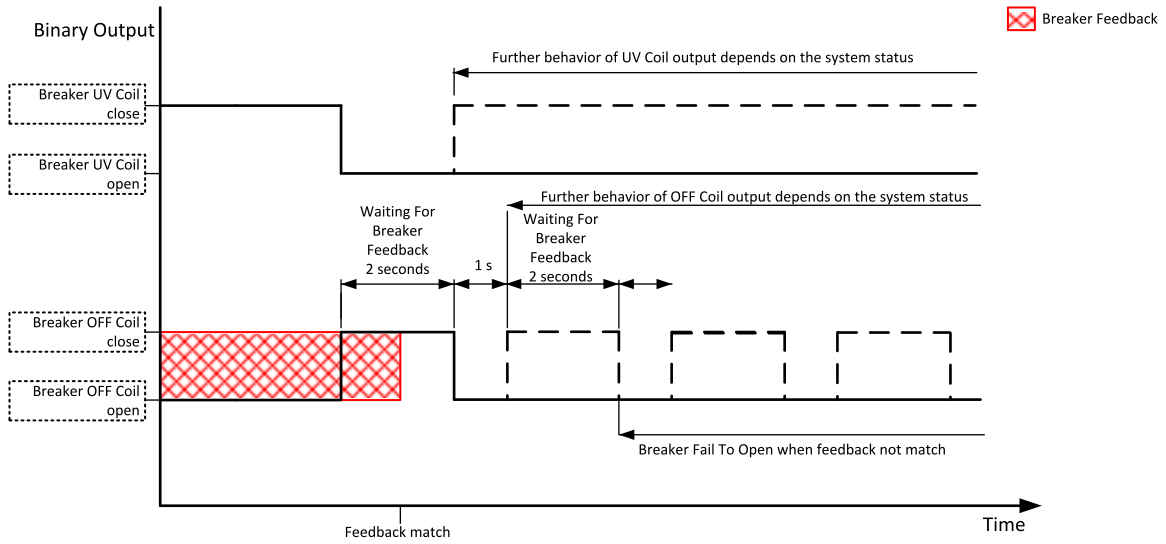

Image 22.34 MCB OFF Coil command

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MCB ON Coil

Related FW	2.2.0	Related applications	MPTM
LBO ID	46		
Description			

The output is intended for control of close coil of Mainsmains circuit breaker.

The output provides pulse, which length is 2 seconds and the pause between attempts is 3 seconds.

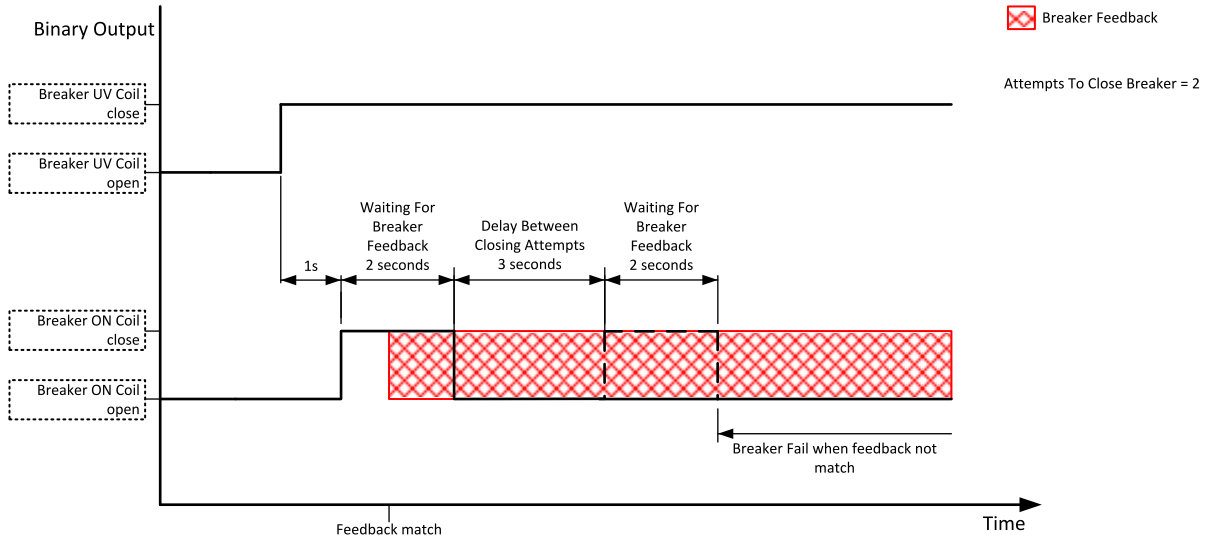

Image 22.35 MCB ON Coil close command

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MCB Status

Related FW	2.2.0	Related applications	MINT, MPTM
LBO ID	85		
Description			

This output indicates the MCB position as it is internally considered by the controller. The position is based on **MCB FEEDBACK** and **MCB FEEDBACK NEGATIVE**.

> ***Note:*** *If the LBI **MCB FEEDBACK** is not configured the status is distributed automatically between all CUs in the group via CAN Intercontroller Communication.*

- In case that only **MCB FEEDBACK** is used, this output mirrors the input.
- In case that both **MCB FEEDBACK** and **MCB FEEDBACK NEGATIVE** are used and
  - Feedback match - output indicates MCB position according to feedbacks.
  - Feedback do not match - output indicates last position when feedbacks matched.

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MCB UV Coil

Related FW	2.2.0	Related applications	MPTM
LBO ID	48		
Description			

The output is intended for control of undervoltage coil of Mainsmains circuit breaker.

The output is closed while Mains values are within limits. Breaker closing command is blocked for 1 sec after the UV coil has been closed to allow the breaker mechanical system to get ready for closing. The output is opened for 2 seconds when the breaker has to open.

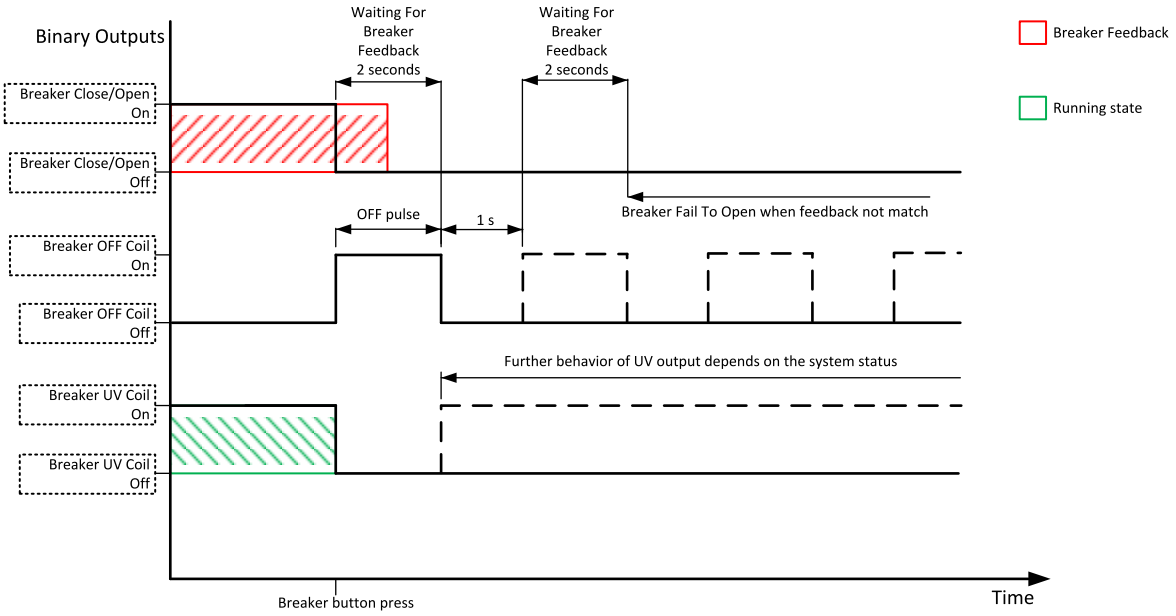

Image 22.36 MCB UV Coil close command

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Mode AUTO

Related FW	2.2.0	Related applications	MINT, MPTM
LBO ID	19		
Description			

This output is active whenever **Controller Mode** = AUTO, i.e. when LBO **NOT IN AUTO** is opened.

back to Logical binary outputs alphabetically

Mode MANRUNSEM

Related FW	2.2.0	Related applications	MINT, MPTM
LBO ID	18		
Description			

This output is active whenever **Controller Mode** = MANSEM.

back to Logical binary outputs alphabetically

Mode OFFPRG

Related FW	2.2.0	Related applications	MINT, MPTM
LBO ID	17		
Description			
This output is active whenever **Controller Mode** = OFF.			

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LBO: N

NCB Close/Open

Related FW	2.2.0	Related applications	MINT, MPTM
LBO ID	50		
Description			
Neutral circuit breaker Close/Open output controls the BESS neutral circuit breaker. It is intended for contactors – provides a continual active signal if NCB should be closed.			

back to Logical binary outputs alphabetically

Not In Auto

Related FW	2.2.0	Related applications	MINT, MPTM
LBO ID	1248		
Description			
This output is closed whenever **Controller Mode** != AUTO, i.e. when LBO **MODE AUTO** is opened.			

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Not Ready

Related FW	2.2.0	Related applications	MINT, MPTM
LBO ID	63		
Description			
This output is closed when the BESS is not operable and is not ready to be started. Closed if: › **Controller Mode** = OFF › LBI **BESS START BLOCKING** is closed			

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Not Used

Related FW	2.2.0	Related applications	MINT, MPTM
LBO ID	286		
Description			
Output has no function.			

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LBO: O

Operational

Related FW	2.2.0	**Related applications**	MINT, MPTM
LBO ID	61		
Description			
This output is closed when the BESS is ready for operation or is currently in operation.			

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OVRT Active

Related FW	2.2.0	**Related applications**	MPTM
LBO ID	2314		
Description			
This output is closed while OVRT Protection is active and stays closed for at least 500 ms. See **Dynamic Support - VRT** for more information.			

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OVRT Invalid

Related FW	2.2.0	**Related applications**	MPTM
LBO ID	2351		
Description			
This output is closed if any value on the y-axis of the**OVRT** curve is equal to or higher than 100% or when the curve is not configured.			

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OVRTCurveTrip

Related FW	2.2.0	**Related applications**	MPTM
LBO ID	2316		
Description			
This output is closed when the BESS Voltage rises above the line of **OVRT** curve and opens when the BESS Voltage drops below the line of **OVRT** curve. This output is always closed at least for 3 seconds. ***Note:** BESS Voltage L1-N, BESS Voltage L2-N and BESS Voltage L3-N are considered.*			

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LBO: P

Parallel To GF Source

Related FW	2.2.0	**Related applications**	MINT, MPTM
LBO ID	7381		
Description			

This binary output carries information about whether at least one source with Grid Forming capability is connected to the common bus. LBO is active if the bus is directly connected to the Mains, or if at least one genset or BESS in u-f mode is connected to it .

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PCS Run Request

Related FW	2.2.0	**Related applications**	MINT, MPTM
LBO ID	2268		
Description			
This output is used for BESS PCS activation. See chapter **BESS starting sequence and BESS states**.			

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P for Q Active

Related FW	2.2.0	**Related applications**	MPTM
LBO ID	1546		
Description			
This output is closed when **BESS PTotal Running P** is reduced in order to achieve **BESS Required Q**. ***Note:*** *Output is opened if there is another reduction active.*			

back to Logical binary outputs alphabetically

P Over Frequency Active

Related FW	2.2.0	**Related applications**	MPTM
LBO ID	1183		
Description			
This output is closed when the **BESS PTotal Running P** starts to be forced to increase due to **Power reduction by over frequency - PoF**.			

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P Over Frequency Curve Invalid

Related FW	2.2.0	**Related applications**	MPTM
LBO ID	2196		
Description			
This output is closed when **Power Over Frequency** curve is not configured.			

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P Under Frequency Active

Related FW	2.2.0	**Related applications**	MPTM
LBO ID	2115		
Description			
This output is closed when the **BESS PTotal Running P** starts to be forced to increase due to **Power**			

increase by under frequency - PuF.

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P Under Frequency Curve Invalid

Related FW	2.2.0	**Related applications**	MPTM
LBO ID	2197		
Description			
This output is closed when **POWER UNDER FREQUENCY** curve is not configured.			

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Pave

Related FW	2.2.0	**Related applications**	MPTM
LBO ID	2248		
Description			
This output is closed when value **Pmom/Pave** is above the curve **P Mom/Pave Max** and stays closed for 5 seconds.			

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Pave FLS

Related FW	2.2.0	**Related applications**	MPTM
LBO ID	2249		
Description			
This output is closed when **Pave Protection** != Disabled and LAI **PMOM** is either not configured or has invalid value.			

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Peak Shaving Active

Related FW	2.2.0	**Related applications**	MINT, MPTM
LBO ID	2118		
Description			
This output is closed when Peak shaving is activated.			

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Peripheral Module Comm Fail

Related FW	2.2.0	**Related applications**	MINT, MPTM
LBO ID	115		
Description			
This output is closed when there is no communication with at least one configured peripheral module.			

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Power Switch 1

Related FW	2.2.0	Related applications	MINT, MPTM
LBO ID	290		
Description			

This is an output from the Power switch function. The behavior of the switch depends on the adjustment of the setpoints **Power Switch On** and **Power Switch Off**

When the dummy load function is used the switching ON of Power switch is blocked while the BESS isn't runningno Gen-set is connected to the bus and is allowed 30 s after start of the BESS.

The Power Switch is activated when **BESS PTotal Running P** reach relative On Level which is related to the **Running Nominal Power Of AllNominal power**

Image 22.37 Power Switch Example

Note: *Power Switch can work in both directions high limit with hysteresis: On > Off or low limit with hysteresis On < Off.*

Note: *Setpoints **Power Switch On** and **Power Switch Off** are invisible until configuration of this LBO.*

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PQ-C Area Limit

Related FW	2.2.0	Related applications	MPTM
LBO ID	2244		
Description			

This output is closed when the **BESS Required Q** is outside the **P For Q PQ C**.

See **P For Q** for more information.

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PQ-L Area Limit

Related FW	2.2.0	Related applications	MPTM
LBO ID	2243		
Description			

This output is closed when the **BESS Required Q** is outside the **P For Q PQ L**.

See **P For Q** for more information.

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Prestart

Related FW	2.2.0	**Related applications**	MINT, MPTM
LBO ID	36		
Description			
This output can be used for control of any device, which has to be activated just before BESS start. The output is closed and opens 100 ms before the **BESS state** = Starting .			

back to Logical binary outputs alphabetically

Precharge

Related FW	2.2.0	**Related applications**	MINT, MPTM
LBO ID	2783		
Description			
This LBO relates to the BESS start sequence decribed in the chapter BESS Precharge Types (Global Guide). State of precharge.			

back to Logical binary outputs alphabetically

Precharge Request

Related FW	2.2.0	**Related applications**	MINT, MPTM
LBO ID	2782		
Description			
This LBO relates to the BESS start sequence decribed in **BESS starting sequence and BESS states**. This LBO initiates the BESS start sequence as a request to get the BESS to the precharge state. The precharge sequence is considered to be finished once the LBI **PRECHARGE FINISHED** gets active. Both signals are mandatory for correct operation.			

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ProcessSystem Power LimitationReservedProcess Power Limitation

Related FW	2.2.0	**Related applications**	MINT, MPTM
LBO ID	2241		
Description			
This output is closed while **BESS PTotal Running P** is being reduced due to: **Import/Export Limitation** = Enabled.			

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PV Operable

Related FW	2.2.0	**Related applications**	MINT, MPTM
LBO ID	2753		
Description			
This LBO is active if at least one of **PV 01 OPERABLE** is operable			

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PV/WT Run Request

Related FW	2.2.0	**Related applications**	MINT, MPTM
LBO ID	2690		
Description			
This output is used to signalize run request of the PV inverter and it is closed all the time when the CU is not in the OFF mode.			

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PVCB Button Echo

Related FW	2.2.0	**Related applications**	MINT, MPTM
LBO ID	2710		
Description			
This output is closed for 1 s every time PVCB Button is pressed.			

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PVCB Close/Open

Related FW	2.2.0	**Related applications**	MINT, MPTM
LBO ID	2685		
Description			
The output controls the PV circuit breaker. Its state represents the breaker position requested by the controller. The breaker must react within 2 seconds to a close or open command, otherwise an alarm **PVCB Fail** is activated.			

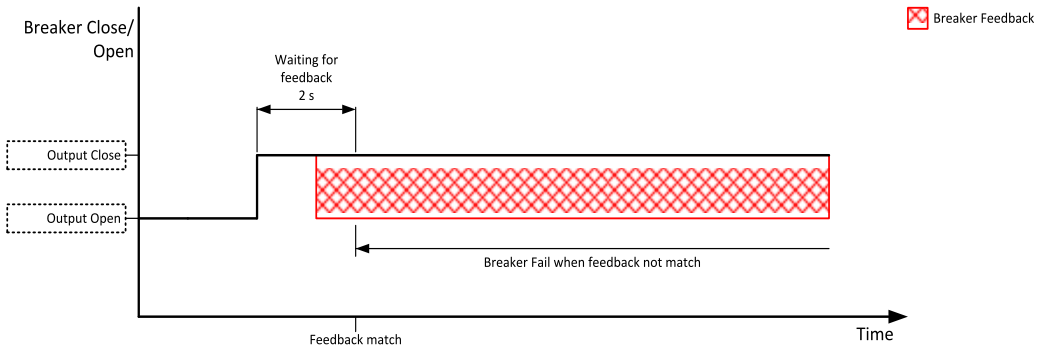


Image 22.38 PVCB Close command

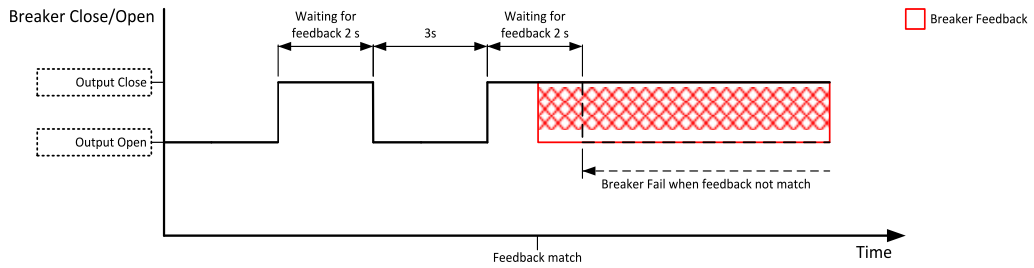


Image 22.39 Repeated PVCB Close command

back to Logical binary outputs alphabetically

PVCB OFF Coil

Related FW	2.2.0	Related applications	MINT, MPTM
LBO ID	2687		

Description

The output is intended for control of open coil of PVCB circuit breaker. The output gives a pulse in the moment the breaker has to be opened. The pulse lasts until the feedback deactivates, but at least for 2 seconds.

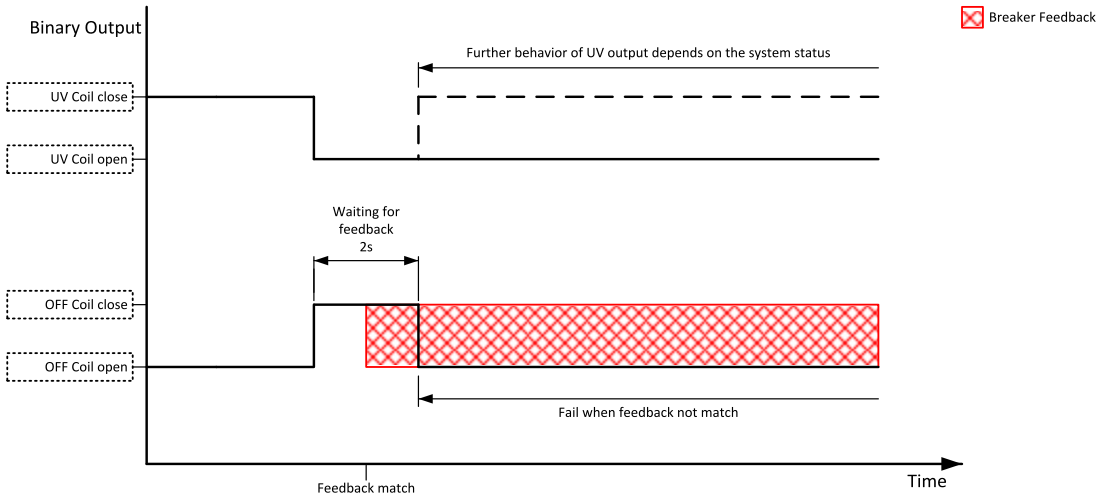


Image 22.40 PVCB OFF Coil command

back to Logical binary outputs alphabetically

PVCB ON Coil

Related FW	2.2.0	Related applications	MINT, MPTM
LBO ID	2686		

Description

The output is intended for control of close coil of PVCB circuit breaker. The output gives at least 2 second pulse in the moment the breaker has to be closed.

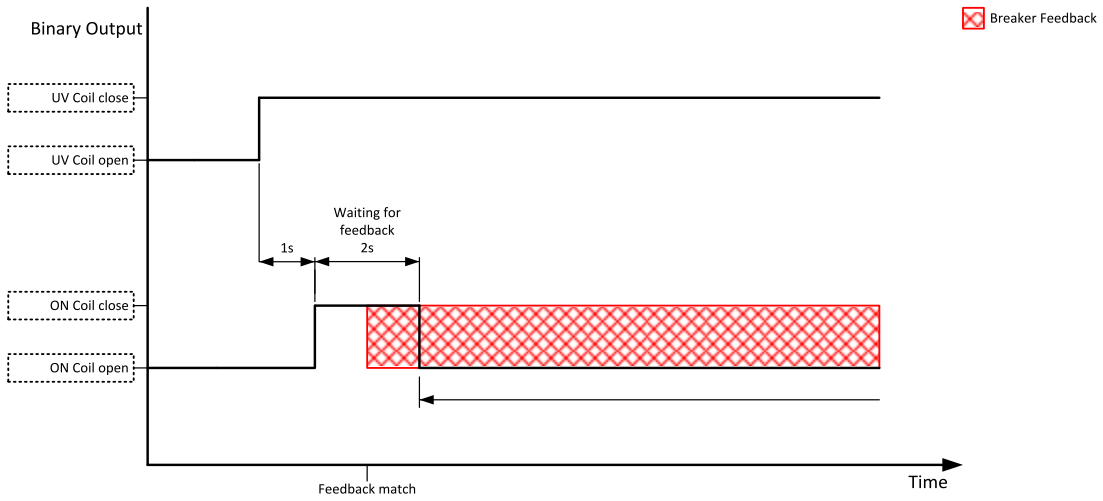
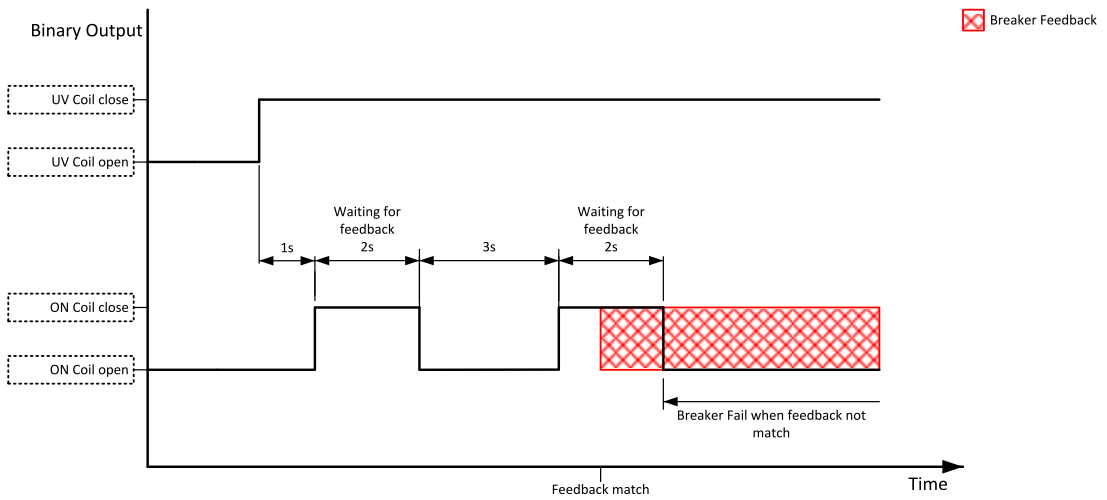


Image 22.41 PVCB ON Coil close command



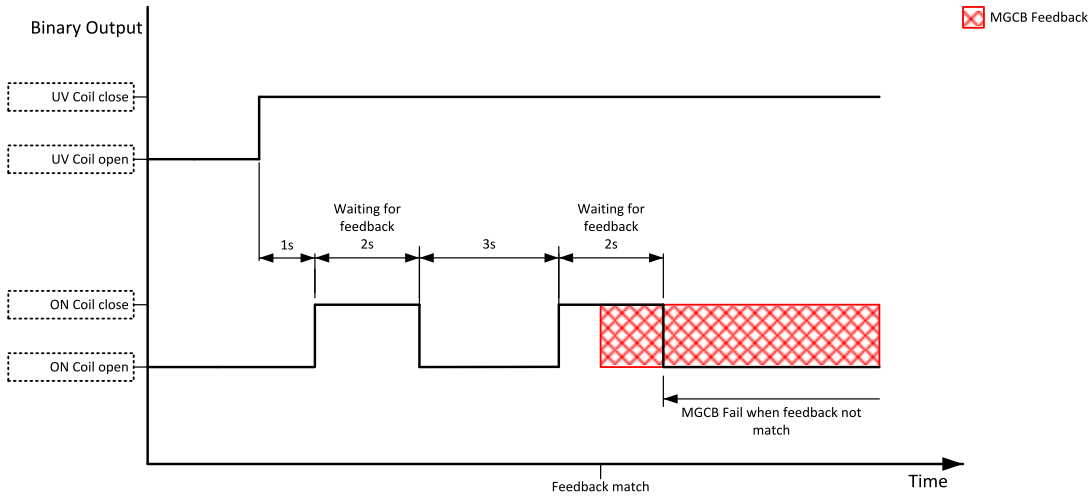


Image 22.42 Repeated PVCB ON coil close command

back to Logical binary outputs alphabetically

PVCB Status

Related FW	2.2.0	**Related applications**	MINT, MPTM
LBO ID	2689		

Description

This output indicates the PVCB position as it is internally considered by the controller.

The position is based on **PVCB FEEDBACK** and **PVCB FEEDBACK NEGATIVE**.

- In case that only**PVCB FEEDBACK** is used, this output mirrors the input.
- In case that both **PVCB FEEDBACK** and **PVCB FEEDBACK NEGATIVE** are used and
  - Feedbacks match - output indicates PVCB position according to feedbacks.
  - Feedbacks do not match - output indicates last position when feedbacks matched.

back to Logical binary outputs alphabetically

PVCB UV Coil

Related FW	2.2.0	Related applications	MINT, MPTM
LBO ID	2688		

Description

The output is intended for control of undervoltage coil of PV circuit breaker. The output is active the whole time when the controller is switched on. The output is deactivated for at least 2 seconds in the moment the breaker has to be switched off.

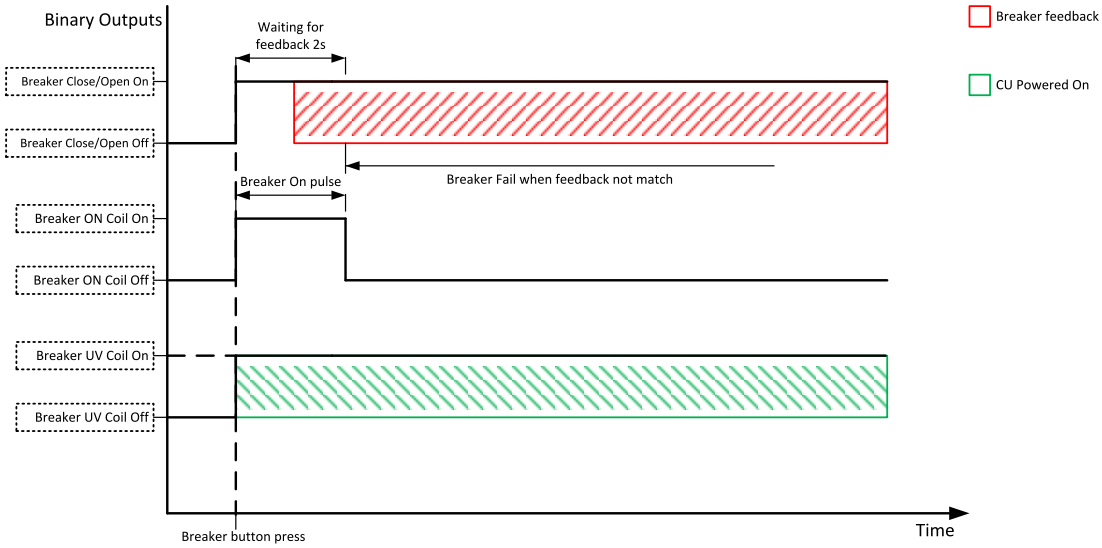


Image 22.43 PVCB UV Coil close command

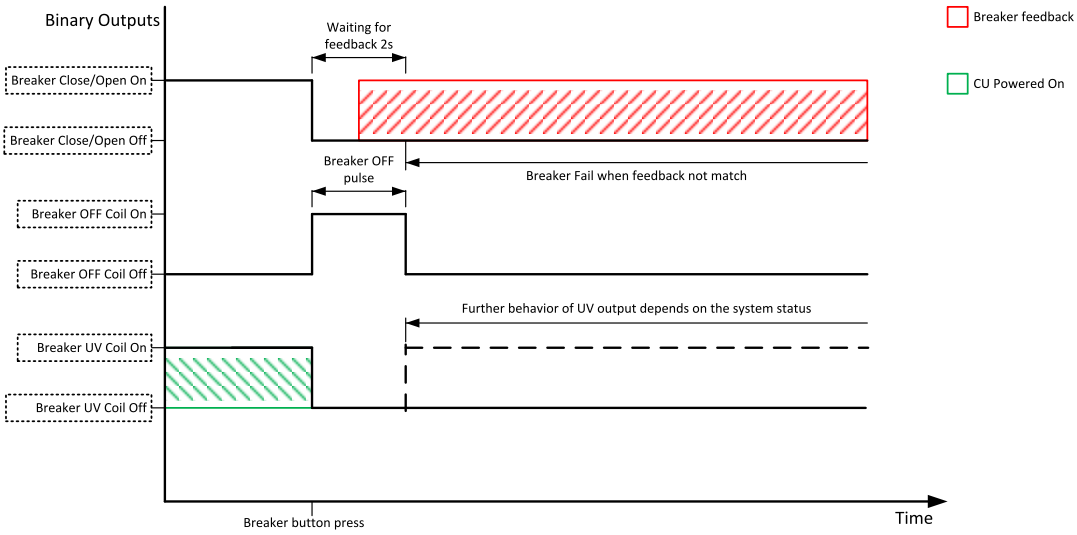


Image 22.44 PVCB UV Coil open command

back to Logical binary outputs alphabetically

LBO: R

Ready

Related FW	2.2.0	Related applications	MINT, MPTM
LBO ID	62		
Description			
This output is closed when the BESS is stopped and it is possible to start it. › No **Alarms level 2** present in the alarmlist › LBI **SD OVERRIDE** is opened			

back to Logical binary outputs alphabetically

Reverse Synchronization

Related FW	2.2.0	Related applications	MPTM
LBO ID	69		
Description			
The output is closed when reverse synchronization is active (synchronization via MCB breaker) and opens when LBO **MCB STATUS** closes.			

back to Logical binary outputs alphabetically

ROCOF 1 Active

Related FW	2.2.0	Related applications	MINT, MPTM
LBO ID	1005		
Description			
This output is closed for 3 seconds when **ROCOF1 Protection** is activated.			

back to Logical binary outputs alphabetically

ROCOF 2 Active

Related FW	2.2.0	Related applications	MINT, MPTM
LBO ID	2724		
Description			
This output is closed for 3 seconds when **ROCOF2 Protection** is activated.			

back to Logical binary outputs alphabetically

ROCOF 3 Active

Related FW	2.2.0	Related applications	MINT, MPTM
LBO ID	2725		
Description			
This output is closed for 3 seconds when**ROCOF1 Protection** is activated.			

back to Logical binary outputs alphabetically

ROCOF 4 Active

Related FW	2.2.0	Related applications	MINT, MPTM
LBO ID	2726		
Description			
This output is closed for 3 seconds when **ROCOF4 Protection** is activated.			

back to Logical binary outputs alphabetically

LBO: S

Sd Override

Related FW	2.2.0	Related applications	MINT, MPTM
LBO ID	962		
Description			
The output is closed if **Sd Override** input is active and opened if **Sd Override** input is inactive. This output is usually used to send information about **Sd Override** input into ECU.			

back to Logical binary outputs alphabetically

SOC Discharge Disabled

Related FW	2.2.0	Related applications	MINT, MPTM
LBO ID	2701		
Description			
This output is active when state of charge of the BESS is too low and BESS cannot be discharged anymore. SOC Discharge Disabled change from 0 to 1: Value **BESS SOC <= SOC Low Target** SOC Discharge Disabled change from 1 to 0: Value **BESS SOC > SOC Low Hysteresis** The activation of this LBO does not occur when the LBI **Ignore Low SOC** is active.			

back to Logical binary outputs alphabetically

SOC Charge Disabled

Related FW	2.2.0	Related applications	MINT, MPTM
LBO ID	2700		
Description			
This output is active when state of charge of the BESS is too high and BESS cannot be charged anymore. ES V Rel Charge Disabled change from 0 to 1: Value **BESS SOC >= SOC High Target** ES V Rel Charge Disabled change from 1 to 0: Value **BESS SOC < SOC Low Hysteresis** The activation of this LBI **[[[Undefined variable co_lbi.lbi1518]]]** is active.			

back to Logical binary outputs alphabetically

Soft Load

Related FW	2.2.0	Related applications	MINT, MPTM
LBO ID	71		
Description			
This output is closed when BCB closes and BESS is being soft loaded via **Soft Load Ramp**. Later change of **BESS P** does not close this output again.			

back to Logical binary outputs alphabetically

Soft Unload

Related FW	2.2.0	Related applications	MINT, MPTM
LBO ID	73		
Description			
This LBO is active while controller perform soft unloading. This output is closed when BCB is requested to be opened and BESS is being soft unloaded via **Soft Unload Ramp**.			

back to Logical binary outputs alphabetically

Start Blocked

Related FW	2.2.0	Related applications	MINT, MPTM
LBO ID	1226		
Description			
This output is closed while start of the BESS is blocked due to at least one of these reasons: › LBI **BESS Start Blocking** is closed › **Application Mode** = MPTM, **Controller Mode** = AUTO, LBO **Mains/Bus HealthyMains Healthy** is opened and LBI **Force Parallel** is closed			

back to Logical binary outputs alphabetically

Start Button Echo

Related FW	2.2.0	Related applications	MINT, MPTM
LBO ID	33		
Description			
This output is closed for 1 s every time Start Button is pressed.			

back to Logical binary outputs alphabetically

Starting

Related FW	2.2.0	Related applications	MINT, MPTM
LBO ID	65		
Description			
This output is closed at the beginning of the **Precharge TO** period and opens after starting phase is finished or when **BESS Start Fail** alarm is activated.			

back to Logical binary outputs alphabetically

Stop Button Echo

Related FW	2.2.0	**Related applications**	MINT, MPTM
LBO ID	32		
Description			
This output is closed for 1 s every time Stop Button is pressed.			

back to Logical binary outputs alphabetically

Stop Bus Energize

Related FW	2.2.0	**Related applications**	MINT, MPTM
LBO ID	7366		
Description			
The LBO Stop Bus Energize is active when any controller in the comap system is about to close the CB to the dead bus or any battery source is going to start and generate voltage to already a closed breaker. For setpoint **Starting Sequence BCB Control** = Starting with BCB Opened the lbo activates once the system is running and a command to close the BCB breaker occurs. With **Starting Sequence BCB Control** =Starting with BCB Closed the LBO activates after start command.			

back to Logical binary outputs alphabetically

Stopping

Related FW	2.2.0	**Related applications**	MINT, MPTM
LBO ID	75		
Description			
This output i closed during stopping sequence after stop command is received and opens after the BESS is considered to be stopped.			

back to Logical binary outputs alphabetically

Sync To Mains Allowed

Related FW	2.2.0	**Related applications**	MPTM
LBO ID	1057		
Description			
This output is closed when synchronization to the mains is allowed or **Breaker state** = ParalOper. See **Synchronization & Connection Conditions** for more information.			

back to Logical binary outputs alphabetically

System Ready

Related FW	2.2.0	Related applications	MINT, MPTM
LBO ID	86		
Description			
This output is closed if the controller group has enough capacity to fulfill the requested power reserve. If the output is opened, then the group has not enough capacity to fulfill the reserve even if all the units will run. ***Note:*** *Fulfilled reserve means that* ***Available Nominal Power*** *is above the* ***Minimal Running Nominal Power***			

back to Logical binary outputs alphabetically

System Reserve OK

Related FW	2.2.0	Related applications	MINT, MPTM
LBO ID	87		
Description			
This output is closed when **Actual Reserve** is higher than the **Start Reserve**.			

back to Logical binary outputs alphabetically

Synchronizing

Related FW	2.2.0	Related applications	MINT, MPTM
LBO ID	325		
Description			
The output is active during synchronization when controller is in the Synchro or RevSync state.			

back to Logical binary outputs alphabetically

LBO: U

UQ-C Area Limit

Related FW	2.2.0	Related applications	MPTM
LBO ID	2246		
Description			
This output is closed when the **BESS Required Q** is outside the **P For Q UQ C**. See **P For Q** for more information.			

back to Logical binary outputs alphabetically

UQ-L Area Limit

Related FW	2.2.0	**Related applications**	MPTM
LBO ID	2245		
Description			
This output is closed when the **BESS Required Q** is outside the **P For Q UQ L**. See **P For Q** for more information.			

back to Logical binary outputs alphabetically

LBO: V

Vector Shift Active

Related FW	2.2.0	**Related applications**	MINT, MPTM
LBO ID	93		
Description			
This output is closed for 3 seconds when **Vector Shift Protection** is activated.			

back to Logical binary outputs alphabetically

Voltage Down

Related FW	2.2.0	**Related applications**	MINT, MPTM
LBO ID	55		
Description			
This output together with the complementary output **Voltage Up** are designed for voltage and power factor control of the BESS, where the BESS inverter regulator does not support analogue control.			

back to Logical binary outputs alphabetically

Voltage Up

Related FW	2.2.0	**Related applications**	MINT, MPTM
LBO ID	54		
Description			
This output together with the complementary output **Voltage Down** are designed for voltage and power factor control of the BESS, where the BESS inverter regulator does not support analogue control.			

back to Logical binary outputs alphabetically

LBO: W

WT Operable

Related FW	2.2.0	**Related applications**	MINT, MPTM
LBO ID	2754		
Description			
This LBO is active if at least one of **WT 01 Operable** is operable			

back to Logical binary outputs alphabetically

11.1.8 Logical analog inputs

What Logical analog inputs are:

Internal functions of the controller may require some input values to be associated (configured). The analog values enter the controller via Logical Analog Inputs - LAIs..

Hint: To correctly integrate LAI within the configuration, it is essential to understand the expected format of the LAI input variable. There are several different approaches, with the unit and the number of decimal places playing a key role.

From the perspective of the input variable's unit, LAI can be divided into two groups:

- The unit is always fixed.
- The unit changes depending on the configured power format (typically units such as [kW], [MW], [V], and [kV]).

From the perspective of the number of decimal places, the following approaches exist:

- The LAI includes the attribute "**Effective resolution**" – this indicates the number of decimal places used when processing the variable. The input value may contain more or fewer decimal places, but only the specified number is effectively used. The effective number of decimal places may also be influenced by the configured power format.
- The variable must contain exactly the specified number of decimal places. In this case, the LAI description uses the term "**Required resolution**".

Alphabetical groups of Logical analog inputs

LAI: A 1346
LAI: B 1349
LAI: C 1357
LAI: D 1360
LAI: G 1361
LAI: I 1361
LAI: L 1362
LAI: M 1364
LAI: P 1365
LAI: Q 1399
LAI: T 1404
LAI: U 1405
LAI: W 1425

For full list of Logical analog inputs go to the chapter **Logical analog inputs alphabetically**.

Logical analog inputs alphabetically

LAI: A 1346
AC BESS Current L1 1346
AC BESS Current L2 1346
AC BESS Current L3 1346
AC BESS Frequency 1346
AC BESS P 1347
AC BESS Q 1347
AC BESS Voltage L1 1347
AC BESS Voltage L2 1348
AC BESS Voltage L3 1348
LAI: B 1349
BESS 01 Discharge kWh 1349
BESS XY Discharge kWh 1349
BESS 01 Charge kWh ... 1350
BESS XY Charge kWh .. 1350
Battery Charging Cycles 1350
BESS Capacity 1351
BESS 01 Max Discharging P 1351
BESS XY Max Discharging P 1351
BESS 01 Max Charging P 1352
BESS XY Max Charging P 1352
BESS P Request 1352
BESS Q Request 1353
BESS 01 SOC 1353
BESS XY SOC 1353
BESS XY Nominal P 1354
BESS XY Actual P 1355
BESS XY Actual Q 1356
BESS Temperature 1356
LAI: C 1357
Cold Temp 1 1357
Cold Temp 2 1357
Cold Temp 3 1357
Cold Temp 4 1358
Cold Temp 5 1358
Cold Temp 6 1358
Cold Temp 7 1359
Cold Temp 8 1359
Cold Temp 9 1359
Cold Temp 10 1360
LAI: D 1360
Dynamic Spinning Reserve 1360
Dynamic Spinning Reserve Offset 1360
LAI: G 1361
Gen P Min 1361
LAI: I 1361
Irradiation of PV Array 1 . 1361
Irradiation of PV Array 2 . 1361
Irradiation of PV Array 3 . 1362
Irradiation of PV Array 4 . 1362
LAI: L 1362
Load Control: ANEXT Baseload 1362
Load Control ANEXT: Local Baseload 1363
Load Control: ANEXT Imp/Exp Load 1363
Load Reduction 1363
LAI: M 1364
Mains Measurement P .. 1364
Mains Measurement Q .. 1364
LAI: P 1365
PF Control: ANEXT Base PF 1365
PF Control: ANEXT Imp/Exp PF 1366
Pmom 1366
PV 01 Actual P 1366
PV 01 Actual Q 1367
PV 01 kWh 1367
PV 01 Nominal P 1367
PV 02 Actual P 1367
PV 02 Actual Q 1368
PV 02 kWh 1368
PV 02 Nominal P 1368
PV 03 Actual P 1368
PV 03 Actual Q 1369
PV 03 kWh 1369
PV 03 Nominal P 1369
PV 04 Actual P 1369
PV 04 Actual Q 1370
PV 04 kWh 1370
PV 04 Nominal P 1370
PV 05 Actual P 1370
PV 05 Actual Q 1371
PV 05 kWh 1371
PV 05 Nominal P 1371
PV 06 Actual P 1371
PV 06 Actual Q 1372
PV 06 kWh 1372
PV 06 Nominal P 1372
PV 07 Actual P 1372
PV 07 Actual Q 1373
PV 07 kWh 1373
PV 07 Nominal P 1373
PV 08 Actual P 1373
PV 08 Actual Q 1374
PV 08 kWh 1374
PV 08 Nominal P 1374
PV 09 Actual P 1374
PV 09 Actual Q 1375
PV 09 kWh 1375
PV 09 Nominal P 1375
PV 10 Actual P 1375
PV 10 Actual Q 1376
PV 10 kWh 1376
PV 10 Nominal P 1376
PV 11 Actual P 1376

PV 11 Actual Q 1377
PV 11 kWh 1377
PV 11 Nominal P 1377
PV 12 Actual P 1377
PV 12 Actual Q 1378
PV 12 kWh 1378
PV 12 Nominal P 1378
PV 13 Actual P 1378
PV 13 Actual Q 1379
PV 13 kWh 1379
PV 13 Nominal P 1379
PV 14 Actual P 1379
PV 14 Actual Q 1380
PV 14 kWh 1380
PV 14 Nominal P 1380
PV 15 Actual P 1380
PV 15 Actual Q 1381
PV 15 kWh 1381
PV 15 Nominal P 1381
PV 16 Actual P 1381
PV 16 Actual Q 1382
PV 16 kWh 1382
PV 16 Nominal P 1382
PV 17 Actual P 1382
PV 17 Actual Q 1383
PV 17 kWh 1383
PV 17 Nominal P 1383
PV 18 Actual P 1383
PV 18 Actual Q 1384
PV 18 kWh 1384
PV 18 Nominal P 1384
PV 19 Actual P 1384
PV 19 Actual Q 1385
PV 19 kWh 1385
PV 19 Nominal P 1385
PV 20 Actual P 1385
PV 20 Actual Q 1386
PV 20 kWh 1386
PV 20 Nominal P 1386
PV 21 Actual P 1386
PV 21 Actual Q 1387
PV 21 kWh 1387
PV 21 Nominal P 1387
PV 22 Actual P 1387
PV 22 Actual Q 1388
PV 22 kWh 1388
PV 22 Nominal P 1388
PV 23 Actual P 1388
PV 23 Actual Q 1389
PV 23 kWh 1389
PV 23 Nominal P 1389
PV 24 Actual P 1389
PV 24 Actual Q 1390
PV 24 kWh 1390
PV 24 Nominal P 1390
PV 25 Actual P 1390
PV 25 Actual Q 1391
PV 25 kWh 1391
PV 25 Nominal P 1391
PV 26 Actual P 1391
PV 26 Actual Q 1392
PV 26 kWh 1392
PV 26 Nominal P 1392
PV 17 Actual P 1392
PV 27 Actual Q 1393
PV 27 kWh 1393
PV 27 Nominal P 1393
PV 28 Actual P 1393
PV 28 Actual Q 1394
PV 28 kWh 1394
PV 28 Nominal P 1394
PV 29 Actual P 1394
PV 29 Actual Q 1395
PV 29 kWh 1395
PV 29 Nominal P 1395
PV 30 Actual P 1395
PV 30 Actual Q 1396
PV 30 kWh 1396
PV 30 Nominal P 1396
PV 31 Actual P 1396
PV 31 Actual Q 1397
PV 31 kWh 1397
PV 31 Nominal P 1397
PV 32 Actual P 1397
PV 32 Actual Q 1398
PV 32 kWh 1398
PV 32 Nominal P 1398
LAI: Q 1399
Q Control: ANEXT Base Q 1399
Q Control: ANEXT Imp/Exp Q 1399
Q(Um): 0 Ref ANEXT Base Q 1400
Q(Um): 0 Ref ANEXT Imp/Exp Q 1401
Qref/Ulim: ANEXT Qref/Pnom B Q 1402
Qref/Ulim: ANEXT Qref/Pnom I/E Q 1403
LAI: T 1404
TestF 1404
TestP 1404
TestQ 1404
TestU 1405
LAI: U 1405
Uni Gen 01 Actual P 1405
Uni Gen 01 Actual Q 1405
Uni Gen 01 Fuel 1406
Uni Gen 01 kWh 1406
Uni Gen 01 Nominal P 1406
Uni Gen 02 Actual P 1406
Uni Gen 02 Actual Q 1407
Uni Gen 02 Fuel 1407
Uni Gen 02 kWh 1407
Uni Gen 02 Nom P 1407
Uni Gen 03 Actual P 1408
Uni Gen 03 Actual Q 1408
Uni Gen 03 Fuel 1408

Uni Gen 03 kWh 1408
Uni Gen 03 Nom P 1409
Uni Gen 04 Actual P 1409
Uni Gen 04 Actual Q 1409
Uni Gen 04 Fuel 1409
Uni Gen 04 kWh 1410
Uni Gen 04 Nom P 1410
Uni Gen 05 Actual P 1410
Uni Gen 05 Actual Q 1410
Uni Gen 05 Fuel 1411
Uni Gen 05 kWh 1411
Uni Gen 05 Nom P 1411
Uni Gen 06 Actual P 1411
Uni Gen 06 Actual Q 1412
Uni Gen 06 Fuel 1412
Uni Gen 06 kWh 1412
Uni Gen 06 Nom P 1412
Uni Gen 07 Actual P 1413
Uni Gen 07 Actual Q 1413
Uni Gen 07 Fuel 1413
Uni Gen 07 kWh 1413
Uni Gen 07 Nom P 1414
Uni Gen 08 Actual P 1414
Uni Gen 08 Actual Q 1414
Uni Gen 08 Fuel 1414
Uni Gen 08 kWh 1415
Uni Gen 08 Nom P 1415
Uni Gen 09 Actual P 1415
Uni Gen 09 Actual Q 1415
Uni Gen 09 Fuel 1416
Uni Gen 09 kWh 1416
Uni Gen 09 Nom P 1416
Uni Gen 10 Actual P 1416
Uni Gen 10 Actual Q 1417
Uni Gen 10 Fuel 1417
Uni Gen 10 kWh 1417
Uni Gen 10 Nom P 1417
Uni Gen 11 Actual P 1418
Uni Gen 11 Actual Q 1418
Uni Gen 11 Fuel 1418
Uni Gen 11 kWh 1418
Uni Gen 11 Nom P 1419
Uni Gen 12 Actual P 1419
Uni Gen 12 Actual Q 1419
Uni Gen 12 Fuel 1419
Uni Gen 12 kWh 1420
Uni Gen 12 Nom P 1420
Uni Gen 13 Actual P 1420
Uni Gen 13 Actual Q 1420
Uni Gen 13 Fuel 1421
Uni Gen 13 kWh 1421
Uni Gen 13 Nom P 1421
Uni Gen 14 Actual P 1421
Uni Gen 14 Actual Q 1422
Uni Gen 14 Fuel 1422
Uni Gen 14 kWh 1422
Uni Gen 14 Nom P 1422
Uni Gen 15 Actual P 1423
Uni Gen 15 Actual Q 1423
Uni Gen 15 Fuel 1423
Uni Gen 15 kWh 1423
Uni Gen 15 Nom P 1424
Uni Gen 16 Actual P 1424
Uni Gen 16 Actual Q 1424
Uni Gen 16 Fuel 1424
Uni Gen 16 kWh 1425
Uni Gen 16 Nom P 1425
LAI: W 1425
WT 01 Actual P 1425
WT 01 Actual Q 1425
WT 01 kWh 1425
WT 01 Nominal P 1426
WT 02 Actual P 1426
WT 02 Actual Q 1426
WT 02 kWh 1426
WT 02 Nominal P 1426
WT 03 Actual P 1426
WT 03 Actual Q 1427
WT 03 kWh 1427
WT 03 Nominal P 1427
WT 04 Actual P 1427
WT 04 Actual Q 1427
WT 04 kWh 1427
WT 04 Nominal P 1428
WT 05 Nominal P 1428
WT 05 Actual Q 1428
WT 05 Actual P 1428
WT 05 kWh 1428
WT 06 Actual P 1428
WT 06 Actual Q 1429
WT 06 kWh 1429
WT 06 Nominal P 1429
WT 07 Actual P 1429
WT 07 Actual Q 1429
WT 07 kWh 1429
WT 07 Nominal P 1430
WT 08 Actual P 1430
WT 08 Actual Q 1430
WT 08 kWh 1430
WT 08 Nominal P 1430

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LAI: A

AC BESS Current L1

Related FW	2.2.0	**Related applications**	MINT, MPTM
LAI ID	563		
Expected format of source value	Units: [A] Effective resolution: 1		
Description			
This LAI is used as input for **BESS Current L1** Measurement in function **BESS AC values measured over LAIs**.			

back to Logical analog inputs alphabetically

AC BESS Current L2

Related FW	2.2.0	**Related applications**	MINT, MPTM
LAI ID	564		
Expected format of source value	Units: [A] Effective resolution: 1		
Description			
This LAI is used as input for **BESS Current L2** Measurement in function **BESS AC values measured over LAIs**.			

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AC BESS Current L3

Related FW	2.2.0	**Related applications**	MINT, MPTM
LAI ID	565		
Expected format of source value	Units: [A] Effective resolution: 1		
Description			
This LAI is used as input for **BESS Current L3** Measurement in function **BESS AC values measured over LAIs**.			

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AC BESS Frequency

Related FW	2.2.0	**Related applications**	MINT, MPTM
LAI ID	566		
Expected format of source value	Units: [Hz] Effective resolution: 0,001		
Description			
This LAI is used as input for **BESS Frequency** Measurement in function **BESS AC values measured over LAIs**. This input is mandatory if setpoint **BESS AC Measurement** = Current & Voltage Analog Input.			

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AC BESS P

Related FW	2.2.0	**Related applications**	MINT, MPTM
LAI ID	558		
Expected format of source value	Units: [kW / MW] - according to the selected power format Effective resolution: 0,1 kW / 1 kW / 0,01 MW - according to the selected power format		
Description			
This LAI is used as input for **BESS P** Measurement in function **BESS AC values measured over LAIs**. This input is mandatory if setpoint **BESS AC Measurement** = Current Analog Input OR Current & Voltage Analog Input.			

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AC BESS Q

Related FW	2.2.0	**Related applications**	MINT, MPTM
LAI ID	559		
Expected format of source value	Units: [kVAr / MVAr] - according to the selected power format Effective resolution: 0,1 kVAr / 1 kVAr / 0,01 MVAr - according to the selected power format		
Description			
This LAI is used as input for **BESS Q** Measurement in function **BESS AC values measured over LAIs**. This input is mandatory if setpoint **BESS AC Measurement** = Current Analog Input OR Current & Voltage Analog Input			

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AC BESS Voltage L1

Related FW	2.2.0	**Related applications**	MINT, MPTM
LAI ID	560		
Expected format of source value	Units: [V /kV] - according to the selected power format Effective resolution: 1 V / 0,01 kV - according to the selected power format		
Description			
This LAI is used as input for **BESS Voltage L1**(Ph-N) Measurement in function **BESS AC values measured over LAIs**. This input is mandatory if setpoint **BESS AC Measurement** = Current & Voltage Analog Input.			

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AC BESS Voltage L2

Related FW	2.2.0	**Related applications**	MINT, MPTM
LAI ID	561		
Expected format of source value	Units: [V /kV] - according to the selected power format Effective resolution: 1 V / 0,01 kV - according to the selected power format		
Description			
This LAI is used as input for **BESS Voltage L2**(Ph-N) Measurement in function **BESS AC values measured over LAIs**. This input is mandatory if setpoint **BESS AC Measurement** = Current & Voltage Analog Input.			

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AC BESS Voltage L3

Related FW	2.2.0	**Related applications**	MINT, MPTM
LAI ID	562		
Expected format of source value	Units: [V /kV] - according to the selected power format Effective resolution: 1 V / 0,01 kV - according to the selected power format		
Description			
This LAI is used as input for **BESS Voltage L3**(Ph-N) Measurement in function **BESS AC values measured over LAIs**. This input is mandatory if setpoint **BESS AC Measurement** = Current & Voltage Analog Input.			

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LAI: B

BESS 01 Discharge kWh

Related FW	2.2.0	**Related applications**	MINT, MPTM
LAI ID	427		
Expected format of source value	Units: [kWh] Effective resolution: 1		
Description			
This LAI defines the amount of discharged energy from the BESS and it is used as source for statistic values.			

BESS XY Discharge kWh

Related FW	2.2.0	**Related applications**	MINT, MPTM
Description			

This signal represents the total energy charged into the first subordinate BESS unit (BESS 01) in the MultiBESS system. It reflects the cumulative amount of energy (in kilowatt-hours) that has been produced by the BESS over time.

Source:

- Originates from the **BESS Discharge kWh** value configured in the InteliNeo 530 BESS unit.

Aggregation of Total MultiBESS Charge Energy:

- The InteliNeo 6000 aggregates this value using a sum function across all active BESS units.
- The result automatically replace the value which normally input the controller via LAI **BESS 01 DISCHARGE KWH**.

Note: *The description is the same for each "BESS XY Discharge kWh" LAI, where XY stands for numbers 02 (LAI ID = 946) to 31 (LAI ID = 975) and 32 (LAI ID = 1007).*

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BESS 01 Charge kWh

Related FW	2.2.0	**Related applications**	MINT, MPTM
LAI ID	426		
Expected format of source value	Units: [kWh] Effective resolution: 1		
Description			
This LAI defines the amount of charged energy to the BESS and is used as a source for statistic values.			

BESS XY Charge kWh

Related FW	2.2.0	**Related applications**	MINT, MPTM
Description			

This signal represents the total energy charged into the first subordinate BESS unit (BESS 01) in the MultiBESS system. It reflects the cumulative amount of energy (in kilowatt-hours) that has been stored in the battery over time.

Source:

- Originates from the **BESS Charge kWh** value configured in the InteliNeo 530 BESS unit.

Aggregation of Total MultiBESS Charge Energy:

- The InteliNeo 6000 aggregates this value using a sum function across all active BESS units.
- The result automatically replace the value which normally input the controller via LAI **BESS 01 CHARGE KWH**.

Note: *The description is the same for each "BESS XY Charge kWh" LAI, where XY stands for numbers 02 (LAI ID = 976) to 32 (LAI ID = 1006).*

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Battery Charging Cycles

Related FW	2.2.0	**Related applications**	MINT, MPTM
LAI ID	428		
Expected format of source value	Units: [ ] Effective resolution: 1		
Description			
This analog input is used as source for the statistic value **Batt. Charging Cycles** and for the function Daily Battery Cycles Control.			

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BESS Capacity

Related FW	2.2.0	**Related applications**	MINT, MPTM
LAI ID	370		
Expected format of source value	Units: [kWh] Effective resolution: 1		
Description			
Capacity of the BESS.			

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BESS 01 Max Discharging P

Related FW	2.2.0	**Related applications**	MINT, MPTM
LAI ID	425		
Expected format of source value	Units: [kW] Effective resolution: 0,1		
Description			
This LAI defines maximal allowed discharge power of the BESS. See the chapter **Max. charging/discharging power of the BESS**.			

BESS XY Max Discharging P

Related FW	2.2.0	**Related applications**	MINT, MPTM
Description			

This signal represents the maximum discharging power of the first subordinate BESS unit (BESS 01) in the MultiBESS system. It defines the upper limit of power that the unit can deliver to the grid during discharging operations.

Source:

- Originates from the **ES Max Discharging Power** value configured in the InteliNeo 530 BESS unit.

Aggregation of Total MultiBESS Max Discharging Power:

- The InteliNeo 6000 aggregates this value using a sum function across all active BESS units.
- The result is used as "**BESS Max Discharging P**", which reflects the total discharging capability of the system and replace the information which normally comes via LAI **BESS 01 Max Discharging P**.
- Aggregation is conditioned by the LBI **BESS 01 Ready To Load**. This ensures that only BESS units which are currently online and in a ready state are included in the total max dischargin power calculation.

Note: *The description is the same for each "BESS XY Max Discharging P" LAI, where XY stands for numbers 02 (LAI ID = 817) to 32 (LAI ID = 847).*

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BESS 01 Max Charging P

Related FW	2.2.0	**Related applications**	MINT, MPTM
LAI ID	424		
Expected format of source value	Units: [kW] Effective resolution: 0,1		
Description			
Maximal allowed charging power of the BESS. See the chapter **Max. charging/discharging power of the BESS**.			

BESS XY Max Charging P

Related FW	2.2.0	**Related applications**	MINT, MPTM
Description			

This signal represents the maximum charging power of the first subordinate BESS unit (BESS 01) in the MultiBESS system. It defines the upper limit of power that the unit can absorb from the grid or generator during charging operations.

Source:

- Originates from the **ES Max Charging Power** value configured in the InteliNeo 530 BESS unit.

Aggregation of Total MultiBESS Max Charging Power:

- The InteliNeo 6000 aggregates this value using a sum function across all active BESS units.
- The result is used as **BESS Max Charging P**, which reflects the total charging capability of the system and replace the information which normally comes via LAI **BESS 01 Max Charging P**.
- Aggregation is conditioned by the LBI **BESS 01 Ready To Load**. This ensures that only BESS units which are currently online and in a ready state are included in the total max charging power calculation.

Note: *The description is the same for each "BESS XY Max Charging P" LAI, where XY stands for numbers 02 (LAI ID = 785) to 32 (LAI ID = 815).*

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BESS P Request

Related FW	2.2.0	**Related applications**	MINT, MPTM
LAI ID	420		
Expected format of source value	Units: [kW / MW] - according to the selected power format Effective resolution: 0,1 kW / 1 kW / 0,01 MW - according to the selected power format		
Description			
LAI is used for adjusting BESS Power Request while Charging / Discarding process.			

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BESS Q Request

Related FW	2.2.0	Related applications	MINT, MPTM
LAI ID	429		
Expected format of source value	Units: [kVAr / MVAr] - according to the selected power format Effective resolution: 0,1 kVAr / 1 kVAr / 0,01 MVAr - according to the selected power format		
Description			
LAI is used for adjusting BESS Reactive Power Request while Charging / Discarding process.			

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BESS 01 SOC

Related FW	2.2.0	Related applications	MINT, MPTM
LAI ID	368		
Expected format of source value	Units: [%] Effective resolution: 1		
Description			
This LAI is used to monitor actual state of charge of the BESS. The LAI has to be used in configuration and has to provide the valid value in expected format. Else the Alarm **Sd BESS SOC Not Configured** is issued.			

BESS XY SOC

Related FW	2.2.0	Related applications	MINT, MPTM
Description			
This signal represents the State of Charge (SOC) of the first subordinate BESS unit (BESS 01) in the MultiBESS system. It indicates the current energy level of the battery as a percentage of its total capacity, which is essential for energy management and operational decisions. Source: › Originates from the **ES SOC** value configured in the InteliNeo 530 BESS unit. Aggregation of Total MultiBESS SOC: › The InteliNeo 6000 aggregates this value using an average function across all active BESS units. › The result automatically replace the value which normally input the controller via LAI **BESS 01 SOC** , which reflects the average state of charge of the entire BESS group. › Aggregation is conditioned by the LBI **BESS 01 Ready To Load**. This ensures that only BESS units which are currently online and in a ready state are included in the total SOC calculation. ***Note:*** *The description is the same for each "BESS XY SOC" LAI, where XY stands for numbers 02 (LAI ID = 913) to 32 (LAI ID = 943).*			

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BESS XY Nominal P

Related FW	2.2.0	**Related applications**	MINT, MPTM
LBI ID	752		
Expected format of source value	Units: [kW] Effective resolution: 0,1		
Description			

This signal represents the nominal power of the first subordinate BESS unit (BESS 01) in the MultiBESS system. It is a key parameter used by the master controller (InteliNeo 6000) to determine the total available power capacity of the entire BESS group.

Source:

- Originates from the **BESS Nominal P** value configured in the InteliNeo 530 BESS unit.

Aggregation of Total MultiBESS P Nominal value:

- The InteliNeo 6000 aggregates this value using a sum function across all active BESS units.
- The result is used to compute the **MultiBESS P Nominal** value, which reflects the total nominal power of the system.
- Aggregation is conditioned by the LBI **BESS 01 Ready To Load**. This ensures that only BESS units which are currently online and in a ready state are included in the total nominal power calculation.

Note: *The description is the same for each "BESS XY Nominal P" LAI, where XY stands for numbers 01 (LAI ID = 752) to 32 (LAI ID = 783).*

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BESS XY Actual P

Related FW	2.2.0	**Related applications**	MINT, MPTM
LAI ID	848		
Expected format of source value	Units: [kW] Effective resolution: 0,1		
Description			

This signal represents the actual active power output of the first subordinate BESS unit (BESS 01) in the MultiBESS system. It reflects the real-time power being delivered by the unit to the grid or load.

Source:

- Originates from the BESS P value configured in the InteliNeo 530 BESS unit.

Aggregation of Total MultiBESS Actual P:

- The InteliNeo 6000 aggregates this value using a **sum** function across all active BESS units.
- The result is represented by value **MultiBESS P**, which reflects the total real-time active power output of the system. The value must be linked to the LAI **AC BESS P** manually.
- Aggregation is conditioned by the LBI **BESS 01 Ready To Load**. This ensures that only BESS units which are currently online and in a ready state are included in the total actual power calculation.

Note: *The description is the same for each "BESS XY Actual P" LAI, where XY stands for numbers 01 (LAI ID = 848) to 32 (LAI ID = 879).*

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BESS XY Actual Q

Related FW	2.2.0	**Related applications**	MINT, MPTM
LAI ID	880		
Expected format of source value	Units: [kVAr] Effective resolution: 0,1		
Description			

This signal represents the actual reactive power output of the first subordinate BESS unit (BESS 01) in the MultiBESS system. It reflects the real-time reactive power being either supplied to or absorbed from the grid by the unit, which is essential for voltage regulation and power factor correction.

Source:

- Originates from the **BESS Q** value configured in the InteliNeo 530 BESS unit.

Aggregation of Total MultiBESS Actual Q:

- The InteliNeo 6000 aggregates this value using a sum function across all active BESS units.
- The result is represented by value **MultiBESS Q**, which reflects the total real-time reactive power output of the system. The value must be linked to the LAI **AC BESS Q** manually.
- Aggregation is conditioned by the LBI **BESS 01 Ready To Load**. This ensures that only BESS units which are currently online and in a ready state are included in the total reactive power calculation.

Note: *The description is the same for each "BESS XY Actual Q" LAI, where XY stands for numbers 01 (LAI ID = 880) to 32 (LAI ID = 911).*

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BESS Temperature

Related FW	2.2.0	**Related applications**	MINT, MPTM
LAI ID	371		
Expected format of source value	Units: [°C / °F] - according to the selected units format Effective resolution: 0,1		
Description			

This LAI is used as input for temperature of the BESS.

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LAI: C

Cold Temp 1

Related FW	2.2.0	**Related applications**	MINT, MPTM
LAI ID	56		
Expected format of source value	Units: [°C / °F] - according to the selected units format Effective resolution: 0,1		
Description			
This LAI is used for compensation of thermocouple temperature measurement. It is used when there is a significant temperature difference between on-board terminal and a module terminal (such as Inteli AIN8TC). This input compensate the CAN module configured with address (index) 1. ***Note:*** *The compensation is only for thermocouples without internal compensation "Thermo (nc) …" (not cold junction compensation).*			

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Cold Temp 2

Related FW	2.2.0	**Related applications**	MINT, MPTM
LAI ID	57		
Expected format of source value	Units: [°C / °F] - according to the selected units format Effective resolution: 0,1		
Description			
This LAI is used for compensation of thermocouple temperature measurement. It is used when there is a significant temperature difference between on-board terminal and a module terminal (such as Inteli AIN8TC). This input compensate the CAN module configured with address (index) 2. ***Note:*** *The compensation is only for thermocouples without internal compensation "Thermo (nc) …" (not cold junction compensation).*			

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Cold Temp 3

Related FW	2.2.0	**Related applications**	MINT, MPTM
LAI ID	58		
Expected format of source value	Units: [°C / °F] - according to the selected units format Effective resolution: 0,1		
Description			
This LAI is used for compensation of thermocouple temperature measurement. It is used when there is a significant temperature difference between on-board terminal and a module terminal (such as Inteli AIN8TC). This input compensate the CAN module configured with address (index) 3. ***Note:*** *The compensation is only for thermocouples without internal compensation "Thermo (nc) …" (not cold junction compensation).*			

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Cold Temp 4

Related FW	2.2.0	**Related applications**	MINT, MPTM
LAI ID	59		
Expected format of source value	Units: [°C / °F] - according to the selected units format Effective resolution: 0,1		
Description			
This LAI is used for compensation of thermocouple temperature measurement. It is used when there is a significant temperature difference between on-board terminal and a module terminal (such as Inteli AIN8TC). This input compensate the CAN module configured with address (index) 4. ***Note:*** *The compensation is only for thermocouples without internal compensation "Thermo (nc) …" (not cold junction compensation).*			

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Cold Temp 5

Related FW	2.2.0	**Related applications**	MINT, MPTM
LAI ID	341		
Expected format of source value	Units: [°C / °F] - according to the selected units format Effective resolution: 0,1		
Description			
This LAI is used for compensation of thermocouple temperature measurement. It is used when there is a significant temperature difference between on-board terminal and a module terminal (such as Inteli AIN8TC). This input compensate the CAN module configured with address (index) 5. ***Note:*** *The compensation is only for thermocouples without internal compensation "Thermo (nc) …" (not cold junction compensation).*			

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Cold Temp 6

Related FW	2.2.0	**Related applications**	MINT, MPTM
LAI ID	342		
Expected format of source value	Units: [°C / °F] - according to the selected units format Effective resolution: 0,1		
Description			
This LAI is used for compensation of thermocouple temperature measurement. It is used when there is a significant temperature difference between on-board terminal and a module terminal (such as Inteli AIN8TC). This input compensate the CAN module configured with address (index) 6. ***Note:*** *The compensation is only for thermocouples without internal compensation "Thermo (nc) …" (not cold junction compensation).*			

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Cold Temp 7

Related FW	2.2.0	**Related applications**	MINT, MPTM
LAI ID	343		
Expected format of source value	Units: [°C / °F] - according to the selected units format Effective resolution: 0,1		
Description			
This LAI is used for compensation of thermocouple temperature measurement. It is used when there is a significant temperature difference between on-board terminal and a module terminal (such as Inteli AIN8TC). This input compensate the CAN module configured with address (index) 7. ***Note:*** *The compensation is only for thermocouples without internal compensation "Thermo (nc) …" (not cold junction compensation).*			

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Cold Temp 8

Related FW	2.2.0	**Related applications**	MINT, MPTM
LAI ID	344		
Expected format of source value	Units: [°C / °F] - according to the selected units format Effective resolution: 0,1		
Description			
This LAI is used for compensation of thermocouple temperature measurement. It is used when there is a significant temperature difference between on-board terminal and a module terminal (such as Inteli AIN8TC). This input compensate the CAN module configured with address (index) 8. ***Note:*** *The compensation is only for thermocouples without internal compensation "Thermo (nc) …" (not cold junction compensation).*			

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Cold Temp 9

Related FW	2.2.0	**Related applications**	MINT, MPTM
LAI ID	418		
Expected format of source value	Units: [°C / °F] - according to the selected units format Effective resolution: 0,1		
Description			
This LAI is used for compensation of thermocouple temperature measurement. It is used when there is a significant temperature difference between on-board terminal and a module terminal (such as Inteli AIN8TC). This input compensate the CAN module configured with address (index) 9. ***Note:*** *The compensation is only for thermocouples without internal compensation "Thermo (nc) …" (not cold junction compensation).*			

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Cold Temp 10

Related FW	2.2.0	**Related applications**	MINT, MPTM
LAI ID	419		
Expected format of source value	Units: [°C / °F] - according to the selected units format Effective resolution: 0,1		
Description			
This LAI is used for compensation of thermocouple temperature measurement. It is used when there is a significant temperature difference between on-board terminal and a module terminal (such as Inteli AIN8TC). This input compensate the CAN module configured with address (index) 10. ***Note:*** *The compensation is only for thermocouples without internal compensation "Thermo (nc) …" (not cold junction compensation).*			

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LAI: D

Dynamic Spinning Reserve

Related FW	2.2.0	**Related applications**	MINT
LAI ID	192		
Expected format of source value	Units: [kW / MW] - according to the selected power format Effective resolution: 0,1 kW / 1 kW / 0,01 MW - according to the selected power format		
Description			
This LAI is used as source of the value **Dynamic Spinning Reserve**.			

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Dynamic Spinning Reserve Offset

Related FW	2.2.0	**Related applications**	MINT
LAI ID	233		
Expected format of source value	Units: [kW / MW] - according to the selected power format Effective resolution: 0,1 kW / 1 kW / 0,01 MW - according to the selected power format		
Description			
This LAI is used as source of the value **Dynamic Spinning Reserve Offset**.			

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LAI: G

Gen P Min

Related FW	2.2.0	Related applications	MINT, MPTM
LAI ID	742		
Expected format of source value	Units: [%] Effective resolution: 1		
Description			
The LAI serves as an alternative configuration for the setpoint **#Gen P Min**, used in the power balancing function of gensets (see **Active power control in Off-grid operation**). When configured, the LAI overrides the setpoint value and directly influences the genset power balancing. The LAI must be linked to an analog value that represents the desired power setpoint for genset balancing. The LAI must be identically configured across all controllers in the system to ensure consistent power balancing. ***Note:*** *The genset power balancing function can alternatively be switched to control mode via LAI Gen P Min. In this case, the setpoint requirement is replaced by the analog value from the LAI.*			

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LAI: I

Irradiation of PV Array 1

Related FW	2.2.0	Related applications	MINT, MPTM
LAI ID	544		
Expected format of source value	Units: [%] Effective resolution: 0,1		
Description			
This parameter represents the irradiation data for PV Array 1, providing information about the amount of sunlight received at the specific location within the microgrid.			

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Irradiation of PV Array 2

Related FW	2.2.0	Related applications	MINT, MPTM
LAI ID	545		
Expected format of source value	Units: [%] Effective resolution: 0,1		
Description			
This parameter represents the irradiation data for PV Array 2, offering insights into the amount of sunlight received at the specific location within the microgrid.			

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Irradiation of PV Array 3

Related FW	2.2.0	**Related applications**	MINT, MPTM
LAI ID	546		
Expected format of source value	Units: [%] Effective resolution: 0,1		
Description			
This parameter provides irradiation data for PV Array 3, indicating the amount of sunlight received at the specific location within the microgrid.			

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Irradiation of PV Array 4

Related FW	2.2.0	**Related applications**	MINT, MPTM
LAI ID	547		
Expected format of source value	Units: [%] Effective resolution: 0,1		
Description			
This parameter offers irradiation data for PV Array 4, providing information about the amount of sunlight received at the specific location within the microgrid.			

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LAI: L

Load Control: ANEXT Baseload

Related FW	2.2.0	**Related applications**	MINT, MPTM
LAI ID	1		
Expected format of source value	Units: [kW / MW] - according to the selected power format Effective resolution: 0,1 kW / 1 kW / 0,01 MW - according to the selected power format		
Description			
This LAI is source value for control of Active Power if **Load Request Source** = Analog External Value. The Baseload is active if: › MINT: **#System Load Control PTM** = Baseload › MPTM: **Load Control PTM Mode** = Baseload This function LAI can be given negative value for charging of the BESS if necessary.			

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Load Control ANEXT: Local Baseload

Related FW	2.2.0	**Related applications**	MINT, MPTM
LAI ID	405		
Expected format of source value	Units: [kW / MW] - according to the selected power format Effective resolution: 0,1 kW / 1 kW / 0,01 MW - according to the selected power format		
Description			
This LAI is source of requested local baseload when Local Baseload Source = Analog External Value. Input for the new Local Baseload control controlled by setpoint Local Baseload Source. ***Note:*** *When setpoint Source Mode Select = Generator then Local Baseload Request can not be nagative.*			

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Load Control: ANEXT Imp/Exp Load

Related FW	2.2.0	**Related applications**	MPTM
LAI ID	2		
Expected format of source value	Units: [kW / MW] - according to the selected power format Effective resolution: 0,1 kW / 1 kW / 0,01 MW - according to the selected power format		
Description			
This LAI is source value for control of Active Power if **Load Request Source** = Analog External Value. The Import/Export is active if **#System Load Control PTM** = Load Shar and **Load Control PTM Mode** = Import/Export.			

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Load Reduction

Related FW	2.2.0	**Related applications**	MPTM
LAI ID	193		
Description			
This LAI adjusts maximal allowed load of the BESS while Setpoiont **Load Reduction** is Enabled and LBI **Load Reduction Enable** is closed. Always the lowest load defined by this LAI or by LBIs, **Load Reduction 1**, **Load Reduction 2**, etc. is allowed. ***Note:*** *The value of this setpoint relates to **Installed Power** only if **Installed Power** != OFF, otherwise it relates to **Nominal power**.*			

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LAI: M

Mains Measurement P

Related FW	2.2.0	**Related applications**	MPTM
LAI ID	5		
Expected format of source value	Units: [kW / MW] - according to the selected power format Effective resolution: 0,1 kW / 1 kW / 0,01 MW - according to the selected power format		
Description			
This LAI is designed for **Mains Import Measurement**, when **Mains Measurement P** = Analog Input. Value from this input is used in load transfer from Mains to BESS. Load transfer is considered to be finished when this value is lower than **Mains Unload MCB Open Window**			

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Mains Measurement Q

Related FW	2.2.0	**Related applications**	MPTM
LAI ID	6		
Expected format of source value	Units: [kVAr / MVAr] - according to the selected power format Effective resolution: 0,1 kVAr / 1 kVAr / 0,01 MVAr - according to the selected power format		
Description			
This LAI is designed for **Mains Import Measurement**, when **Mains Measurement Q** = Analog Input. Value from this input is used in load transfer from Mains to BESS. Load transfer is considered to be finished when this value is lower than **Mains Unload MCB Open Window**			

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LAI: P

PF Control: ANEXT Base PF

Related FW	2.2.0	**Related applications**	MINT, MPTM
LAI ID	3		
Expected format of source value	Units: [ ] - according to the selected power format Effective resolution: 0,001		

Description

This LAI is a source value for control of the Power Factor if **PF/Q Request Source** = Analog External Value , **PF/Q Control PTM Mode** = PF Control,.

The Base PF is active if **#System PF Control PTM** = Var Shar, **PF/Q Control PTM Mode** = PF Control and **PF/Q Regulation Type** = Base PF/Q Control.

- MINT: **#System PF Control PTM** = Base PF
- MPTM: **PF/Q Control PTM Mode** = PF Control and **PF/Q Regulation Type** = Base PF/Q Control

Analog value	Cos phi factor
<0.600	0.6L
0.600 .. 1.000	0.6L .. 1.00
1.001 .. 1.200	0.99C .. 0.80C

Note: *Always use a three decimal number for this LAI. Thus the range for this LAI is 0.600 to 1.200.*

Note: *If all setpoints are adjusted as mentioned above and **Breaker state** = ParalOper, but this LAI is not configured, alarm **Wrn PF Control Fail** is activated.*

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PF Control: ANEXT Imp/Exp PF

Related FW	2.2.0	**Related applications**	MPTM
LAI ID	4		
Expected format of source value	Units: [ ] - according to the selected power format Effective resolution: 0,001		
Description			

This LAI is a source value for control of the Power Factor if **PF/Q Request Source** = Analog External Value, **PF/Q Control PTM Mode** = PF Control.

The Import/Export PF is active if **#System PF Control PTM** = Var Shar, **PF/Q Control PTM Mode** = PF Control and **PF/Q Regulation Type** = Import/Export PF/Q Control.

Analog value	Cos phi factor
<0.600	0.6L
0.600 .. 1.000	0.6L .. 1.00
1.001 .. 1.200	0.99C .. 0.80C

Note: *Always use a three decimal number for this LAI.*

Note: *If all setpoints are adjusted as mentioned above and **Breaker state** = ParalOper, but this LAI is not configured, alarm **Wrn PF Control Fail** is activated.*

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Pmom

Related FW	2.2.0	**Related applications**	MPTM
LAI ID	340		
Expected format of source value	Units: [kW / MW] - according to the selected power format Effective resolution: 0,1 kW / 1 kW / 0,01 MW - according to the selected power format		
Description			

This LAI is used for receiving exported power measured in all 3 phases and is used during **Pave** function. The value can be received via **CAN Intercontroller Communication** from InteliPro Sync, InteliPro, InteliMains or connected to physical analog input.

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PV 01 Actual P

Related FW	2.2.0	**Related applications**	MINT, MPTM
LAI ID	358		
Expected format of source value	Units: [kW] Effective resolution: 0,1		
Description			

This LAI is designed to monitor actual power of the PV 1.

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PV 01 Actual Q

Related FW	2.2.0	**Related applications**	MINT, MPTM
LAI ID	359		
Expected format of source value	Units: [kVAr] Effective resolution: 0,1		
Description			
This LAI is designed to monitor actual reactive power of the PV 1.			

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PV 01 kWh

Related FW	2.2.0	**Related applications**	MINT, MPTM
LAI ID	361		
Expected format of source value	Units: [kWh] Effective resolution: 1		
Description			
This LAI defines the amount of energy produced by PV 1 and is used as a source for statistic values.			

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PV 01 Nominal P

Related FW	2.2.0	**Related applications**	MINT, MPTM
LAI ID	360		
Expected format of source value	Units: [kW] Effective resolution: 0,1		
Description			
This LAI is used to define nominal power of the PV 1 used in the system.			

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PV 02 Actual P

Related FW	2.2.0	**Related applications**	MINT, MPTM
LAI ID	449		
Expected format of source value	Units: [kW] Effective resolution: 0,1		
Description			
This LAI is designed to monitor actual power of the PV 2.			

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PV 02 Actual Q

Related FW	2.2.0	**Related applications**	MINT, MPTM
LAI ID	464		
Expected format of source value	Units: [kVAr] Effective resolution: 0,1		
Description			
This LAI is designed to monitor actual reactive power of the PV 2.			

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PV 02 kWh

Related FW	2.2.0	**Related applications**	MINT, MPTM
LAI ID	479		
Expected format of source value	Units: [kWh] Effective resolution: 1		
Description			
This LAI defines the amount of energy produced by PV 2 and is used as a source for statistic values.			

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PV 02 Nominal P

Related FW	2.2.0	**Related applications**	MINT, MPTM
LAI ID	434		
Expected format of source value	Units: [kW] Effective resolution: 0,1		
Description			
This LAI is used to define nominal power of the PV 2 used in the system.			

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PV 03 Actual P

Related FW	2.2.0	**Related applications**	MINT, MPTM
LAI ID	450		
Expected format of source value	Units: [kW] Effective resolution: 0,1		
Description			
This LAI is designed to monitor actual power of the PV 3.			

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PV 03 Actual Q

Related FW	2.2.0	**Related applications**	MINT, MPTM
LAI ID	465		
Expected format of source value	Units: [kVAr] Effective resolution: 0,1		
Description			
This LAI is designed to monitor actual reactive power of the PV 3.			

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PV 03 kWh

Related FW	2.2.0	**Related applications**	MINT, MPTM
LAI ID	480		
Expected format of source value	Units: [kWh] Effective resolution: 1		
Description			
This LAI defines the amount of energy produced by PV 3 and is used as a source for statistic values.			

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PV 03 Nominal P

Related FW	2.2.0	**Related applications**	MINT, MPTM
LAI ID	435		
Expected format of source value	Units: [kW] Effective resolution: 0,1		
Description			
This LAI is used to define nominal power of the PV 3 used in the system.			

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PV 04 Actual P

Related FW	2.2.0	**Related applications**	MINT, MPTM
LAI ID	451		
Expected format of source value	Units: [kW] Effective resolution: 0,1		
Description			
This LAI is designed to monitor actual power of the PV 4.			

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PV 04 Actual Q

Related FW	2.2.0	**Related applications**	MINT, MPTM
LAI ID	466		
Expected format of source value	Units: [kVAr] Effective resolution: 0,1		
Description			
This LAI is designed to monitor actual reactive power of the PV 4.			

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PV 04 kWh

Related FW	2.2.0	**Related applications**	MINT, MPTM
LAI ID	481		
Expected format of source value	Units: [kWh] Effective resolution: 1		
Description			
This LAI defines the amount of energy produced by PV 4 and is used as a source for statistic values.			

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PV 04 Nominal P

Related FW	2.2.0	**Related applications**	MINT, MPTM
LAI ID	436		
Expected format of source value	Units: [kW] Effective resolution: 0,1		
Description			
This LAI is used to define nominal power of the PV 4 used in the system.			

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PV 05 Actual P

Related FW	2.2.0	**Related applications**	MINT, MPTM
LAI ID	452		
Expected format of source value	Units: [kW] Effective resolution: 0,1		
Description			
This LAI is designed to monitor actual power of the PV 5.			

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PV 05 Actual Q

Related FW	2.2.0	**Related applications**	MINT, MPTM
LAI ID	467		
Expected format of source value	Units: [kVAr] Effective resolution: 0,1		
Description			
This LAI is designed to monitor actual reactive power of the PV 5.			

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PV 05 kWh

Related FW	2.2.0	**Related applications**	MINT, MPTM
LAI ID	482		
Expected format of source value	Units: [kWh] Effective resolution: 1		
Description			
This LAI defines the amount of energy produced by PV 5 and is used as a source for statistic values.			

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PV 05 Nominal P

Related FW	2.2.0	**Related applications**	MINT, MPTM
LAI ID	437		
Expected format of source value	Units: [kW] Effective resolution: 0,1		
Description			
This LAI is used to define nominal power of the PV 5 used in the system.			

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PV 06 Actual P

Related FW	2.2.0	**Related applications**	MINT, MPTM
LAI ID	453		
Expected format of source value	Units: [kW] Effective resolution: 0,1		
Description			
This LAI is designed to monitor actual power of the PV 6.			

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PV 06 Actual Q

Related FW	2.2.0	**Related applications**	MINT, MPTM
LAI ID	468		
Expected format of source value	Units: [kVAr] Effective resolution: 0,1		
Description			
This LAI is designed to monitor actual reactive power of the PV 6.			

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PV 06 kWh

Related FW	2.2.0	**Related applications**	MINT, MPTM
LAI ID	483		
Expected format of source value	Units: [kWh] Effective resolution: 1		
Description			
This LAI defines the amount of energy produced by PV 6 and is used as a source for statistic values.			

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PV 06 Nominal P

Related FW	2.2.0	**Related applications**	MINT, MPTM
LAI ID	438		
Expected format of source value	Units: [kW] Effective resolution: 0,1		
Description			
This LAI is used to define nominal power of the PV 6 used in the system.			

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PV 07 Actual P

Related FW	2.2.0	**Related applications**	MINT, MPTM
LAI ID	454		
Expected format of source value	Units: [kW] Effective resolution: 0,1		
Description			
This LAI is designed to monitor actual power of the PV 7.			

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PV 07 Actual Q

Related FW	2.2.0	**Related applications**	MINT, MPTM
LAI ID	469		
Expected format of source value	Units: [kVAr] Effective resolution: 0,1		
Description			
This LAI is designed to monitor actual reactive power of the PV 7.			

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PV 07 kWh

Related FW	2.2.0	**Related applications**	MINT, MPTM
LAI ID	484		
Expected format of source value	Units: [kWh] Effective resolution: 1		
Description			
This LAI defines the amount of energy produced by PV 7 and is used as a source for statistic values.			

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PV 07 Nominal P

Related FW	2.2.0	**Related applications**	MINT, MPTM
LAI ID	439		
Expected format of source value	Units: [kW] Effective resolution: 0,1		
Description			
This LAI is used to define nominal power of the PV 7 used in the system.			

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PV 08 Actual P

Related FW	2.2.0	**Related applications**	MINT, MPTM
LAI ID	455		
Expected format of source value	Units: [kW] Effective resolution: 0,1		
Description			
This LAI is designed to monitor actual power of the PV 8.			

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PV 08 Actual Q

Related FW	2.2.0	**Related applications**	MINT, MPTM
LAI ID	470		
Expected format of source value	Units: [kVAr] Effective resolution: 0,1		
Description			
This LAI is designed to monitor actual reactive power of the PV 8.			

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PV 08 kWh

Related FW	2.2.0	**Related applications**	MINT, MPTM
LAI ID	485		
Expected format of source value	Units: [kWh] Effective resolution: 1		
Description			
This LAI defines the amount of energy produced by PV 8 and is used as a source for statistic values.			

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PV 08 Nominal P

Related FW	2.2.0	**Related applications**	MINT, MPTM
LAI ID	440		
Expected format of source value	Units: [kW] Effective resolution: 0,1		
Description			
This LAI is used to define nominal power of the PV 8 used in the system.			

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PV 09 Actual P

Related FW	2.2.0	**Related applications**	MINT, MPTM
LAI ID	456		
Expected format of source value	Units: [kW] Effective resolution: 0,1		
Description			
This LAI is designed to monitor actual power of the PV 9.			

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PV 09 Actual Q

Related FW	2.2.0	**Related applications**	MINT, MPTM
LAI ID	471		
Expected format of source value	Units: [kVAr] Effective resolution: 0,1		
Description			
This LAI is designed to monitor actual reactive power of the PV 9.			

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PV 09 kWh

Related FW	2.2.0	**Related applications**	MINT, MPTM
LAI ID	486		
Expected format of source value	Units: [kWh] Effective resolution: 1		
Description			
This LAI defines the amount of energy produced by PV 9 and is used as a source for statistic values.			

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PV 09 Nominal P

Related FW	2.2.0	**Related applications**	MINT, MPTM
LAI ID	441		
Expected format of source value	Units: [kW] Effective resolution: 0,1		
Description			
This LAI is used to define nominal power of the PV 9 used in the system.			

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PV 10 Actual P

Related FW	2.2.0	**Related applications**	MINT, MPTM
LAI ID	457		
Expected format of source value	Units: [kW] Effective resolution: 0,1		
Description			
This LAI is designed to monitor actual power of the PV 10.			

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PV 10 Actual Q

Related FW	2.2.0	**Related applications**	MINT, MPTM
LAI ID	472		
Expected format of source value	Units: [kVAr] Effective resolution: 0,1		
Description			
This LAI is designed to monitor actual reactive power of the PV 10.			

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PV 10 kWh

Related FW	2.2.0	**Related applications**	MINT, MPTM
LAI ID	487		
Expected format of source value	Units: [kWh] Effective resolution: 1		
Description			
This LAI defines the amount of energy produced by PV 10 and is used as a source for statistic values.			

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PV 10 Nominal P

Related FW	2.2.0	**Related applications**	MINT, MPTM
LAI ID	442		
Expected format of source value	Units: [kW] Effective resolution: 0,1		
Description			
This LAI is used to define nominal power of the PV 10 used in the system.			

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PV 11 Actual P

Related FW	2.2.0	**Related applications**	MINT, MPTM
LAI ID	458		
Expected format of source value	Units: [kW] Effective resolution: 0,1		
Description			
This LAI is designed to monitor actual power of the PV 11.			

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PV 11 Actual Q

Related FW	2.2.0	**Related applications**	MINT, MPTM
LAI ID	473		
Expected format of source value	Units: [kVAr] Effective resolution: 0,1		
Description			
This LAI is designed to monitor actual reactive power of the PV 11.			

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PV 11 kWh

Related FW	2.2.0	**Related applications**	MINT, MPTM
LAI ID	488		
Expected format of source value	Units: [kWh] Effective resolution: 1		
Description			
This LAI defines the amount of energy produced by PV 11 and is used as a source for statistic values.			

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PV 11 Nominal P

Related FW	2.2.0	**Related applications**	MINT, MPTM
LAI ID	443		
Expected format of source value	Units: [kW] Effective resolution: 0,1		
Description			
This LAI is used to define nominal power of the PV 11 used in the system.			

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PV 12 Actual P

Related FW	2.2.0	**Related applications**	MINT, MPTM
LAI ID	459		
Expected format of source value	Units: [kW] Effective resolution: 0,1		
Description			
This LAI is designed to monitor actual power of the PV 12.			

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PV 12 Actual Q

Related FW	2.2.0	**Related applications**	MINT, MPTM
LAI ID	474		
Expected format of source value	Units: [kVAr] Effective resolution: 0,1		
Description			
This LAI is designed to monitor actual reactive power of the PV 12.			

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PV 12 kWh

Related FW	2.2.0	**Related applications**	MINT, MPTM
LAI ID	489		
Expected format of source value	Units: [kWh] Effective resolution: 1		
Description			
This LAI defines the amount of energy produced by PV 12 and is used as a source for statistic values.			

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PV 12 Nominal P

Related FW	2.2.0	**Related applications**	MINT, MPTM
LAI ID	444		
Expected format of source value	Units: [kW] Effective resolution: 0,1		
Description			
This LAI is used to define nominal power of the PV 12 used in the system.			

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PV 13 Actual P

Related FW	2.2.0	**Related applications**	MINT, MPTM
LAI ID	460		
Expected format of source value	Units: [kW] Effective resolution: 0,1		
Description			
This LAI is designed to monitor actual power of the PV 13.			

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PV 13 Actual Q

Related FW	2.2.0	**Related applications**	MINT, MPTM
LAI ID	475		
Expected format of source value	Units: [kVAr] Effective resolution: 0,1		
Description			
This LAI is designed to monitor actual reactive power of the PV 13.			

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PV 13 kWh

Related FW	2.2.0	**Related applications**	MINT, MPTM
LAI ID	490		
Expected format of source value	Units: [kWh] Effective resolution: 1		
Description			
This LAI defines the amount of energy produced by PV 13 and is used as a source for statistic values.			

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PV 13 Nominal P

Related FW	2.2.0	**Related applications**	MINT, MPTM
LAI ID	445		
Expected format of source value	Units: [kW] Effective resolution: 0,1		
Description			
This LAI is used to define nominal power of the PV 13 used in the system.			

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PV 14 Actual P

Related FW	2.2.0	**Related applications**	MINT, MPTM
LAI ID	461		
Expected format of source value	Units: [kW] Effective resolution: 0,1		
Description			
This LAI is designed to monitor actual power of the PV 14.			

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PV 14 Actual Q

Related FW	2.2.0	**Related applications**	MINT, MPTM
LAI ID	476		
Expected format of source value	Units: [kVAr] Effective resolution: 0,1		
Description			
This LAI is designed to monitor actual reactive power of the PV 14.			

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PV 14 kWh

Related FW	2.2.0	**Related applications**	MINT, MPTM
LAI ID	491		
Expected format of source value	Units: [kWh] Effective resolution: 1		
Description			
This LAI defines the amount of energy produced by PV 14 and is used as a source for statistic values.			

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PV 14 Nominal P

Related FW	2.2.0	**Related applications**	MINT, MPTM
LAI ID	446		
Expected format of source value	Units: [kW] Effective resolution: 0,1		
Description			
This LAI is used to define nominal power of the PV 14 used in the system.			

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PV 15 Actual P

Related FW	2.2.0	**Related applications**	MINT, MPTM
LAI ID	462		
Expected format of source value	Units: [kW] Effective resolution: 0,1		
Description			
This LAI is designed to monitor actual power of the PV 15.			

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PV 15 Actual Q

Related FW	2.2.0	**Related applications**	MINT, MPTM
LAI ID	477		
Expected format of source value	Units: [kVAr] Effective resolution: 0,1		
Description			
This LAI is designed to monitor actual reactive power of the PV 15.			

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PV 15 kWh

Related FW	2.2.0	**Related applications**	MINT, MPTM
LAI ID	492		
Expected format of source value	Units: [kWh] Effective resolution: 1		
Description			
This LAI defines the amount of energy produced by PV 15 and is used as a source for statistic values.			

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PV 15 Nominal P

Related FW	2.2.0	**Related applications**	MINT, MPTM
LAI ID	447		
Expected format of source value	Units: [kW] Effective resolution: 0,1		
Description			
This LAI is used to define nominal power of the PV 15 used in the system.			

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PV 16 Actual P

Related FW	2.2.0	**Related applications**	MINT, MPTM
LAI ID	463		
Expected format of source value	Units: [kW] Effective resolution: 0,1		
Description			
This LAI is designed to monitor actual power of the PV 16.			

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PV 16 Actual Q

Related FW	2.2.0	**Related applications**	MINT, MPTM
LAI ID	478		
Expected format of source value	Units: [kVAr] Effective resolution: 0,1		
Description			
This LAI is designed to monitor actual reactive power of the PV 16.			

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PV 16 kWh

Related FW	2.2.0	**Related applications**	MINT, MPTM
LAI ID	493		
Expected format of source value	Units: [kWh] Effective resolution: 1		
Description			
This LAI defines the amount of energy produced by PV 16 and is used as a source for statistic values.			

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PV 16 Nominal P

Related FW	2.2.0	**Related applications**	MINT, MPTM
LAI ID	448		
Expected format of source value	Units: [kW] Effective resolution: 0,1		
Description			
This LAI is used to define nominal power of the PV 16 used in the system.			

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PV 17 Actual P

Related FW	2.2.0	**Related applications**	MINT, MPTM
LAI ID	673		
Expected format of source value	Units: [kW] Effective resolution: 0,1		
Description			
This LAI is designed to monitor actual power of the PV 17.			

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PV 17 Actual Q

Related FW	2.2.0	**Related applications**	MINT, MPTM
LAI ID	689		
Expected format of source value	Units: [kVAr] Effective resolution: 0,1		
Description			
This LAI is designed to monitor actual reactive power of the PV 17.			

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PV 17 kWh

Related FW	2.2.0	**Related applications**	MINT, MPTM
LAI ID	705		
Expected format of source value	Units: [kWh] Effective resolution: 1		
Description			
This LAI defines the amount of energy produced by PV 17 and is used as a source for statistic values.			

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PV 17 Nominal P

Related FW	2.2.0	**Related applications**	MINT, MPTM
LAI ID	657		
Expected format of source value	Units: [kW] Effective resolution: 0,1		
Description			
This LAI is used to define nominal power of the PV 17 used in the system.			

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PV 18 Actual P

Related FW	2.2.0	**Related applications**	MINT, MPTM
LAI ID	674		
Expected format of source value	Units: [kW] Effective resolution: 0,1		
Description			
This LAI is designed to monitor actual power of the PV 18.			

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PV 18 Actual Q

Related FW	2.2.0	**Related applications**	MINT, MPTM
LAI ID	690		
Expected format of source value	Units: [kVAr] Effective resolution: 0,1		
Description			
This LAI is designed to monitor actual reactive power of the PV 18.			

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PV 18 kWh

Related FW	2.2.0	**Related applications**	MINT, MPTM
LAI ID	706		
Expected format of source value	Units: [kWh] Effective resolution: 1		
Description			
This LAI defines the amount of energy produced by PV 18 and is used as a source for statistic values.			

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PV 18 Nominal P

Related FW	2.2.0	**Related applications**	MINT, MPTM
LAI ID	658		
Expected format of source value	Units: [kW] Effective resolution: 0,1		
Description			
This LAI is used to define nominal power of the PV 18 used in the system.			

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PV 19 Actual P

Related FW	2.2.0	**Related applications**	MINT, MPTM
LAI ID	675		
Expected format of source value	Units: [kW] Effective resolution: 0,1		
Description			
This LAI is designed to monitor actual power of the PV 19.			

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PV 19 Actual Q

Related FW	2.2.0	**Related applications**	MINT, MPTM
LAI ID	691		
Expected format of source value	Units: [kVAr] Effective resolution: 0,1		
Description			
This LAI is designed to monitor actual reactive power of the PV 19.			

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PV 19 kWh

Related FW	2.2.0	**Related applications**	MINT, MPTM
LAI ID	707		
Expected format of source value	Units: [kWh] Effective resolution: 1		
Description			
This LAI defines the amount of energy produced by PV 19 and is used as a source for statistic values.			

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PV 19 Nominal P

Related FW	2.2.0	**Related applications**	MINT, MPTM
LAI ID	659		
Expected format of source value	Units: [kW] Effective resolution: 0,1		
Description			
This LAI is used to define nominal power of the PV 19 used in the system.			

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PV 20 Actual P

Related FW	2.2.0	**Related applications**	MINT, MPTM
LAI ID	676		
Expected format of source value	Units: [kW] Effective resolution: 0,1		
Description			
This LAI is designed to monitor actual power of the PV 20.			

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PV 20 Actual Q

Related FW	2.2.0	**Related applications**	MINT, MPTM
LAI ID	692		
Expected format of source value	Units: [kVAr] Effective resolution: 0,1		
Description			
This LAI is designed to monitor actual reactive power of the PV 20.			

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PV 20 kWh

Related FW	2.2.0	**Related applications**	MINT, MPTM
LAI ID	708		
Expected format of source value	Units: [kWh] Effective resolution: 1		
Description			
This LAI defines the amount of energy produced by PV 20 and is used as a source for statistic values.			

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PV 20 Nominal P

Related FW	2.2.0	**Related applications**	MINT, MPTM
LAI ID	660		
Expected format of source value	Units: [kW] Effective resolution: 0,1		
Description			
This LAI is used to define nominal power of the PV 20 used in the system.			

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PV 21 Actual P

Related FW	2.2.0	**Related applications**	MINT, MPTM
LAI ID	677		
Expected format of source value	Units: [kW] Effective resolution: 0,1		
Description			
This LAI is designed to monitor actual power of the PV 21.			

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PV 21 Actual Q

Related FW	2.2.0	**Related applications**	MINT, MPTM
LAI ID	693		
Expected format of source value	Units: [kVAr] Effective resolution: 0,1		
Description			
This LAI is designed to monitor actual reactive power of the PV 21.			

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PV 21 kWh

Related FW	2.2.0	**Related applications**	MINT, MPTM
LAI ID	709		
Expected format of source value	Units: [kWh] Effective resolution: 1		
Description			
This LAI defines the amount of energy produced by PV 21 and is used as a source for statistic values.			

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PV 21 Nominal P

Related FW	2.2.0	**Related applications**	MINT, MPTM
LAI ID	661		
Expected format of source value	Units: [kW] Effective resolution: 0,1		
Description			
This LAI is used to define nominal power of the PV 21 used in the system.			

back to Logical analog inputs alphabetically

PV 22 Actual P

Related FW	2.2.0	**Related applications**	MINT, MPTM
LAI ID	678		
Expected format of source value	Units: [kW] Effective resolution: 0,1		
Description			
This LAI is designed to monitor actual power of the PV 22.			

back to Logical analog inputs alphabetically

PV 22 Actual Q

Related FW	2.2.0	**Related applications**	MINT, MPTM
LAI ID	694		
Expected format of source value	Units: [kVAr] Effective resolution: 0,1		
Description			
This LAI is designed to monitor actual reactive power of the PV 22.			

back to Logical analog inputs alphabetically

PV 22 kWh

Related FW	2.2.0	**Related applications**	MINT, MPTM
LAI ID	710		
Expected format of source value	Units: [kWh] Effective resolution: 1		
Description			
This LAI defines the amount of energy produced by PV 22 and is used as a source for statistic values.			

back to Logical analog inputs alphabetically

PV 22 Nominal P

Related FW	2.2.0	**Related applications**	MINT, MPTM
LAI ID	662		
Expected format of source value	Units: [kW] Effective resolution: 0,1		
Description			
This LAI is used to define nominal power of the PV 22 used in the system.			

back to Logical analog inputs alphabetically

PV 23 Actual P

Related FW	2.2.0	**Related applications**	MINT, MPTM
LAI ID	679		
Expected format of source value	Units: [kW] Effective resolution: 0,1		
Description			
This LAI is designed to monitor actual power of the PV 23.			

back to Logical analog inputs alphabetically

PV 23 Actual Q

Related FW	2.2.0	**Related applications**	MINT, MPTM
LAI ID	695		
Expected format of source value	Units: [kVAr] Effective resolution: 0,1		
Description			
This LAI is designed to monitor actual reactive power of the PV 23.			

back to Logical analog inputs alphabetically

PV 23 kWh

Related FW	2.2.0	**Related applications**	MINT, MPTM
LAI ID	711		
Expected format of source value	Units: [kWh] Effective resolution: 1		
Description			
This LAI defines the amount of energy produced by PV 23 and is used as a source for statistic values.			

back to Logical analog inputs alphabetically

PV 23 Nominal P

Related FW	2.2.0	**Related applications**	MINT, MPTM
LAI ID	663		
Expected format of source value	Units: [kW] Effective resolution: 0,1		
Description			
This LAI is used to define nominal power of the PV 23 used in the system.			

back to Logical analog inputs alphabetically

PV 24 Actual P

Related FW	2.2.0	**Related applications**	MINT, MPTM
LAI ID	680		
Expected format of source value	Units: [kW] Effective resolution: 0,1		
Description			
This LAI is designed to monitor actual power of the PV 24.			

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PV 24 Actual Q

Related FW	2.2.0	**Related applications**	MINT, MPTM
LAI ID	696		
Expected format of source value	Units: [kVAr] Effective resolution: 0,1		
Description			
This LAI is designed to monitor actual reactive power of the PV 24.			

back to Logical analog inputs alphabetically

PV 24 kWh

Related FW	2.2.0	**Related applications**	MINT, MPTM
LAI ID	712		
Expected format of source value	Units: [kWh] Effective resolution: 1		
Description			
This LAI defines the amount of energy produced by PV 24 and is used as a source for statistic values.			

back to Logical analog inputs alphabetically

PV 24 Nominal P

Related FW	2.2.0	**Related applications**	MINT, MPTM
LAI ID	664		
Expected format of source value	Units: [kW] Effective resolution: 0,1		
Description			
This LAI is used to define nominal power of the PV 24 used in the system.			

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PV 25 Actual P

Related FW	2.2.0	**Related applications**	MINT, MPTM
LAI ID	681		
Expected format of source value	Units: [kW] Effective resolution: 0,1		
Description			
This LAI is designed to monitor actual power of the PV 25.			

back to Logical analog inputs alphabetically

PV 25 Actual Q

Related FW	2.2.0	**Related applications**	MINT, MPTM
LAI ID	697		
Expected format of source value	Units: [kVAr] Effective resolution: 0,1		
Description			
This LAI is designed to monitor actual reactive power of the PV 25.			

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PV 25 kWh

Related FW	2.2.0	**Related applications**	MINT, MPTM
LAI ID	713		
Expected format of source value	Units: [kWh] Effective resolution: 1		
Description			
This LAI defines the amount of energy produced by PV 25 and is used as a source for statistic values.			

back to Logical analog inputs alphabetically

PV 25 Nominal P

Related FW	2.2.0	**Related applications**	MINT, MPTM
LAI ID	665		
Expected format of source value	Units: [kW] Effective resolution: 0,1		
Description			
This LAI is used to define nominal power of the PV 25 used in the system.			

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PV 26 Actual P

Related FW	2.2.0	**Related applications**	MINT, MPTM
LAI ID	682		
Expected format of source value	Units: [kW] Effective resolution: 0,1		
Description			
This LAI is designed to monitor actual power of the PV 26.			

back to Logical analog inputs alphabetically

PV 26 Actual Q

Related FW	2.2.0	**Related applications**	MINT, MPTM
LAI ID	698		
Expected format of source value	Units: [kVAr] Effective resolution: 0,1		
Description			
This LAI is designed to monitor actual reactive power of the PV 26.			

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PV 26 kWh

Related FW	2.2.0	**Related applications**	MINT, MPTM
LAI ID	714		
Expected format of source value	Units: [kWh] Effective resolution: 1		
Description			
This LAI defines the amount of energy produced by PV 26 and is used as a source for statistic values.			

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PV 26 Nominal P

Related FW	2.2.0	**Related applications**	MINT, MPTM
LAI ID	666		
Expected format of source value	Units: [kW] Effective resolution: 0,1		
Description			
This LAI is used to define nominal power of the PV 26 used in the system.			

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PV 17 Actual P

Related FW	2.2.0	**Related applications**	MINT, MPTM
LAI ID	683		
Expected format of source value	Units: [kW] Effective resolution: 0,1		
Description			
This LAI is designed to monitor actual power of the PV 27.			

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PV 27 Actual Q

Related FW	2.2.0	**Related applications**	MINT, MPTM
LAI ID	699		
Expected format of source value	Units: [kVAr] Effective resolution: 0,1		
Description			
This LAI is designed to monitor actual reactive power of the PV 27.			

back to Logical analog inputs alphabetically

PV 27 kWh

Related FW	2.2.0	**Related applications**	MINT, MPTM
LAI ID	715		
Description			
This LAI defines the amount of energy produced by PV 27 and is used as a source for statistic values.			

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PV 27 Nominal P

Related FW	2.2.0	**Related applications**	MINT, MPTM
LAI ID	667		
Expected format of source value	Units: [kW] Effective resolution: 0,1		
Description			
This LAI is used to define nominal power of the PV 27 used in the system.			

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PV 28 Actual P

Related FW	2.2.0	**Related applications**	MINT, MPTM
LAI ID	684		
Expected format of source value	Units: [kW] Effective resolution: 0,1		
Description			
This LAI is designed to monitor actual power of the PV 28.			

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PV 28 Actual Q

Related FW	2.2.0	**Related applications**	MINT, MPTM
LAI ID	700		
Expected format of source value	Units: [kVAr] Effective resolution: 0,1		
Description			
This LAI is designed to monitor actual reactive power of the PV 28.			

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PV 28 kWh

Related FW	2.2.0	**Related applications**	MINT, MPTM
LAI ID	716		
Expected format of source value	Units: [kWh] Effective resolution: 1		
Description			
This LAI defines the amount of energy produced by PV 28 and is used as a source for statistic values.			

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PV 28 Nominal P

Related FW	2.2.0	**Related applications**	MINT, MPTM
LAI ID	668		
Expected format of source value	Units: [kW] Effective resolution: 0,1		
Description			
This LAI is used to define nominal power of the PV 28 used in the system.			

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PV 29 Actual P

Related FW	2.2.0	**Related applications**	MINT, MPTM
LAI ID	685		
Expected format of source value	Units: [kW] Effective resolution: 0,1		
Description			
This LAI is designed to monitor actual power of the PV 29.			

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PV 29 Actual Q

Related FW	2.2.0	**Related applications**	MINT, MPTM
LAI ID	701		
Expected format of source value	Units: [kVAr] Effective resolution: 0,1		
Description			
This LAI is designed to monitor actual reactive power of the PV 29.			

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PV 29 kWh

Related FW	2.2.0	**Related applications**	MINT, MPTM
LAI ID	717		
Expected format of source value	Units: [kWh] Effective resolution: 1		
Description			
This LAI defines the amount of energy produced by PV 29 and is used as a source for statistic values.			

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PV 29 Nominal P

Related FW	2.2.0	**Related applications**	MINT, MPTM
LAI ID	669		
Expected format of source value	Units: [kW] Effective resolution: 0,1		
Description			
This LAI is used to define nominal power of the PV 29 used in the system.			

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PV 30 Actual P

Related FW	2.2.0	**Related applications**	MINT, MPTM
LAI ID	686		
Expected format of source value	Units: [kW] Effective resolution: 0,1		
Description			
This LAI is designed to monitor actual power of the PV 30.			

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PV 30 Actual Q

Related FW	2.2.0	**Related applications**	MINT, MPTM
LAI ID	702		
Expected format of source value	Units: [kVAr] Effective resolution: 0,1		
Description			
This LAI is designed to monitor actual reactive power of the PV 30.			

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PV 30 kWh

Related FW	2.2.0	**Related applications**	MINT, MPTM
LAI ID	718		
Expected format of source value	Units: [kWh] Effective resolution: 1		
Description			
This LAI defines the amount of energy produced by PV 30 and is used as a source for statistic values.			

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PV 30 Nominal P

Related FW	2.2.0	**Related applications**	MINT, MPTM
LAI ID	670		
Expected format of source value	Units: [kW] Effective resolution: 0,1		
Description			
This LAI is used to define nominal power of the PV 30 used in the system.			

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PV 31 Actual P

Related FW	2.2.0	**Related applications**	MINT, MPTM
LAI ID	687		
Expected format of source value	Units: [kW] Effective resolution: 0,1		
Description			
This LAI is designed to monitor actual power of the PV 31.			

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PV 31 Actual Q

Related FW	2.2.0	**Related applications**	MINT, MPTM
LAI ID	703		
Expected format of source value	Units: [kVAr] Effective resolution: 0,1		
Description			
This LAI is designed to monitor actual reactive power of the PV 31.			

back to Logical analog inputs alphabetically

PV 31 kWh

Related FW	2.2.0	**Related applications**	MINT, MPTM
LAI ID	719		
Expected format of source value	Units: [kWh] Effective resolution: 1		
Description			
This LAI defines the amount of energy produced by PV 31 and is used as a source for statistic values.			

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PV 31 Nominal P

Related FW	2.2.0	**Related applications**	MINT, MPTM
LAI ID	671		
Expected format of source value	Units: [kW] Effective resolution: 0,1		
Description			
This LAI is used to define nominal power of the PV 31 used in the system.			

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PV 32 Actual P

Related FW	2.2.0	**Related applications**	MINT, MPTM
LAI ID	688		
Expected format of source value	Units: [kW] Effective resolution: 0,1		
Description			
This LAI is designed to monitor actual power of the PV 32.			

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PV 32 Actual Q

Related FW	2.2.0	**Related applications**	MINT, MPTM
LAI ID	704		
Expected format of source value	Units: [kVAr] Effective resolution: 0,1		
Description			
This LAI is designed to monitor actual reactive power of the PV 32.			

back to Logical analog inputs alphabetically

PV 32 kWh

Related FW	2.2.0	**Related applications**	MINT, MPTM
LAI ID	720		
Expected format of source value	Units: [kWh] Effective resolution: 1		
Description			
This LAI defines the amount of energy produced by PV 32 and is used as a source for statistic values.			

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PV 32 Nominal P

Related FW	2.2.0	**Related applications**	MINT, MPTM
LAI ID	672		
Expected format of source value	Units: [kW] Effective resolution: 0,1		
Description			
This LAI is used to define nominal power of the PV 32 used in the system.			

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LAI: Q

Q Control: ANEXT Base Q

Related FW	2.2.0	**Related applications**	MINT, MPTM
LAI ID	171		
Expected format of source value	Units: [kVAr / MVAr] - according to the selected power format Effective resolution: 0,1 kVAr / 1 kVAr / 0,01 MVAr - according to the selected power format		
Description			

This LAI is a source value for control of the Q power if **PF/Q Request Source** = Analog External Value, **PF/Q Control PTM Mode** = Q Control,

The Base Q is active if **#System PF Control PTM** = Var Shar, **PF/Q Control PTM Mode** = Q Control and **PF/Q Regulation Type** = Base PF/Q Control.

- MINT: **#System PF Control PTM** = Base Q
- MPTM: **PF/Q Control PTM Mode** = Q Control and **PF/Q Regulation Type** = Base PF/Q Control

Note: *If all setpoints are adjusted as mentioned above and **Breaker state** = ParalOper, but this LAI is not configured, alarm **Wrn Q Control Fail** is activated.*

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Q Control: ANEXT Imp/Exp Q

Related FW	2.2.0	**Related applications**	MPTM
LAI ID	195		
Expected format of source value	Units: [kVAr / MVAr] - according to the selected power format Effective resolution: 0,1 kVAr / 1 kVAr / 0,01 MVAr - according to the selected power format		
Description			

This LAI is a source value for control of the Power Factor if **PF/Q Request Source** = Analog External Value, **PF/Q Control PTM Mode** = Q Control.

The Import/Export Q is active if **#System PF Control PTM** = Var Shar, **PF/Q Control PTM Mode** = Q Control and **PF/Q Regulation Type** = Import/Export PF/Q Control.

Note: *If all setpoints are adjusted as mentioned above and **Breaker state** = ParalOper, but this LAI is not configured, alarm **Wrn Q Control Fail** is activated.*

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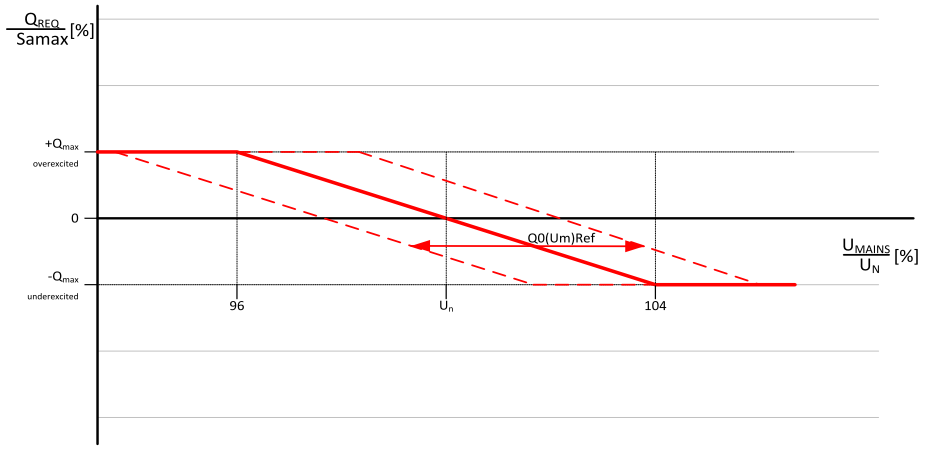
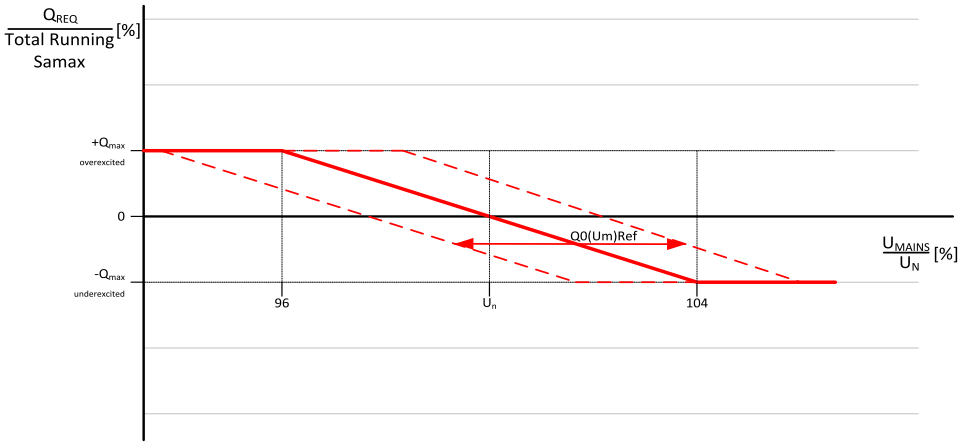
Q(Um): 0 Ref ANEXT Base Q

Related FW	2.2.0	Related applications	MINT, MPTM
LAI ID	326		
Description			

This LAI is used to shift **Q(UM)** curve left or right if **PF/Q Control PTM Mode** = Q(Um), **PF/Q Request Source** = Analog External Value and **PF/Q Regulation Type** = Base PF/Q Control.





Note: *If all setpoints are adjusted as mentioned above and* ***Breaker state*** *= ParalOper, but this LAI is not configured, or is out of sensor range alarm* ***Wrn Q(Um) Fail*** *is activated.*

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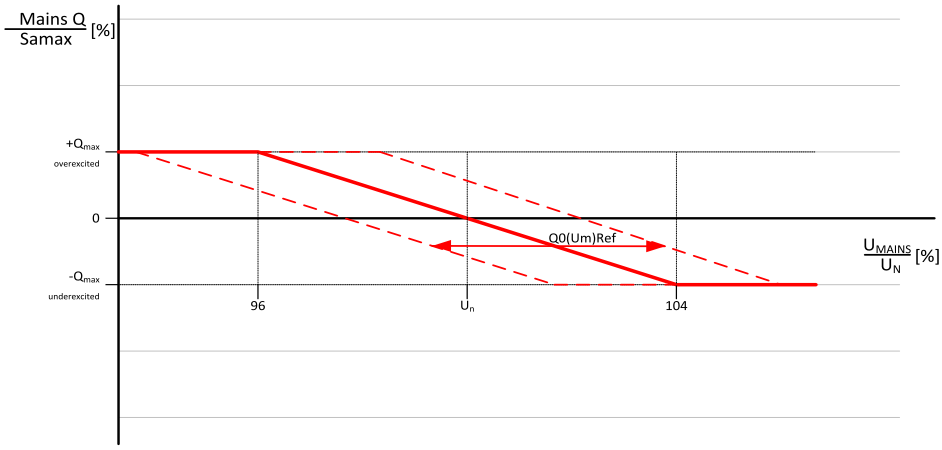
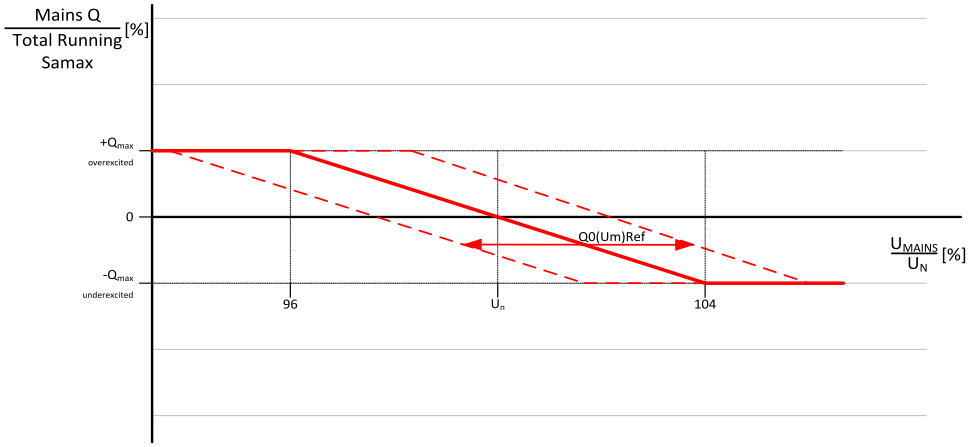
Q(Um): 0 Ref ANEXT Imp/Exp Q

Related FW	2.2.0	**Related applications**	MPTM
LAI ID	327		

Description

This LAI is used to shift **Q(UM)** curve left or right if **PF/Q Control PTM Mode** = Q(Um), **PF/Q Request Source** = Analog External Value and **PF/Q Regulation Type** = Import/Export PF/Q Control.





Note: *If all setpoints are adjusted as mentioned above and* ***Breaker state*** *= ParalOper, but this LAI is not configured, or is out of sensor range alarm* ***Wrn Q(Um) Fail*** *is activated.*

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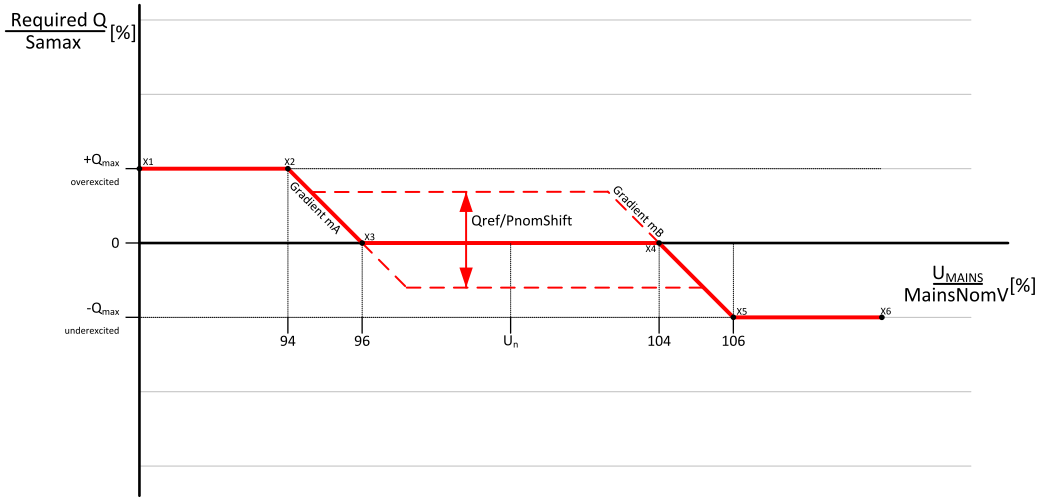
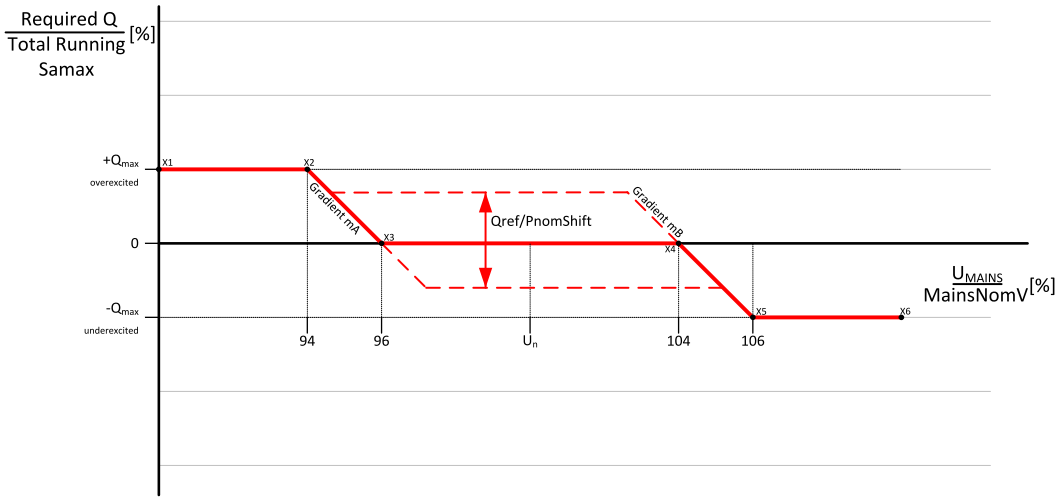
Qref/Ulim: ANEXT Qref/Pnom B Q

Related FW	2.2.0	Related applications	MPTM
LAI ID	328		
Description			

This LAI is used to shift part of the **QREF/ULIM** curve up or down if **PF/Q Control PTM Mode** = Qref/Ulim, **PF/Q Request Source** = Analog External Value and **PF/Q Regulation Type** = Base PF/Q Control.





Note: *If all setpoints are adjusted as mentioned above and* ***Breaker state*** *= ParalOper, but this LAI is not configured, or is out of sensor range, alarm* ***Wrn Qref/Ulim Fail*** *is activated.*

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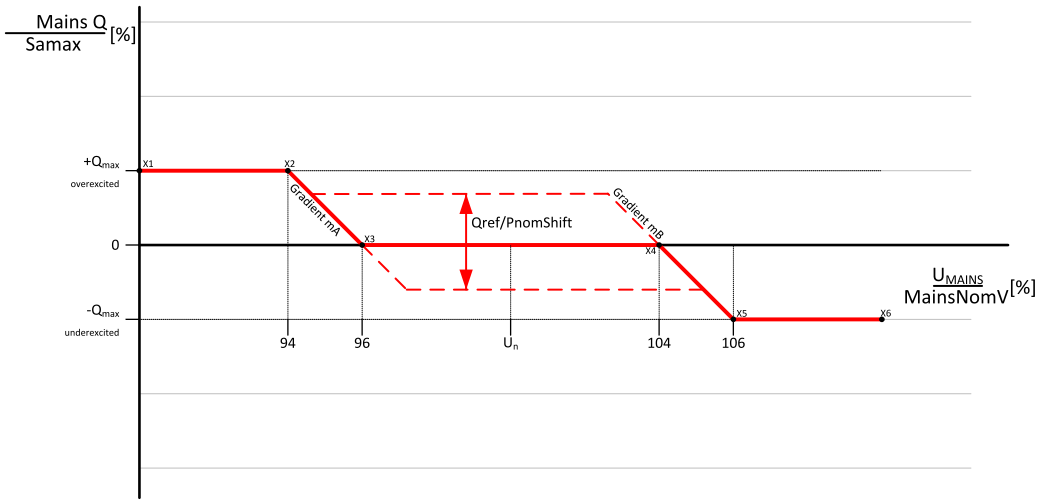
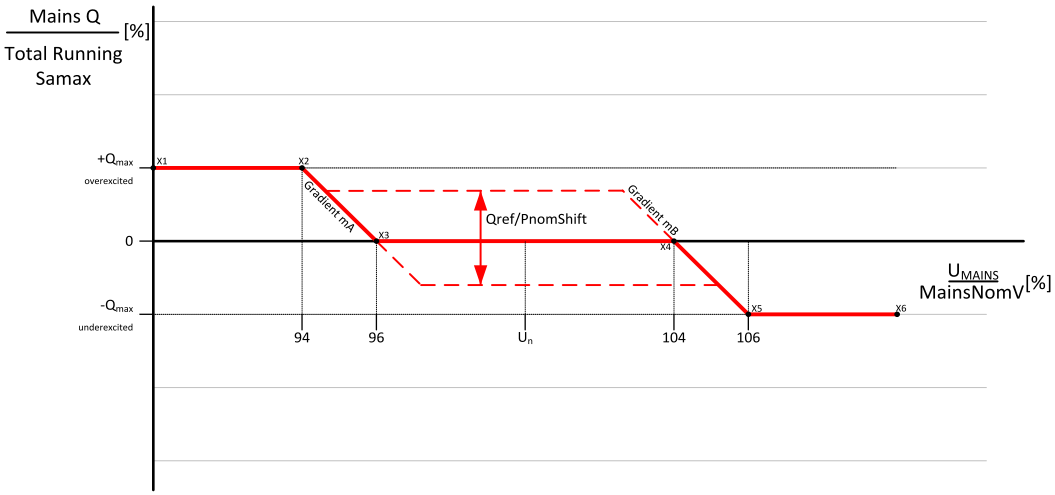
Qref/Ulim: ANEXT Qref/Pnom I/E Q

Related FW	2.2.0	Related applications	MPTM
LAI ID	329		

Description

This LAI is used to shift part of the **QREF/ULIM** curve up or down if **PF/Q Control PTM Mode** = Qref/Ulim, **PF/Q Request Source** = Analog External Value and **PF/Q Regulation Type** = Import/Export PF/Q Control.





Note: *If all setpoints are adjusted as mentioned above and* ***Breaker state*** *= ParalOper, but this LAI is not configured, or is out of sensor range, alarm* ***Wrn Qref/Ulim Fail*** *is activated.*

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LAI: T

TestF

Related FW	2.2.0	**Related applications**	MPTM
LAI ID	194		
Expected format of source value	Units: [Hz] Effective resolution: 0,001		
Description			
This LAI is used for adjusting mains frequency while **Testing of Grid Codes** function is enabled. Value received via this input is stored in **Test Frequency** as **Nominal Frequency** + value of this input. ***Note:*** *Setpoint **Grid Codes Test** has to be Enabled and alarm **Wrn Test UPQF** has to be active, otherwise this LAI has no effect.*			

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TestP

Related FW	2.2.0	**Related applications**	MPTM
LAI ID	231		
Expected format of source value	Units: [kW / MW] - according to the selected power format Effective resolution: 0,1 kW / 1 kW / 0,01 MW - according to the selected power format		
Description			
This LAI is used for adjusting generator's active power while **Testing of Grid Codes** function is enabled. ***Note:*** *Setpoint **Grid Codes Test** has to be Enabled and alarm **Wrn Test UPQF** has to be active, otherwise this LAI has no effect.*			

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TestQ

Related FW	2.2.0	**Related applications**	MPTM
LAI ID	232		
Expected format of source value	Units: [kVAr / MVAr] - according to the selected power format Effective resolution: 0,1 kVAr / 1 kVAr / 0,01 MVAr - according to the selected power format		
Description			
This LAI is used for adjusting generator's reactive power while **Testing of Grid Codes** function is enabled. ***Note:*** *Setpoint **Grid Codes Test** has to be Enabled and alarm **Wrn Test UPQF** has to be active, otherwise this LAI has no effect.*			

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TestU

Related FW	2.2.0	Related applications	MPTM
LAI ID	385		
Expected format of source value	Units: [V /kV] - according to the selected power format Effective resolution: 1 V / 0,01 kV - according to the selected power format		
Description			

This LAI is used for adjusting generator's active power while **Testing of Grid Codes** function is enabled.

Value received via this input is considered as relative value of Mains Voltage Ph-N related to **Mains/Bus Nominal Voltage Ph-N** or as relative value of Mains Voltage Ph-Ph related to **Mains/Bus Nominal Voltage Ph-Ph** based on **Connection type**.

Note: *Setpoint **Grid Codes Test** has to be Enabled and alarm **Wrn Test UPQF** has to be active, otherwise this LAI has no effect.*

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LAI: U

Uni Gen 01 Actual P

Related FW	2.2.0	Related applications	MINT
LAI ID	589		
Description			

This LAI is intended for reading of actual value of the active power of each particular universal Genset inside the Universal Gensets group. The actual power is then propagated to the Value **Uni Gen 1 Actual P** and is aggregated to the value **Uni Gen Actual P**. The format (resolution) of this input has to correspond to the Power Format selected in InteliNeo (0,1 kW, 1 kW, 0,01 MW).

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Uni Gen 01 Actual Q

Related FW	2.2.0	Related applications	MINT
LAI ID	605		
Description			

This LAI is intended for reading of actual value of the reactive power of each particular universal Genset inside the Universal Gensets group. The actual reactive power is then propagated to the Value **Uni Gen 1 Actual Q** and is aggregated to the value **Uni Gen Actual Q**. The format (resolution) of this input has to correspond to the Power Format selected in InteliNeo (0,1 kVAr, 1 kVAr, 0,01 MVAr).

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Uni Gen 01 Fuel

Related FW	2.2.0	**Related applications**	MINT
LAI ID	641		
Description			
This LAI is intended for reading of fuel used volume consumed by the Universal Gensets. The kWh from each particular Universal Genset is aggregated to the common value**Fuel Used** in statistics values. This value is used for calculation of interval kWh statistic values. The format and dimension of this value depends on selected Unit Format in InteliConfig (Metric / US).			

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Uni Gen 01 kWh

Related FW	2.2.0	**Related applications**	MINT
LAI ID	621		
Description			
This LAI is intended for reading of energy produced by the Universal Gensets. The kWh from each particular Universal Genset is aggregated to the common value **Gen kWh** in statistics values. This value is used for calculation of interval kWh statistic values.			

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Uni Gen 01 Nominal P

Related FW	2.2.0	**Related applications**	MINT
LAI ID	573		
Description			
This LAI is intended for reading of nominal power of each particular universal Genset inside the Universal Gensets group. The nominal power is then propagated to the Value **Uni Gen 1 Nominal P** and is aggregated to the value Uni Gen Nominal Power. The format (resolution) of this input has to correspond to the Power Format selected in InteliNeo (0,1 kW, 1 kW, 0,01 MW).			

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Uni Gen 02 Actual P

Related FW	2.2.0	**Related applications**	MINT
LAI ID	590		
Description			
This LAI is intended for reading of actual value of the active power of each particular universal Genset inside the Universal Gensets group. The actual power is then propagated to the Value **Uni Gen 2 Actual P** and is aggregated to the value **Uni Gen Actual P**. The format (resolution) of this input has to correspond to the Power Format selected in InteliNeo (0,1 kW, 1 kW, 0,01 MW).			

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Uni Gen 02 Actual Q

Related FW	2.2.0	**Related applications**	MINT
LAI ID	606		
Description			
This LAI is intended for reading of actual value of the reactive power of each particular universal Genset inside the Universal Gensets group. The actual reactive power is then propagated to the Value **Uni Gen 2 Actual Q** and is aggregated to the value **Uni Gen Actual Q**. The format (resolution) of this input has to correspond to the Power Format selected in InteliNeo (0,1 kVAr, 1 kVAr, 0,01 MVAr).			

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Uni Gen 02 Fuel

Related FW	2.2.0	**Related applications**	MINT
LAI ID	642		
Description			
This LAI is intended for reading of fuel used volume consumed by the Universal Gensets. The kWh from each particular Universal Genset is aggregated to the common value**Fuel Used** in statistics values. This value is used for calculation of interval kWh statistic values. The format and dimension of this value depends on selected Unit Format in InteliConfig (Metric / US).			

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Uni Gen 02 kWh

Related FW	2.2.0	**Related applications**	MINT
LAI ID	622		
Description			
This LAI is intended for reading of energy produced by the Universal Gensets. The kWh from each particular Universal Genset is aggregated to the common value **Gen kWh** in statistics values. This value is used for calculation of interval kWh statistic values.			

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Uni Gen 02 Nom P

Related FW	2.2.0	**Related applications**	MINT
LAI ID	574		
Description			
This LAI is intended for reading of nominal power of each particular universal Genset inside the Universal Gensets group. The nominal power is then propagated to the Value **Uni Gen 2 Nominal P** and is aggregated to the value **Uni Gen Nominal P**. The format (resolution) of this input has to correspond to the Power Format selected in InteliNeo (0,1 kW, 1 kW, 0,01 MW).			

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Uni Gen 03 Actual P

Related FW	2.2.0	Related applications	MINT
LAI ID	591		
Description			
This LAI is intended for reading of actual value of the active power of each particular universal Genset inside the Universal Gensets group. The actual power is then propagated to the Value **Uni Gen 3 Actual P** and is aggregated to the value **Uni Gen Actual P**. The format (resolution) of this input has to correspond to the Power Format selected in InteliNeo (0,1 kW, 1 kW, 0,01 MW).			

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Uni Gen 03 Actual Q

Related FW	2.2.0	Related applications	MINT
LAI ID	607		
Description			
This LAI is intended for reading of actual value of the reactive power of each particular universal Genset inside the Universal Gensets group. The actual reactive power is then propagated to the Value **Uni Gen 3 Actual Q** and is aggregated to the value **Uni Gen Actual Q**. The format (resolution) of this input has to correspond to the Power Format selected in InteliNeo (0,1 kVAr, 1 kVAr, 0,01 MVAr).			

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Uni Gen 03 Fuel

Related FW	2.2.0	Related applications	MINT
LAI ID	643		
Description			
This LAI is intended for reading of fuel used volume consumed by the Universal Gensets. The kWh from each particular Universal Genset is aggregated to the common value**Fuel Used** in statistics values. This value is used for calculation of interval kWh statistic values. The format and dimension of this value depends on selected Unit Format in InteliConfig (Metric / US).			

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Uni Gen 03 kWh

Related FW	2.2.0	Related applications	MINT
LAI ID	623		
Description			
This LAI is intended for reading of energy produced by the Universal Gensets. The kWh from each particular Universal Genset is aggregated to the common value **Gen kWh** in statistics values. This value is used for calculation of interval kWh statistic values.			

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Uni Gen 03 Nom P

Related FW	2.2.0	Related applications	MINT
LAI ID	575		
Description			
This LAI is intended for reading of nominal power of each particular universal Genset inside the Universal Gensets group. The nominal power is then propagated to the Value **Uni Gen 3 Nominal P** and is aggregated to the value **Uni Gen Nominal P**. The format (resolution) of this input has to correspond to the Power Format selected in InteliNeo (0,1 kW, 1 kW, 0,01 MW).			

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Uni Gen 04 Actual P

Related FW	2.2.0	Related applications	MINT
LAI ID	592		
Description			
This LAI is intended for reading of actual value of the active power of each particular universal Genset inside the Universal Gensets group. The actual power is then propagated to the Value **Uni Gen 4 Actual P** and is aggregated to the value **Uni Gen Actual P**. The format (resolution) of this input has to correspond to the Power Format selected in InteliNeo (0,1 kW, 1 kW, 0,01 MW).			

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Uni Gen 04 Actual Q

Related FW	2.2.0	Related applications	MINT
LAI ID	608		
Description			
This LAI is intended for reading of actual value of the reactive power of each particular universal Genset inside the Universal Gensets group. The actual reactive power is then propagated to the Value **Uni Gen 4 Actual Q** and is aggregated to the value **Uni Gen Actual Q**. The format (resolution) of this input has to correspond to the Power Format selected in InteliNeo (0,1 kVAr, 1 kVAr, 0,01 MVAr).			

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Uni Gen 04 Fuel

Related FW	2.2.0	Related applications	MINT
LAI ID	644		
Description			
This LAI is intended for reading of fuel used volume consumed by the Universal Gensets. The kWh from each particular Universal Genset is aggregated to the common value**Fuel Used** in statistics values. This value is used for calculation of interval kWh statistic values. The format and dimension of this value depends on selected Unit Format in InteliConfig (Metric / US).			

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Uni Gen 04 kWh

Related FW	2.2.0	**Related applications**	MINT
LAI ID	624		
Description			
This LAI is intended for reading of energy produced by the Universal Gensets. The kWh from each particular Universal Genset is aggregated to the common value **Gen kWh** in statistics values. This value is used for calculation of interval kWh statistic values.			

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Uni Gen 04 Nom P

Related FW	2.2.0	**Related applications**	MINT
LAI ID	576		
Description			
This LAI is intended for reading of nominal power of each particular universal Genset inside the Universal Gensets group. The nominal power is then propagated to the Value **Uni Gen 4 Nominal P** and is aggregated to the value **Uni Gen Nominal P**. The format (resolution) of this input has to correspond to the Power Format selected in InteliNeo (0,1 kW, 1 kW, 0,01 MW).			

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Uni Gen 05 Actual P

Related FW	2.2.0	**Related applications**	MINT, MPTM
LAI ID	593		
Description			
This LAI is intended for reading of actual value of the active power of each particular universal Genset inside the Universal Gensets group. The actual power is then propagated to the Value **Uni Gen 5 Actual P** and is aggregated to the value **Uni Gen Actual P**. The format (resolution) of this input has to correspond to the Power Format selected in InteliNeo (0,1 kW, 1 kW, 0,01 MW).			

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Uni Gen 05 Actual Q

Related FW	2.2.0	**Related applications**	MINT, MPTM
LAI ID	609		
Description			
This LAI is intended for reading of actual value of the reactive power of each particular universal Genset inside the Universal Gensets group. The actual reactive power is then propagated to the Value **Uni Gen 5 Actual Q** and is aggregated to the value **Uni Gen Actual Q**. The format (resolution) of this input has to correspond to the Power Format selected in InteliNeo (0,1 kVAr, 1 kVAr, 0,01 MVAr).			

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Uni Gen 05 Fuel

Related FW	2.2.0	**Related applications**	MINT, MPTM
LAI ID	645		
Description			
This LAI is intended for reading of fuel used volume consumed by the Universal Gensets. The kWh from each particular Universal Genset is aggregated to the common value**Fuel Used** in statistics values. This value is used for calculation of interval kWh statistic values. The format and dimension of this value depends on selected Unit Format in InteliConfig (Metric / US).			

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Uni Gen 05 kWh

Related FW	2.2.0	**Related applications**	MINT, MPTM
LAI ID	625		
Description			
This LAI is intended for reading of energy produced by the Universal Gensets. The kWh from each particular Universal Genset is aggregated to the common value **Gen kWh** in statistics values. This value is used for calculation of interval kWh statistic values.			

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Uni Gen 05 Nom P

Related FW	2.2.0	**Related applications**	MINT, MPTM
LAI ID	577		
Description			
This LAI is intended for reading of nominal power of each particular universal Genset inside the Universal Gensets group. The nominal power is then propagated to the Value **Uni Gen 5 Nominal P** and is aggregated to the value **Uni Gen Nominal P**. The format (resolution) of this input has to correspond to the Power Format selected in InteliNeo (0,1 kW, 1 kW, 0,01 MW).			

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Uni Gen 06 Actual P

Related FW	2.2.0	**Related applications**	MINT, MPTM
LAI ID	594		
Description			
This LAI is intended for reading of actual value of the active power of each particular universal Genset inside the Universal Gensets group. The actual power is then propagated to the Value **Uni Gen 6 Actual P** and is aggregated to the value **Uni Gen Actual P**. The format (resolution) of this input has to correspond to the Power Format selected in InteliNeo (0,1 kW, 1 kW, 0,01 MW).			

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Uni Gen 06 Actual Q

Related FW	2.2.0	**Related applications**	MINT, MPTM
LAI ID	610		
Description			
This LAI is intended for reading of actual value of the reactive power of each particular universal Genset inside the Universal Gensets group. The actual reactive power is then propagated to the Value **Uni Gen 6 Actual Q** and is aggregated to the value **Uni Gen Actual Q**. The format (resolution) of this input has to correspond to the Power Format selected in InteliNeo (0,1 kVAr, 1 kVAr, 0,01 MVAr).			

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Uni Gen 06 Fuel

Related FW	2.2.0	**Related applications**	MINT, MPTM
LAI ID	646		
Description			
This LAI is intended for reading of fuel used volume consumed by the Universal Gensets. The kWh from each particular Universal Genset is aggregated to the common value**Fuel Used** in statistics values. This value is used for calculation of interval kWh statistic values. The format and dimension of this value depends on selected Unit Format in InteliConfig (Metric / US).			

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Uni Gen 06 kWh

Related FW	2.2.0	**Related applications**	MINT, MPTM
LAI ID	626		
Description			
This LAI is intended for reading of energy produced by the Universal Gensets. The kWh from each particular Universal Genset is aggregated to the common value **Gen kWh** in statistics values. This value is used for calculation of interval kWh statistic values.			

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Uni Gen 06 Nom P

Related FW	2.2.0	**Related applications**	MINT, MPTM
LAI ID	578		
Description			
This LAI is intended for reading of nominal power of each particular universal Genset inside the Universal Gensets group. The nominal power is then propagated to the Value **Uni Gen 6 Nominal P** and is aggregated to the value **Uni Gen Nominal P**. The format (resolution) of this input has to correspond to the Power Format selected in InteliNeo (0,1 kW, 1 kW, 0,01 MW).			

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Uni Gen 07 Actual P

Related FW	2.2.0	**Related applications**	MINT, MPTM
LAI ID	595		
Description			
This LAI is intended for reading of actual value of the active power of each particular universal Genset inside the Universal Gensets group. The actual power is then propagated to the Value **Uni Gen 7 Actual P** and is aggregated to the value **Uni Gen Actual P**. The format (resolution) of this input has to correspond to the Power Format selected in InteliNeo (0,1 kW, 1 kW, 0,01 MW).			

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Uni Gen 07 Actual Q

Related FW	2.2.0	**Related applications**	MINT, MPTM
LAI ID	611		
Description			
This LAI is intended for reading of actual value of the reactive power of each particular universal Genset inside the Universal Gensets group. The actual reactive power is then propagated to the Value **Uni Gen 7 Actual Q** and is aggregated to the value **Uni Gen Actual Q**. The format (resolution) of this input has to correspond to the Power Format selected in InteliNeo (0,1 kVAr, 1 kVAr, 0,01 MVAr).			

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Uni Gen 07 Fuel

Related FW	2.2.0	**Related applications**	MINT, MPTM
LAI ID	647		
Description			
This LAI is intended for reading of fuel used volume consumed by the Universal Gensets. The kWh from each particular Universal Genset is aggregated to the common value**Fuel Used** in statistics values. This value is used for calculation of interval kWh statistic values. The format and dimension of this value depends on selected Unit Format in InteliConfig (Metric / US).			

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Uni Gen 07 kWh

Related FW	2.2.0	**Related applications**	MINT, MPTM
LAI ID	627		
Description			
This LAI is intended for reading of energy produced by the Universal Gensets. The kWh from each particular Universal Genset is aggregated to the common value **Gen kWh** in statistics values. This value is used for calculation of interval kWh statistic values.			

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Uni Gen 07 Nom P

Related FW	2.2.0	Related applications	MINT, MPTM
LAI ID	579		
Description			
This LAI is intended for reading of nominal power of each particular universal Genset inside the Universal Gensets group. The nominal power is then propagated to the Value **Uni Gen 7 Nominal P** and is aggregated to the value **Uni Gen Nominal P**. The format (resolution) of this input has to correspond to the Power Format selected in InteliNeo (0,1 kW, 1 kW, 0,01 MW).			

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Uni Gen 08 Actual P

Related FW	2.2.0	Related applications	MINT, MPTM
LAI ID	596		
Description			
This LAI is intended for reading of actual value of the active power of each particular universal Genset inside the Universal Gensets group. The actual power is then propagated to the Value **Uni Gen 8 Actual P** and is aggregated to the value **Uni Gen Actual P**. The format (resolution) of this input has to correspond to the Power Format selected in InteliNeo (0,1 kW, 1 kW, 0,01 MW).			

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Uni Gen 08 Actual Q

Related FW	2.2.0	Related applications	MINT, MPTM
LAI ID	612		
Description			
This LAI is intended for reading of actual value of the reactive power of each particular universal Genset inside the Universal Gensets group. The actual reactive power is then propagated to the Value **Uni Gen 8 Actual Q** and is aggregated to the value **Uni Gen Actual Q**. The format (resolution) of this input has to correspond to the Power Format selected in InteliNeo (0,1 kVAr, 1 kVAr, 0,01 MVAr).			

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Uni Gen 08 Fuel

Related FW	2.2.0	Related applications	MINT, MPTM
LAI ID	648		
Description			
This LAI is intended for reading of fuel used volume consumed by the Universal Gensets. The kWh from each particular Universal Genset is aggregated to the common value**Fuel Used** in statistics values. This value is used for calculation of interval kWh statistic values. The format and dimension of this value depends on selected Unit Format in InteliConfig (Metric / US).			

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Uni Gen 08 kWh

Related FW	2.2.0	**Related applications**	MINT, MPTM
LAI ID	628		
Description			
This LAI is intended for reading of energy produced by the Universal Gensets. The kWh from each particular Universal Genset is aggregated to the common value **Gen kWh** in statistics values. This value is used for calculation of interval kWh statistic values.			

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Uni Gen 08 Nom P

Related FW	2.2.0	**Related applications**	MINT, MPTM
LAI ID	580		
Description			
This LAI is intended for reading of nominal power of each particular universal Genset inside the Universal Gensets group. The nominal power is then propagated to the Value **Uni Gen 8 Nominal P** and is aggregated to the value **Uni Gen Nominal P**. The format (resolution) of this input has to correspond to the Power Format selected in InteliNeo (0,1 kW, 1 kW, 0,01 MW).			

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Uni Gen 09 Actual P

Related FW	2.2.0	**Related applications**	MINT, MPTM
LAI ID	597		
Description			
This LAI is intended for reading of actual value of the active power of each particular universal Genset inside the Universal Gensets group. The actual power is then propagated to the Value **Uni Gen 9 Actual P** and is aggregated to the value **Uni Gen Actual P**. The format (resolution) of this input has to correspond to the Power Format selected in InteliNeo (0,1 kW, 1 kW, 0,01 MW).			

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Uni Gen 09 Actual Q

Related FW	2.2.0	**Related applications**	MINT, MPTM
LAI ID	613		
Description			
This LAI is intended for reading of actual value of the reactive power of each particular universal Genset inside the Universal Gensets group. The actual reactive power is then propagated to the Value **Uni Gen 9 Actual Q** and is aggregated to the value **Uni Gen Actual Q**. The format (resolution) of this input has to correspond to the Power Format selected in InteliNeo (0,1 kVAr, 1 kVAr, 0,01 MVAr).			

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Uni Gen 09 Fuel

Related FW	2.2.0	**Related applications**	MINT, MPTM
LAI ID	649		
Description			
This LAI is intended for reading of fuel used volume consumed by the Universal Gensets. The kWh from each particular Universal Genset is aggregated to the common value**Fuel Used** in statistics values. This value is used for calculation of interval kWh statistic values. The format and dimension of this value depends on selected Unit Format in InteliConfig (Metric / US).			

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Uni Gen 09 kWh

Related FW	2.2.0	**Related applications**	MINT, MPTM
LAI ID	629		
Description			
This LAI is intended for reading of energy produced by the Universal Gensets. The kWh from each particular Universal Genset is aggregated to the common value **Gen kWh** in statistics values. This value is used for calculation of interval kWh statistic values.			

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Uni Gen 09 Nom P

Related FW	2.2.0	**Related applications**	MINT, MPTM
LAI ID	581		
Description			
This LAI is intended for reading of nominal power of each particular universal Genset inside the Universal Gensets group. The nominal power is then propagated to the Value **Uni Gen 9 Nominal P** and is aggregated to the value **Uni Gen Nominal P**. The format (resolution) of this input has to correspond to the Power Format selected in InteliNeo (0,1 kW, 1 kW, 0,01 MW).			

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Uni Gen 10 Actual P

Related FW	2.2.0	**Related applications**	MINT, MPTM
LAI ID	598		
Description			
This LAI is intended for reading of actual value of the active power of each particular universal Genset inside the Universal Gensets group. The actual power is then propagated to the Value **Uni Gen 10 Actual P** and is aggregated to the value **Uni Gen Actual P**. The format (resolution) of this input has to correspond to the Power Format selected in InteliNeo (0,1 kW, 1 kW, 0,01 MW).			

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Uni Gen 10 Actual Q

Related FW	2.2.0	**Related applications**	MINT, MPTM
LAI ID	614		
Description			
This LAI is intended for reading of actual value of the reactive power of each particular universal Genset inside the Universal Gensets group. The actual reactive power is then propagated to the Value **Uni Gen 10 Actual Q** and is aggregated to the value **Uni Gen Actual Q**. The format (resolution) of this input has to correspond to the Power Format selected in InteliNeo (0,1 kVAr, 1 kVAr, 0,01 MVAr).			

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Uni Gen 10 Fuel

Related FW	2.2.0	**Related applications**	MINT, MPTM
LAI ID	650		
Description			
This LAI is intended for reading of fuel used volume consumed by the Universal Gensets. The kWh from each particular Universal Genset is aggregated to the common value**Fuel Used** in statistics values. This value is used for calculation of interval kWh statistic values. The format and dimension of this value depends on selected Unit Format in InteliConfig (Metric / US).			

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Uni Gen 10 kWh

Related FW	2.2.0	**Related applications**	MINT, MPTM
LAI ID	630		
Description			
This LAI is intended for reading of energy produced by the Universal Gensets. The kWh from each particular Universal Genset is aggregated to the common value **Gen kWh** in statistics values. This value is used for calculation of interval kWh statistic values.			

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Uni Gen 10 Nom P

Related FW	2.2.0	**Related applications**	MINT, MPTM
LAI ID	582		
Description			
This LAI is intended for reading of nominal power of each particular universal Genset inside the Universal Gensets group. The nominal power is then propagated to the Value **Uni Gen 10 Nominal P** and is aggregated to the value **Uni Gen Nominal P**. The format (resolution) of this input has to correspond to the Power Format selected in InteliNeo (0,1 kW, 1 kW, 0,01 MW).			

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Uni Gen 11 Actual P

Related FW	2.2.0	**Related applications**	MINT, MPTM
LAI ID	599		
Description			
This LAI is intended for reading of actual value of the active power of each particular universal Genset inside the Universal Gensets group. The actual power is then propagated to the Value **Uni Gen 11 Actual P** and is aggregated to the value **Uni Gen Actual P**. The format (resolution) of this input has to correspond to the Power Format selected in InteliNeo (0,1 kW, 1 kW, 0,01 MW).			

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Uni Gen 11 Actual Q

Related FW	2.2.0	**Related applications**	MINT, MPTM
LAI ID	615		
Description			
This LAI is intended for reading of actual value of the reactive power of each particular universal Genset inside the Universal Gensets group. The actual reactive power is then propagated to the Value **Uni Gen 11 Actual Q** and is aggregated to the value **Uni Gen Actual Q**. The format (resolution) of this input has to correspond to the Power Format selected in InteliNeo (0,1 kVAr, 1 kVAr, 0,01 MVAr).			

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Uni Gen 11 Fuel

Related FW	2.2.0	**Related applications**	MINT, MPTM
LAI ID	651		
Description			
This LAI is intended for reading of fuel used volume consumed by the Universal Gensets. The kWh from each particular Universal Genset is aggregated to the common value**Fuel Used** in statistics values. This value is used for calculation of interval kWh statistic values. The format and dimension of this value depends on selected Unit Format in InteliConfig (Metric / US).			

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Uni Gen 11 kWh

Related FW	2.2.0	**Related applications**	MINT, MPTM
LAI ID	631		
Description			
This LAI is intended for reading of energy produced by the Universal Gensets. The kWh from each particular Universal Genset is aggregated to the common value **Gen kWh** in statistics values. This value is used for calculation of interval kWh statistic values.			

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Uni Gen 11 Nom P

Related FW	2.2.0	**Related applications**	MINT, MPTM
LAI ID	583		
Description			
This LAI is intended for reading of nominal power of each particular universal Genset inside the Universal Gensets group. The nominal power is then propagated to the Value **Uni Gen 11 Nominal P** and is aggregated to the value **Uni Gen Nominal P**. The format (resolution) of this input has to correspond to the Power Format selected in InteliNeo (0,1 kW, 1 kW, 0,01 MW).			

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Uni Gen 12 Actual P

Related FW	2.2.0	**Related applications**	MINT, MPTM
LAI ID	600		
Description			
This LAI is intended for reading of actual value of the active power of each particular universal Genset inside the Universal Gensets group. The actual power is then propagated to the Value **Uni Gen 12 Actual P** and is aggregated to the value **Uni Gen Actual P**. The format (resolution) of this input has to correspond to the Power Format selected in InteliNeo (0,1 kW, 1 kW, 0,01 MW).			

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Uni Gen 12 Actual Q

Related FW	2.2.0	**Related applications**	MINT, MPTM
LAI ID	616		
Description			
This LAI is intended for reading of actual value of the reactive power of each particular universal Genset inside the Universal Gensets group. The actual reactive power is then propagated to the Value **Uni Gen 12 Actual Q** and is aggregated to the value **Uni Gen Actual Q**. The format (resolution) of this input has to correspond to the Power Format selected in InteliNeo (0,1 kVAr, 1 kVAr, 0,01 MVAr).			

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Uni Gen 12 Fuel

Related FW	2.2.0	**Related applications**	MINT, MPTM
LAI ID	652		
Description			
This LAI is intended for reading of fuel used volume consumed by the Universal Gensets. The kWh from each particular Universal Genset is aggregated to the common value**Fuel Used** in statistics values. This value is used for calculation of interval kWh statistic values. The format and dimension of this value depends on selected Unit Format in InteliConfig (Metric / US).			

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Uni Gen 12 kWh

Related FW	2.2.0	**Related applications**	MINT, MPTM
LAI ID	632		
Description			
This LAI is intended for reading of energy produced by the Universal Gensets. The kWh from each particular Universal Genset is aggregated to the common value **Gen kWh** in statistics values. This value is used for calculation of interval kWh statistic values.			

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Uni Gen 12 Nom P

Related FW	2.2.0	**Related applications**	MINT, MPTM
LAI ID	584		
Description			
This LAI is intended for reading of nominal power of each particular universal Genset inside the Universal Gensets group. The nominal power is then propagated to the Value **Uni Gen 12 Nominal P** and is aggregated to the value **Uni Gen Nominal P**. The format (resolution) of this input has to correspond to the Power Format selected in InteliNeo (0,1 kW, 1 kW, 0,01 MW).			

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Uni Gen 13 Actual P

Related FW	2.2.0	**Related applications**	MINT, MPTM
LAI ID	601		
Description			
This LAI is intended for reading of actual value of the active power of each particular universal Genset inside the Universal Gensets group. The actual power is then propagated to the Value **Uni Gen 13 Actual P** and is aggregated to the value **Uni Gen Actual P**. The format (resolution) of this input has to correspond to the Power Format selected in InteliNeo (0,1 kW, 1 kW, 0,01 MW).			

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Uni Gen 13 Actual Q

Related FW	2.2.0	**Related applications**	MINT, MPTM
LAI ID	617		
7Description			
This LAI is intended for reading of actual value of the reactive power of each particular universal Genset inside the Universal Gensets group. The actual reactive power is then propagated to the Value **Uni Gen 13 Actual Q** and is aggregated to the value **Uni Gen Actual Q**. The format (resolution) of this input has to correspond to the Power Format selected in InteliNeo (0,1 kVAr, 1 kVAr, 0,01 MVAr).			

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Uni Gen 13 Fuel

Related FW	2.2.0	**Related applications**	MINT, MPTM
LAI ID	653		
Description			
This LAI is intended for reading of fuel used volume consumed by the Universal Gensets. The kWh from each particular Universal Genset is aggregated to the common value**Fuel Used** in statistics values. This value is used for calculation of interval kWh statistic values. The format and dimension of this value depends on selected Unit Format in InteliConfig (Metric / US).			

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Uni Gen 13 kWh

Related FW	2.2.0	**Related applications**	MINT, MPTM
LAI ID	633		
Description			
This LAI is intended for reading of energy produced by the Universal Gensets. The kWh from each particular Universal Genset is aggregated to the common value **Gen kWh** in statistics values. This value is used for calculation of interval kWh statistic values.			

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Uni Gen 13 Nom P

Related FW	2.2.0	**Related applications**	MINT, MPTM
LAI ID	585		
Description			
This LAI is intended for reading of nominal power of each particular universal Genset inside the Universal Gensets group. The nominal power is then propagated to the Value **Uni Gen 13 Nominal P** and is aggregated to the value **Uni Gen Nominal P**. The format (resolution) of this input has to correspond to the Power Format selected in InteliNeo (0,1 kW, 1 kW, 0,01 MW).			

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Uni Gen 14 Actual P

Related FW	2.2.0	**Related applications**	MINT, MPTM
LAI ID	602		
Description			
This LAI is intended for reading of actual value of the active power of each particular universal Genset inside the Universal Gensets group. The actual power is then propagated to the Value **Uni Gen 14 Actual P** and is aggregated to the value **Uni Gen Actual P**. The format (resolution) of this input has to correspond to the Power Format selected in InteliNeo (0,1 kW, 1 kW, 0,01 MW).			

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Uni Gen 14 Actual Q

Related FW	2.2.0	**Related applications**	MINT, MPTM
LAI ID	618		
Description			
This LAI is intended for reading of actual value of the reactive power of each particular universal Genset inside the Universal Gensets group. The actual reactive power is then propagated to the Value **Uni Gen 14 Actual Q** and is aggregated to the value **Uni Gen Actual Q**. The format (resolution) of this input has to correspond to the Power Format selected in InteliNeo (0,1 kVAr, 1 kVAr, 0,01 MVAr).			

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Uni Gen 14 Fuel

Related FW	2.2.0	**Related applications**	MINT, MPTM
LAI ID	654		
Description			
This LAI is intended for reading of fuel used volume consumed by the Universal Gensets. The kWh from each particular Universal Genset is aggregated to the common value**Fuel Used** in statistics values. This value is used for calculation of interval kWh statistic values. The format and dimension of this value depends on selected Unit Format in InteliConfig (Metric / US).			

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Uni Gen 14 kWh

Related FW	2.2.0	**Related applications**	MINT, MPTM
LAI ID	634		
Description			
This LAI is intended for reading of energy produced by the Universal Gensets. The kWh from each particular Universal Genset is aggregated to the common value **Gen kWh** in statistics values. This value is used for calculation of interval kWh statistic values.			

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Uni Gen 14 Nom P

Related FW	2.2.0	**Related applications**	MINT, MPTM
LAI ID	586		
Description			
This LAI is intended for reading of nominal power of each particular universal Genset inside the Universal Gensets group. The nominal power is then propagated to the Value **Uni Gen 14 Nominal P** and is aggregated to the value **Uni Gen Nominal P**. The format (resolution) of this input has to correspond to the Power Format selected in InteliNeo (0,1 kW, 1 kW, 0,01 MW).			

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Uni Gen 15 Actual P

Related FW	2.2.0	**Related applications**	MINT, MPTM
LAI ID	603		
Description			
This LAI is intended for reading of actual value of the active power of each particular universal Genset inside the Universal Gensets group. The actual power is then propagated to the Value **Uni Gen 15 Actual P** and is aggregated to the value **Uni Gen Actual P**. The format (resolution) of this input has to correspond to the Power Format selected in InteliNeo (0,1 kW, 1 kW, 0,01 MW).			

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Uni Gen 15 Actual Q

Related FW	2.2.0	**Related applications**	MINT, MPTM
LAI ID	619		
Description			
This LAI is intended for reading of actual value of the reactive power of each particular universal Genset inside the Universal Gensets group. The actual reactive power is then propagated to the Value **Uni Gen 15 Actual Q** and is aggregated to the value **Uni Gen Actual Q**. The format (resolution) of this input has to correspond to the Power Format selected in InteliNeo (0,1 kVAr, 1 kVAr, 0,01 MVAr).			

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Uni Gen 15 Fuel

Related FW	2.2.0	**Related applications**	MINT, MPTM
LAI ID	655		
Description			
This LAI is intended for reading of fuel used volume consumed by the Universal Gensets. The kWh from each particular Universal Genset is aggregated to the common value**Fuel Used** in statistics values. This value is used for calculation of interval kWh statistic values. The format and dimension of this value depends on selected Unit Format in InteliConfig (Metric / US).			

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Uni Gen 15 kWh

Related FW	2.2.0	**Related applications**	MINT, MPTM
LAI ID	635		
Description			
This LAI is intended for reading of energy produced by the Universal Gensets. The kWh from each particular Universal Genset is aggregated to the common value **Gen kWh** in statistics values. This value is used for calculation of interval kWh statistic values.			

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Uni Gen 15 Nom P

Related FW	2.2.0	**Related applications**	MINT, MPTM
LAI ID	587		
Description			
This LAI is intended for reading of nominal power of each particular universal Genset inside the Universal Gensets group. The nominal power is then propagated to the Value **Uni Gen 15 Nominal P** and is aggregated to the value **Uni Gen Nominal P**. The format (resolution) of this input has to correspond to the Power Format selected in InteliNeo (0,1 kW, 1 kW, 0,01 MW).			

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Uni Gen 16 Actual P

Related FW	2.2.0	**Related applications**	MINT, MPTM
LAI ID	604		
Description			
This LAI is intended for reading of actual value of the active power of each particular universal Genset inside the Universal Gensets group. The actual power is then propagated to the Value **Uni Gen 16 Actual P** and is aggregated to the value **Uni Gen Actual P**. The format (resolution) of this input has to correspond to the Power Format selected in InteliNeo (0,1 kW, 1 kW, 0,01 MW).			

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Uni Gen 16 Actual Q

Related FW	2.2.0	**Related applications**	MINT, MPTM
LAI ID	620		
Description			
This LAI is intended for reading of actual value of the reactive power of each particular universal Genset inside the Universal Gensets group. The actual reactive power is then propagated to the Value **Uni Gen 16 Actual Q** and is aggregated to the value **Uni Gen Actual Q**. The format (resolution) of this input has to correspond to the Power Format selected in InteliNeo (0,1 kVAr, 1 kVAr, 0,01 MVAr).			

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Uni Gen 16 Fuel

Related FW	2.2.0	**Related applications**	MINT, MPTM
LAI ID	656		
Description			
This LAI is intended for reading of fuel used volume consumed by the Universal Gensets. The kWh from each particular Universal Genset is aggregated to the common value**Fuel Used** in statistics values. This value is used for calculation of interval kWh statistic values. The format and dimension of this value depends on selected Unit Format in InteliConfig (Metric / US).			

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Uni Gen 16 kWh

Related FW	2.2.0	**Related applications**	MINT, MPTM
LAI ID	636		
Description			
This LAI is intended for reading of energy produced by the Universal Gensets. The kWh from each particular Universal Genset is aggregated to the common value **Gen kWh** in statistics values. This value is used for calculation of interval kWh statistic values.			

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Uni Gen 16 Nom P

Related FW	2.2.0	**Related applications**	MINT, MPTM
LAI ID	588		
Description			
This LAI is intended for reading of nominal power of each particular universal Genset inside the Universal Gensets group. The nominal power is then propagated to the Value **Uni Gen 16 Nominal P** and is aggregated to the value **Uni Gen Nominal P**. The format (resolution) of this input has to correspond to the Power Format selected in InteliNeo (0,1 kW, 1 kW, 0,01 MW).			

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LAI: W

WT 01 Actual P

Related FW	2.2.0	**Related applications**	MINT, MPTM
LAI ID	502		
Description			
This LAI is designed to monitor actual power of the WT 1.			

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WT 01 Actual Q

Related FW	2.2.0	**Related applications**	MINT, MPTM
LAI ID	510		
Description			
This LAI is designed to monitor actual reactive power of the WT 1.			

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WT 01 kWh

Related FW	2.2.0	**Related applications**	MINT, MPTM
LAI ID	518		
Description			
This LAI defines the amount of energy produced by WT 1 and is used as a source for statistic values.			

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WT 01 Nominal P

Related FW	2.2.0	**Related applications**	MINT, MPTM
LAI ID	494		
Description			
This LAI is used to define nominal power of the WT 1 used in the system.			

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WT 02 Actual P

Related FW	2.2.0	**Related applications**	MINT, MPTM
LAI ID	503		
Description			
This LAI is designed to monitor actual power of the WT 2.			

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WT 02 Actual Q

Related FW	2.2.0	**Related applications**	MINT, MPTM
LAI ID	511		
Description			
This LAI is designed to monitor actual reactive power of the WT 2.			

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WT 02 kWh

Related FW	2.2.0	**Related applications**	MINT, MPTM
LAI ID	519		
Description			
This LAI defines the amount of energy produced by WT 2 and is used as a source for statistic values.			

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WT 02 Nominal P

Related FW	2.2.0	**Related applications**	MINT, MPTM
LAI ID	495		
Description			
This LAI is used to define nominal power of the WT 2 used in the system.			

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WT 03 Actual P

Related FW	2.2.0	**Related applications**	MINT, MPTM
LAI ID	504		
Description			
This LAI is designed to monitor actual power of the WT 3.			

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WT 03 Actual Q

Related FW	2.2.0	**Related applications**	MINT, MPTM
LAI ID	512		
Description			
This LAI is designed to monitor actual reactive power of the WT 3.			

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WT 03 kWh

Related FW	2.2.0	**Related applications**	MINT, MPTM
LAI ID	520		
Description			
This LAI defines the amount of energy produced by WT 3 and is used as a source for statistic values.			

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WT 03 Nominal P

Related FW	2.2.0	**Related applications**	MINT, MPTM
LAI ID	496		
Description			
This LAI is used to define nominal power of the WT 3 used in the system.			

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WT 04 Actual P

Related FW	2.2.0	**Related applications**	MINT, MPTM
LAI ID	505		
Description			
This LAI is designed to monitor actual power of the WT 4.			

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WT 04 Actual Q

Related FW	2.2.0	**Related applications**	MINT, MPTM
LAI ID	513		
Description			
This LAI is designed to monitor actual reactive power of the WT 4.			

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WT 04 kWh

Related FW	2.2.0	**Related applications**	MINT, MPTM
LAI ID	521		
Description			
This LAI defines the amount of energy produced by WT 4 and is used as a source for statistic values.			

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WT 04 Nominal P

Related FW	2.2.0	**Related applications**	MINT, MPTM
LAI ID	497		
Description			
This LAI is used to define nominal power of the WT 4 used in the system.			

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WT 05 Nominal P

Related FW	2.2.0	**Related applications**	MINT, MPTM
LAI ID	498		
Description			
This LAI is used to define nominal power of the WT 5 used in the system.			

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WT 05 Actual Q

Related FW	2.2.0	**Related applications**	MINT, MPTM
LAI ID	514		
Description			
This LAI is designed to monitor actual reactive power of the WT 5.			

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WT 05 Actual P

Related FW	2.2.0	**Related applications**	MINT, MPTM
LAI ID	506		
Description			
This LAI is designed to monitor actual power of the WT 5.			

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WT 05 kWh

Related FW	2.2.0	**Related applications**	MINT, MPTM
LAI ID	522		
Description			
This LAI defines the amount of energy produced by WT 5 and is used as a source for statistic values.			

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WT 06 Actual P

Related FW	2.2.0	**Related applications**	MINT, MPTM
LAI ID	507		
Description			
This LAI is designed to monitor actual power of the WT 6.			

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WT 06 Actual Q

Related FW	2.2.0	**Related applications**	MINT, MPTM
LAI ID	515		
Description			
This LAI is designed to monitor actual reactive power of the WT 6.			

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WT 06 kWh

Related FW	2.2.0	**Related applications**	MINT, MPTM
LAI ID	523		
Description			
This LAI defines the amount of energy produced by WT 6 and is used as a source for statistic values.			

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WT 06 Nominal P

Related FW	2.2.0	**Related applications**	MINT, MPTM
LAI ID	499		
Description			
This LAI is used to define nominal power of the WT 6 used in the system.			

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WT 07 Actual P

Related FW	2.2.0	**Related applications**	MINT, MPTM
LAI ID	508		
Description			
This LAI is designed to monitor actual power of the WT 7.			

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WT 07 Actual Q

Related FW	2.2.0	**Related applications**	MINT, MPTM
LAI ID	516		
Description			
This LAI is designed to monitor actual reactive power of the WT 7.			

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WT 07 kWh

Related FW	2.2.0	**Related applications**	MINT, MPTM
LAI ID	524		
Description			
This LAI defines the amount of energy produced by WT 7 and is used as a source for statistic values.			

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WT 07 Nominal P

Related FW	2.2.0	**Related applications**	MINT, MPTM
LAI ID	500		
Description			
This LAI is used to define nominal power of the WT 7 used in the system.			

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WT 08 Actual P

Related FW	2.2.0	**Related applications**	MINT, MPTM
LAI ID	509		
Description			
This LAI is designed to monitor actual power of the WT 8.			

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WT 08 Actual Q

Related FW	2.2.0	**Related applications**	MINT, MPTM
LAI ID	517		
Description			
This LAI is designed to monitor actual reactive power of the WT 8.			

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WT 08 kWh

Related FW	2.2.0	**Related applications**	MINT, MPTM
LAI ID	525		
Description			
This LAI defines the amount of energy produced by WT 8 and is used as a source for statistic values.			

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WT 08 Nominal P

Related FW	2.2.0	**Related applications**	MINT, MPTM
LAI ID	501		
Description			
This LAI is used to define nominal power of the WT 8 used in the system.			

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11.2 Fixed Protection States

11.2.1 List of Fixed Protection States

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Fixed Protections States 1

Related FW	2.2.0	Related applications	MINT, MPTM
Comm object	20744		

Description

This is a group of fixed protection states.

List of protection states by bits:

1. **Wrn Brute Force Protection Active**
2. **Wrn Redundant CAN data mismatch**
3. **Wrn CAN2 Empty**
4. **Wrn SHBIN Collision**
5. **Wrn SHAIN Collision**
6. Not Used
7. **Wrn Universal Genset Overflow**
8. Not Used
9. Not Used
10. Not Used
11. Not Used
12. Not Used
13. Not Used
14. Not Used
15. Not Used
16. **Wrn Battery Undervoltage**
17. **Wrn Battery Overvoltage**
18. **Wrn SD Card Failed**
19. **Wrn Long Term History Fail**
20. Not Used
21. Not Used
22. Not Used
23. **Wrn Override All Sd**
24. Not Used
25. Not Used
26. **Wrn PF Control Fail**
27. **Wrn Q Control Fail**
28. **Wrn Q(Um) Fail**
29. **Wrn Qref/Ulim Fail**
30. **Wrn Q(P) Fail**
31. **Wrn PF(Pm) Fail**
32. **Wrn P(Um) Fail**

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Fixed Protections States 2

Related FW	2.2.0	Related applications	MINT, MPTM
Comm object	20745		
Description			

This is a group of fixed protection states.

List of protection states by bits:

1. **Sd BESS >V L1-N**
2. **Sd BESS >V L2-N**
3. **Sd BESS >V L3-N**
4. **SdBESS >V L1-L2**
5. **Sd BESS >V L2-L3**
6. **Sd BESS >V L3-L1**
7. **Sd BESS >>V L1-N**
8. **Sd BESS >>V L2-N**
9. **Sd BESS >>V L3-N**
10. **Sd BESS >>V L1-L2**
11. **Sd BESS >>V L2-L3**
12. **Sd BESS >>V L3-L1**
13. **Sd BESS <V L1-N**
14. **Sd BESS <V L2-N**
15. **Sd BESS <V L3-N**
16. **Sd BESSMains <V L1-L2**
17. **Sd BESSMains <V L2-L3**
18. **Sd BESSMains <V L3-L1**
19. **Sd BESS V Unbalance Ph-N**
20. **Sd BESS V Unbalance Ph-Ph**
21. **Sd BESS >f**
22. **Sd BESS <f**
23. Not Used
24. Not Used
25. **Sd IDMT Overload**
26. **Sd Short Circuit**
27. **Sd IDMT BESS >A**
28. **Sd IDMT Earth Fault Current**
29. **Sd BESS Current Unbalance**
30. **ALI BESS Ph Rotation Opposite**
31. **PV Not Operable**
32. **PV Anti Islanding**

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Fixed Protections States 3

Related FW	2.2.0	Related applications	MINT, MPTM
Comm object	20746		
Description			

This is a group of fixed protection states.

List of protection states by bits:

1. **Emergency Stop**
2. **Daily Battery Cycles Reached**
3. Not Used
4. Not Used
5. **Wrn Stop Fail**
6. **Wrn SOC Low Alarm**
7. **Wrn SOC High Alarm**
8. **Sd SOC Critical Low**
9. **Sd SOC Critical High**
10. Not Used
11. **Wrn Frequency Regulation Limit**
12. **Wrn Voltage Regulation Limit**
13. **Stp Synchronization Fail**
14. **WrnHst Reverse Synchronization Fail**
15. **Stp BCB Fail**
16. **Stp BCB Secondary Fail**
17. **Sd NCB Fail**
18. **Dead Bus BCB Blocked**
19. **PVCB Fail**
20. **PVCB Fail To Open**
21. **PVCB Fail To Close**
22. **Sd BESS SOC Not Configured**
23. **Stp BESS SOC Not Available**
24. **Sd DC Circuit Close Fail**
25. **Sd BCB Feedback Not Closed**
26. Not Used
27. Not Used
28. Not Used
29. Not Used
30. Not Used
31. Not Used
32. **ALI Manual Restore**

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Fixed Protections States 4

Related FW	2.2.0	Related applications	MINT, MPTM
Comm object	20747		
Description			

This is a group of fixed protection states.

1. **Mains/Bus >V L1-N**
2. **Mains/Bus >V L2-N**
3. **Mains/Bus >V L3-N**
4. **Mains/Bus >V L1-L2**
5. **Mains/Bus >V L2-L3**
6. **Mains/Bus >V L3-L1**
7. **Mains/Bus >>V L1-N**
8. **Mains/Bus >>V L2-N**
9. **Mains/Bus >>V L3-N**
10. **Mains/Bus >>V L1-L2**
11. **Mains/Bus >>V L2-L3**
12. **Mains/Bus >>V L3-L1**
13. **Mains Avg >V L1-N**
14. **Mains Avg >V L2-N**
15. **Mains Avg >V L3-N**
16. **Mains Avg >V L1-L2**
17. **Mains Avg >V L2-L3**
18. **Mains Avg >V L3-L1**
19. **Mains/Bus <V L1-N**
20. **Mains/Bus <V L2-N**
21. **Mains/Bus <V L3-N**
22. **Mains/Bus <V L1-L2**
23. **Mains/Bus <V L2-L3**
24. **Mains/Bus <V L3-L1**
25. **Mains/Bus <<V L1-N**
26. **Mains/Bus <<V L2-N**
27. **Mains/Bus <<V L3-N**
28. **Mains/Bus <<V L1-L2**
29. **Mains/Bus <<V L2-L3**
30. **Mains/Bus <<V L3-L1**
31. **Mains/BusV Unbalance Ph-Ph**
32. **Mains/Bus V Unbalance Ph-N**

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Fixed Protections States 5

Related FW	2.2.0	Related applications	MINT, MPTM
Comm object	20748		
Description			

This is a group of fixed protection states.

List of protection states by bits:

1. **Mains/Bus >f**
2. **Mains/Bus >>f**
3. **Mains/Bus <f**
4. **Mains/Bus <<f**
5. **ALI Mains Ph Rotation Opposite**
6. **ALI BESS Ph Rotation Opposite**
7. **Wrn MCB Fail**
8. **Bus Meas Error**
9. **BESS Anti Islanding**
10. **Wrn Test UPQF**
11. **SyncNotAllowed**
12. **Wrn P for Q Fail**
13. **Wrn Q&U Protection**
14. **MP VRT Protection Trip**
15. **MP MP VRT Protection Trip**
16. **Soft Transfer Fail**
17. **Wrn Fence 1 Alarm**
18. **Wrn Fence 1 Alarm**
19. **BOCWrn Fence 1 Alarm**
20. **Wrn Fence 1 Alarm**
21. **Wrn Fence 2 Alarm**
22. **Sd Fence 2 Alarm**
23. **BOCFence 2 Alarm**
24. **Fence 2 Alarm**
25. Not Used
26. Not Used
27. Not Used
28. Not Used
29. Not Used
30. Not Used
31. Not Used
32. **Wrn SD Card File System Failed**

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Fixed Protections States 6

Related FW	2.2.0	Related applications	MINT, MPTM
Comm object	20749		
Description			

This is a group of fixed protection states.

List of protection states by bits:

1. **Wrn ECU 1 Comm Fail**
2. **Wrn ECU 1 Comm Fail**
3. **Wrn ECU 2 Comm Fail**
4. **Wrn ECU 2 Comm Fail**
5. **Wrn ECU 3 Comm Fail**
6. **Wrn ECU 3 Comm Fail**
7. **Wrn ECU 4 Comm Fail**
8. **Wrn ECU 4 Comm Fail**
9. **Wrn ECU 5 Comm Fail**
10. **Wrn ECU 5 Comm Fail**
11. **Wrn ECU 6 Comm Fail**
12. **Wrn ECU 6 Comm Fail**
13. **Wrn ECU 7 Comm Fail**
14. **Wrn ECU 7 Comm Fail**
15. **Wrn ECU 8 Comm Fail**
16. **Wrn ECU 8 Comm Fail**
17. **Wrn ECU 9 Comm Fail**
18. **Wrn ECU 9 Comm Fail**
19. **Wrn ECU 10 Comm Fail**
20. **Wrn ECU 10 Comm Fail**
21. **Wrn ECU 11 Comm Fail**
22. **Wrn ECU 11 Comm Fail**
23. **Wrn ECU 12 Comm Fail**
24. **Wrn ECU 12 Comm Fail**
25. **Wrn ECU 13 Comm Fail**
26. **Wrn ECU 13 Comm Fail**
27. **Wrn ECU 14 Comm Fail**
28. **Wrn ECU 14 Comm Fail**
29. **Wrn ECU 15 Comm Fail**
30. **Wrn ECU 15 Comm Fail**
31. **Wrn ECU 16 Comm Fail**
32. **Wrn ECU 16 Comm Fail**

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Fixed Protections States 7

Related FW	2.2.0	Related applications	MINT, MPTM
Comm object	20750		
Description			

This is a group of fixed protection states.

List of protection states by bits:

1. **Wrn Alarm e-mail 1 Fail**
2. **Wrn Alarm e-mail 2 Fail**
3. **Wrn Alarm e-mail 3 Fail**
4. **Wrn Alarm e-mail 4 Fail**
5. **Wrn SNMP TRAP 1 Fail**
6. **Wrn SNMP TRAP 2 Fail**
7. **Wrn Maintenance Timer 1 RunHours**
8. **Stp Maintenance Timer 1 RunHours**
9. **Wrn Maintenance 2 RunHours**
10. **Stp Maintenance 2 RunHours**
11. **Wrn Maintenance 3 RunHours**
12. **Maintenance 3 RunHours**
13. **Wrn Maintenance 4 RunHours**
14. **Stp Maintenance 4 RunHours**
15. **Wrn Maintenance 1 Interval**
16. **Maintenance 1 Interval**
17. **Wrn Maintenance 2 Interval**
18. **Maintenance 2 Interval**
19. **Wrn Maintenance 3 Interval**
20. **Stp Maintenance 3 Interval**
21. **Wrn Maintenance 4 Interval**
22. **Stp Maintenance 4 Interval**
23. **Wrn MCB Fail To Open**
24. **Wrn MCB Fail To Close**
25. **Sd BCB Fail To Open**
26. **Sd BCB Fail To Close**
27. **Stp BCB Secondary Fail To Open**
28. **Stp BCB Secondary Fail To Close**
29. **ALI SD Card Not Compatible**
30. **ALI SD Card In Slot**
31. **ALI SD Card Full**
32. **ALI SD Card Formatting/Mounting**

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Fixed Protections States 8

Related FW	2.2.0	Related applications	MINT, MPTM
Comm object	20751		
Description			

This is a group of fixed protection states.

List of protection states by bits:

1. Wrn ECU 17 Comm Fail
2. Sd ECU 17 Comm Fail
3. Wrn ECU 18 Comm Fail
4. Sd ECU 18 Comm Fail
5. Wrn ECU 19 Comm Fail
6. Sd ECU 19 Comm Fail
7. Wrn ECU 20 Comm Fail
8. Sd ECU 20 Comm Fail
9. Wrn ECU 21 Comm Fail
10. Sd ECU 21 Comm Fail
11. Wrn ECU 22 Comm Fail
12. Sd ECU 22 Comm Fail
13. Wrn ECU 23 Comm Fail
14. Sd ECU 23 Comm Fail
15. Wrn ECU 24 Comm Fail
16. Sd ECU 24 Comm Fail
17. Wrn ECU 25 Comm Fail
18. Sd ECU 25 Comm Fail
19. Wrn ECU 26 Comm Fail
20. Sd ECU 26 Comm Fail
21. Wrn ECU 27 Comm Fail
22. Sd ECU 27 Comm Fail
23. Wrn ECU 28 Comm Fail
24. Sd ECU 28 Comm Fail
25. Wrn ECU 29 Comm Fail
26. Sd ECU 29 Comm Fail
27. Wrn ECU 30 Comm Fail
28. Sd ECU 30 Comm Fail
29. Wrn ECU 31 Comm Fail
30. Sd ECU 31 Comm Fail
31. Wrn ECU 32 Comm Fail
32. Sd ECU 32 Comm Fail

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11.3 User Protection States

11.3.1 List of User Protection States

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User Protections States 3 1441
User Protections States 4 1441
User Protections States 5 1441
User Protections States 6 1442
User Protections States 7 1442
User Protections States 8 1442
User Protections States 9 1442
User Protections States 10 1442

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User Protections States 1

Related FW	2.2.0	**Related applications**	MINT, MPTM
Comm object	20759		
Description			
This is a group of user protection states.			

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User Protections States 2

Related FW	2.2.0	**Related applications**	MINT, MPTM
Comm object	20760		
Description			
This is a group of user protection states.			

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User Protections States 3

Related FW	2.2.0	**5Related applications**	MINT, MPTM
Comm object	20761		
Description			
This is a group of user protection states.			

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User Protections States 4

Related FW	2.2.0	**Related applications**	MINT, MPTM
Comm object	20762		
Description			
This is a group of user protection states.			

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User Protections States 5

Related FW	2.2.0	**Related applications**	MINT, MPTM
Comm object	20763		
Description			
This is a group of user protection states.			

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User Protections States 6

Related FW	2.2.0	**Related applications**	MINT, MPTM
Comm object	20764		
Description			
This is a group of user protection states.			

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User Protections States 7

Related FW	2.2.0	**Related applications**	MINT, MPTM
Comm object	20765		
Description			
This is a group of user protection states.			

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User Protections States 8

Related FW	2.2.0	**Related applications**	MINT, MPTM
Comm object	20766		
Description			
This is a group of user protection states.			

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User Protections States 9

Related FW	2.2.0	**Related applications**	MINT, MPTM
Comm object	20767		
Description			
This is a group of user protection states.			

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User Protections States 10

Related FW	2.2.0	**Related applications**	MINT, MPTM
Comm object	20768		
Description			
This is a group of user protection states.			

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11.4 PLC

11.4.1 List of PLC blocks

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Hold 1491

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PWR Calc 1495
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Integration 1499

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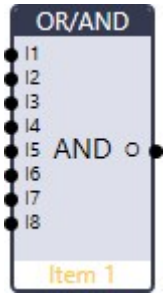
Group: Logical functions

OR/AND

PLC group	Logical functions	
Related FW	2.2.0	
Related applications	MINT, MPTM	
PLC Block ID	1	

Inputs

Input	Type	Negation	Range	Function
Input 1	Binary	Yes	0/1	Input 1
Input 2	Binary	Yes	0/1	Input 2
Input 3	Binary	Yes	0/1	Input 3 (optional)
Input 4	Binary	Yes	0/1	Input 4 (optional)
Input 5	Binary	Yes	0/1	Input 5 (optional)
Input 6	Binary	Yes	0/1	Input 6 (optional)
Input 7	Binary	Yes	0/1	Input 7 (optional)
Input 8	Binary	Yes	0/1	Input 8 (optional)

Outputs

Output	Type	Negation	Range	Function
Output	Binary	Yes	0/1	Result of the logical operation

Description

The block performs logical operation OR / AND of 2 - 8 binary operands. The inputs as well as the output can be inverted.

Function OR

Input 1	Input 2	Output
0	0	0
0	1	1
1	0	1
1	1	1

Function AND

Input 1	Input 2	Output
0	0	0
0	1	0
1	0	0
1	1	1

There have to be at least 2 inputs every time. There may be up to 8 inputs configured.

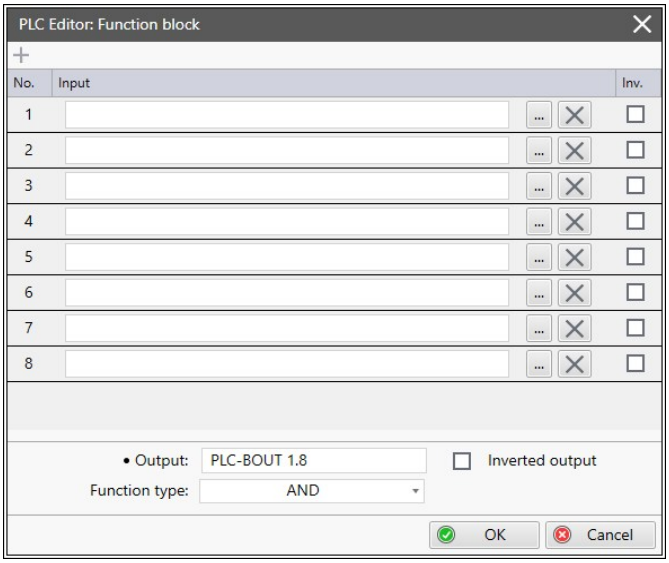


Image 22.45 Configuration of OR/AND block

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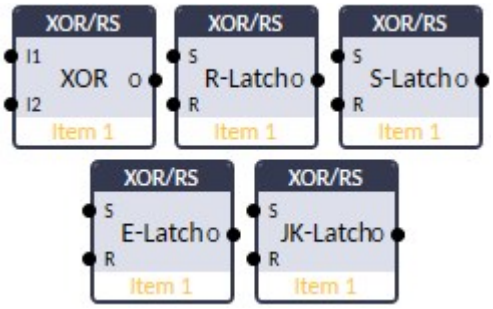
XOR/RS

PLC group	Logical functions	
Related FW	2.2.0	
Related applications	MINT, MPTM	
PLC Block ID	39	

Inputs

Input	Type	Negation	Range	Function
Input 1..2	Binary	Yes	0/1	Inputs 1..2

Outputs

Output	Type	Negation	Range	Function
Output	Binary	Yes	0/1	Result of the logical operation

Description

The block performs logical (boolean) XOR operation of two binary operands or several variants of the RS flipflop function. Both Inputs and Output can be inverted.

Function type XOR

Input 1	Input 2	Output
0	0	0
0	1	1
1	0	1
1	1	0

The result of XOR operation between two binary inputs (Input 1 and Input 2) is defined by table below.

Function type RS

Input 2 (R)	Input 1 (S)	R-latch	S-latch	E-latch	JK-latch
		Q			
0	0	Q^{-1}	Q^{-1}	Q^{-1}	Q^{-1}
0	1	1	1	1	1
1	0	0	0	0	0
1	1	0	1	Q^{-1}	NOT(Q^{-1})

The Q^{-1} denotes the state of the RS block output in the last evaluation cycle.

The block Output value is given by the selected RS flip-flop variant evaluation:

- R-latch: When both inputs (R, S) are set the Reset input is dominant.
- S-latch: When both inputs (R, S) are set the Set input is dominant.
- E-latch: When both inputs (R, S) are set the previous output is preserved.
- JK-latch: When both inputs (R, S) are set the block output is negated.

The block has the setting for the variant functions of the RS flip-flop circuit. This setting is

available in the block configuration dialog (i.e. it is done in the configuration and cannot be changed dynamically while the PLC is running).

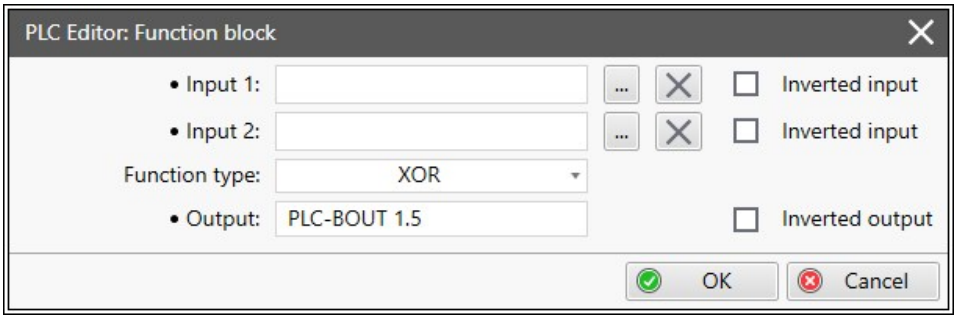


Image 22.46 Configuration of XOR/RS block

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Group: Comparators

Comp Delay

PLC group	Comparators	
Related FW	2.2.0	
Related applications	MINT, MPTM	
PLC Block ID	46	

Inputs

Input	Type	Negation	Range	Function
Input 1	Analog	No	-2^{32} .. 2^{32}	Compared value
Input 2	Analog	No	-2^{32} .. 2^{32}	Comparation level
Delay	Analog	No	0.0 .. 3000.0 [s]	Comparative delay

Outputs

Output	Type	Negation	Range	Function
Output	Binary	Yes	0/1	Comparator output

Description

This PLC block compares the Input value with the Reference comparison level using the selected Relation. The Output will switch on if the Input is equal/higher/smaller/etc. than the Reference comparison level for a time longer than the Delay. All Relation operations between the Input and the Reference are described in the table below.

Relation	Name
">" (default)	greater than
">="	greater than equal
"=="	equal
"<="	less than equal
"<"	less than

Image 22.47 Configuration of Comp Delay block

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Comp Hyst

PLC group	Comparators	
Related FW	2.2.0	
Related applications	MINT, MPTM	
PLC Block ID	3	

Inputs

Input	Type	Negation	Range	Function
Input	Analog	No	-2^{32} .. 2^{32}	Compared value
Input ON	Analog	No	-2^{32} .. 2^{32}	Comparative level for switching on
Input OFF	Analog	No	-2^{32} .. 2^{32}	Comparative level for switching off

Outputs

Output	Type	Negation	Range	Function
Output	Binary	No	0/1	Comparator output

Description

TThe block compares the Input value with two comparison levels I-ON and I-OFF. The evaluation of the block depends on whether the I-ON level is higher than the I-OFF level or vice versa.

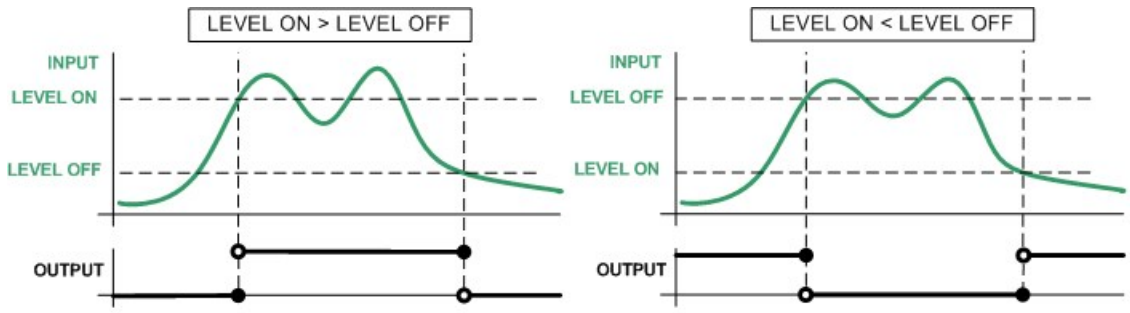

Image 22.48 Different On and Off levels

Image 22.49 Configuration of Comp Hyst block

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Comp Win

PLC group	Comparators	
Related FW	2.2.0	
Related applications	MINT, MPTM	
PLC Block ID	18	

Inputs

Input	Type	Negation	Range	Function
Input	Analog	No	-2^{32} .. 2^{32}	Compared value
Input HIGH	Analog	No	-2^{32} .. 2^{32}	Upper window limit
Input LOW	Analog	No	-2^{32} .. 2^{32}	Lower window limit

Outputs

Output	Type	Negation	Range	Function
Output	Binary	No	0/1	Comparator output

Description

The block output is switched on whenever the input value is in the range defined by Lo and Hi levels.

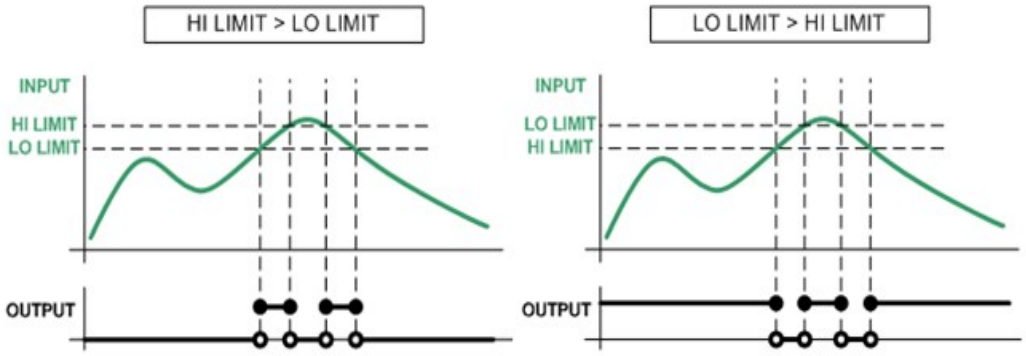

Image 22.50 Principle of delay

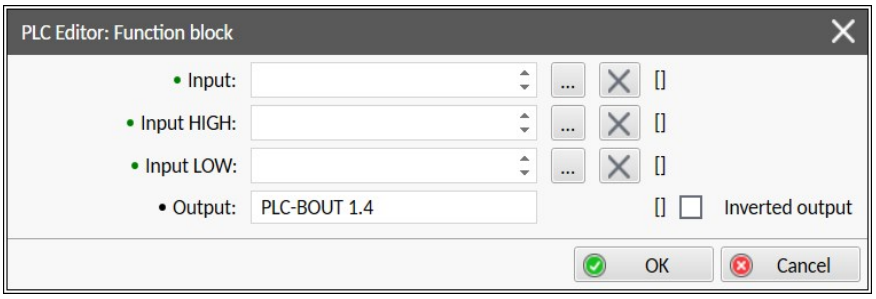

Image 22.51 Configuration of Comp Time block

Note: *All inputs and can be constants or values from controller.*

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Group: Time functions

Delay

PLC group	Time functions	
Related FW	2.2.0	
Related applications	MINT, MPTM	
PLC Block ID	33	

Inputs

Input	Type	Negation	Range	Function
Input	Binary	No	0/1	Input signal to be delayed
Input time up	Analog	No	0 .. 214 748 364,7 [s, m, h]	Delay of the rising edge resp. pulse length generated by rising edge of the input
Input time down	Analog	No	0 .. 214 748 364,7 [s, m, h]	Delay of the falling edge resp. pulse length generated by falling edge of the input
Input reset	Binary	No	0/1	Resets the output to logical 0. The output remains in logical 0 until new rising edge appears on Input (when Input reset is deactivated already)

Outputs

Output	Type	Negation	Range	Function
Output	Binary	No	0/1	Output signal

Description

This block can operate in two operating modes (Delay mode, Pulse mode) = the block mode is defined by the Pulse on edge checbox option - if checked, the Pulse mode is active.

- **Delay mode** - the rising edge at the Output is generated with a delay of the Input time up lenght when arising edge is detected on the Input. A falling edge at the Output is generated with a delay

of the Input time down length when a falling edge is detected on the Input. If the delayed falling edge at the Output arrived before the delayed rising edge, then no pulse would be generated at the Output.

- **Pulse mode** - a pulse of Input time up length is generated at the Output when a rising edge is detected, a pulse of Input time down length is generated at the Output when a falling edge is detected.

Note: *Because of 100 ms tact, the analog inputs are limited to resolution 0,1 s.*

Note: *If Input time up or Input time down value is <0, this input is internally set to zero.*

Note: *Use Pulse on edge option to choose between delay and pulse mode.*

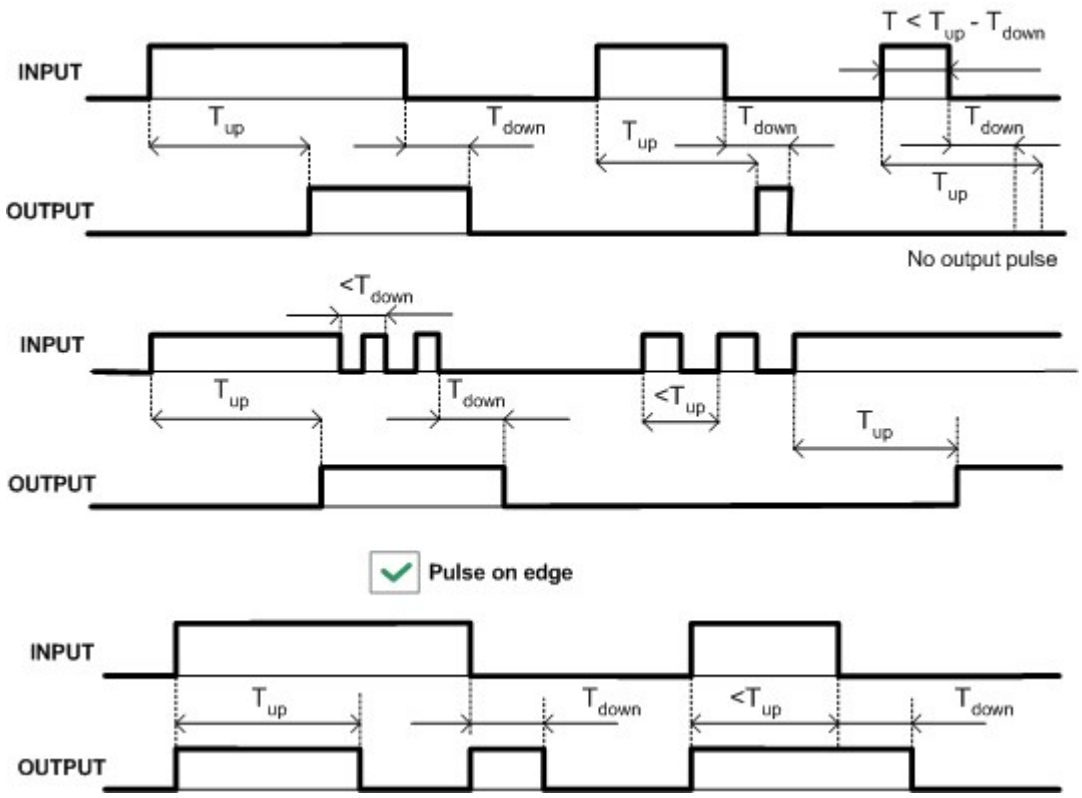

Image 22.52 Delay modes principles

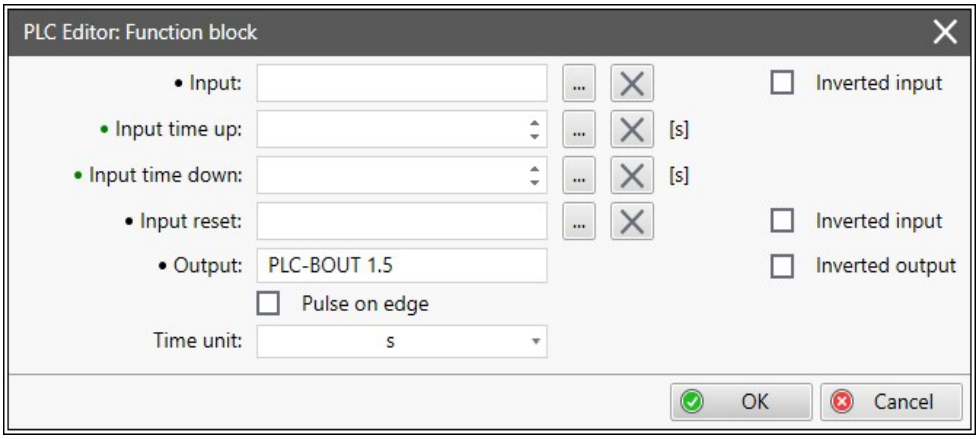

Image 22.53 Configuration of Delay block

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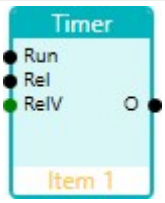
Timer

PLC group	Time functions	
Related FW	2.2.0	
Related applications	MINT, MPTM	
PLC Block ID	38	

Inputs

Input	Type	Negation	Range	Function
Run	Binary	No	0/1	The timer runs only if this input is active or not connected
Reload	Binary	No	0/1	This input reloads the timer to the initial value
Reload value	Analog	No	0,0 .. 214 748 364,7 [s]	Initial value of the timer

Outputs

Output	Type	Negation	Range	Function
Output	Binary	No	0/1	Timer output
Actual Timer Value	Analog	No	N/A	Analog value that shows Actual Timer Value Lowest available value from: **<PLC Resource 1** to **PLC Resource 16>**

Description

The block performs countdown Timer according to the selected Timer mode and actual inputs values.

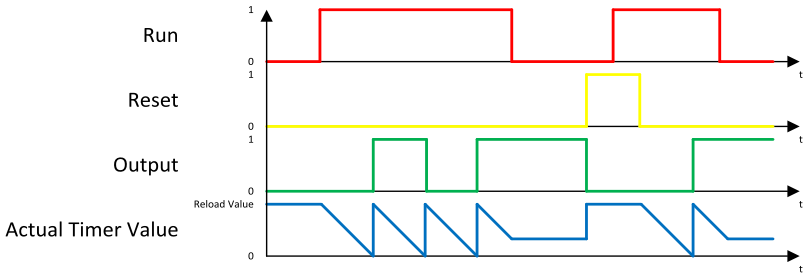
The Timer mode could be selected as:

- ComAp timer mode = if the Timer block is to generate a periodic signal at its Output
- Timer mode TP = if the Timer block is to generate a pulse signal of defined width at its Output
- Timer mode TON = if the Timer block is to delay the rising edge of the Input by a defined time.

- Timer mode TOFF = if the Timer block is to delay the falling edge of the Iutput by a defined time.

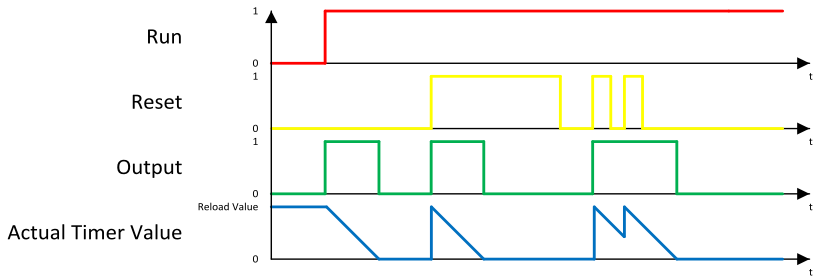
Timer mode ComAp

The Timer is counting down only when the Run is on and Reset is off. It is also reset to the Reload value if it reaches 0 or Reset is enabled. The state of the binary Output is negated whenever the Timer value is zero.



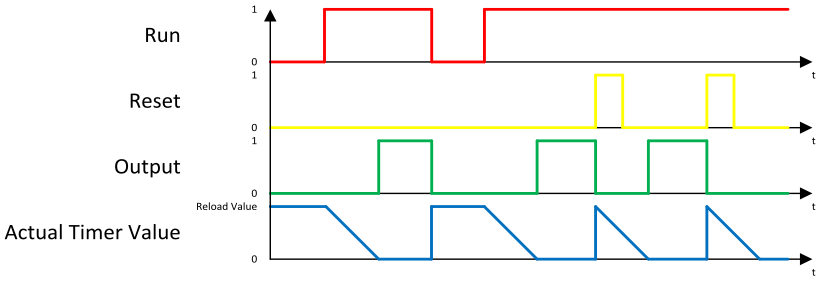
Timer mode TP

The Timer counts down when Run is on.The Reset accepts only the rising edge and is required to load the Reload value to the actual Timer value. The Output is set as long as the Actual Timer Value is not equal to 0 (the countdown is in progress).



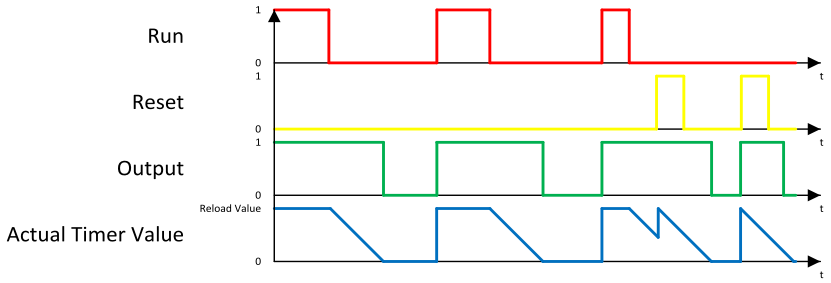
Timer mode TON

The Timer starts counting down with the rising edge of Run. The falling edge of Run, like the rising edge of Reset, reloads the Reload value to actual Timer value. The Output is set when the Actual Timer Value is 0 (the countdown is finished).



Timer mode TOF

The Timer starts counting down with the falling edge of the Run. The rising edge of Run, like the rising edge of Reset, reloads the Reload value to actual Timer value. The Output is set if the Actual Timer Value is not equal to 0 (the countdown is in progress).



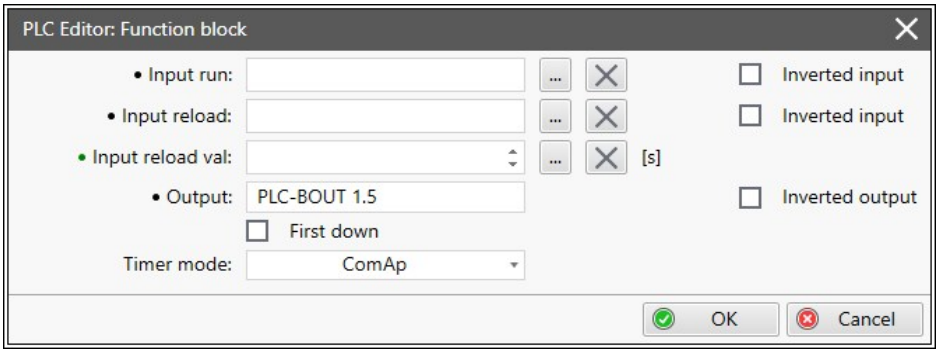


Image 22.54 Configuration of Timer block

Note: *For ComAp Timer mode: if you want the Output to start at logic 0, check the First down option. Otherwise, the Output will start at logical 1.*

IMPORTANT: For ComAp Timer mode: if no inputs are connected and the First down option is not checked, the Output is active.

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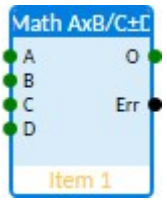
Group: Math operations

AxB/C±D

PLC group		
Related FW	2.2.0	
Related applications	MINT, MPTM	
PLC Block ID	51	

Inputs

Input	Abbr.	Type	Range	Function
Input A	A	Analog	$-2^{32}-1$ .. $+2^{32}-1$	First multiplicant
Input B	B	Analog	$-2^{32}-1$ .. $+2^{32}-1$	Second multiplicant
Input C	C	Analog	$-2^{32}-1$ .. $+2^{32}-1$	Divider
Input D	D	Analog	$-2^{32}-1$ .. $+2^{32}-1$	Additive term (optional)

Outputs

Output	Abbr.	Type	Range	Function
Output	O	Binary	$-2^{32}-1$ .. $+2^{32}-1$	Result of the operation $O = \frac{A \cdot B}{C} \pm D$
Data invalid	Err	Binary	0/1	Set when **Output** is out of range or when dividing by zero occurrs

Description

The block realizes the mathematical operation AxB/C±D. The operation ± is selected by **Function typeselector**. In case of any invalid data on any of the inputs, the **Output** is set to invalid value and **Data Invalid** is closed. The **Output** has resolution and dimension based on setting of the block.

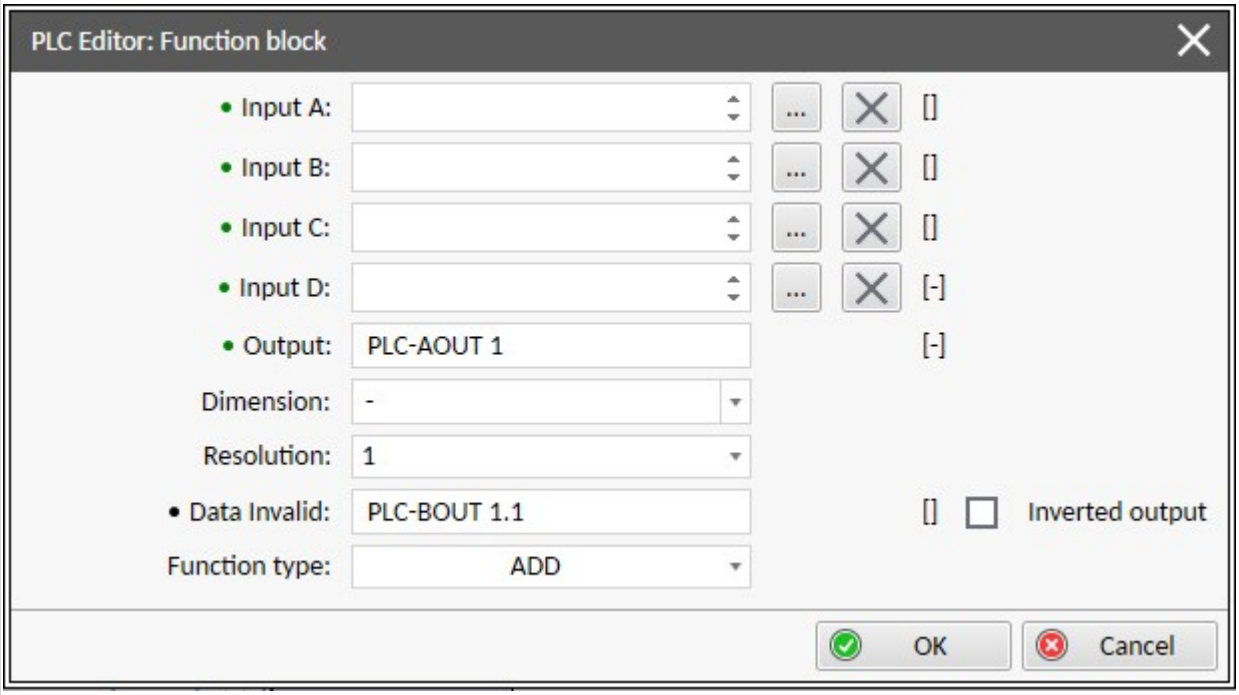


Image 22.55 Configuration of Math AxB/C±D block

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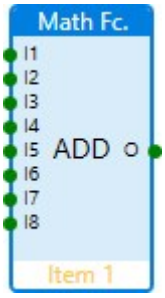
Math Fc.

PLC group		
Related FW	2.2.0	
Related applications	MINT, MPTM	
PLC Block ID	17	

Inputs

Input	Type	Negation	Range	Function
Input 1	Analog	No	-2^{32} .. 2^{32}	Input 1
Input 2	Analog	No	-2^{32} .. 2^{32}	Input 2
Input 3	Analog	No	-2^{32} .. 2^{32}	Input 3
Input 4	Analog	No	-2^{32} .. 2^{32}	Input 4
Input 5	Analog	No	-2^{32} .. 2^{32}	Input 5
Input 6	Analog	No	-2^{32} .. 2^{32}	Input 6
Input 7	Analog	No	-2^{32} .. 2^{32}	Input 7
Input 8	Analog	No	-2^{32} .. 2^{32}	Input 8

Outputs

Output	Type	Negation	Range	Function
Output	Analog	No	-2^{32} .. 2^{32}	Result of the mathematical operation

Description

This block performs basic mathematical operations of 2 to 8 operands based on selected function.All invalid inputs are ignored. If any configured input contains an invalid value and at least one configured input is valid, the output has value counted from only valid configured inputs based on the selected function. If all configured inputs are invalid output has an invalid value.

The Output has a Resolution and Dimension according to the block settings.

Function	Output
ADD - Addition	Input 1 + Input 2 + … + Input N
SUB - Substraction	Input 1 - Input 2 - … - Input N
|SUB| - Absolute value of substraction	ABS(Input 1 - Input 2 - … - Input N)
AVG - Average	Input 1 + Input 2 + … + Input N) / N
MIN - Minimal value	MIN(Input 1, Input 2, … ,Input N)
MAX - Maximal value	MAX(Input 1, Input 2, … ,Input N)

Note: *In case of AVG operation type the N is number of inputs with valid value.*

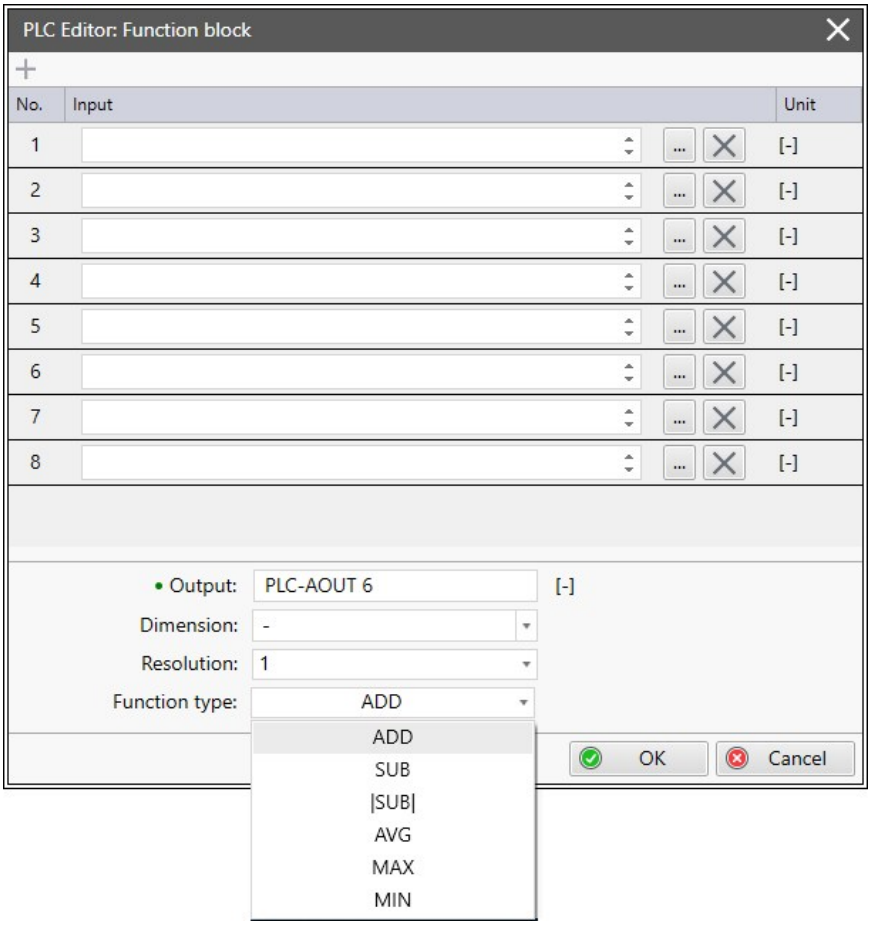


Image 22.56 Configuration of Math Fc. block

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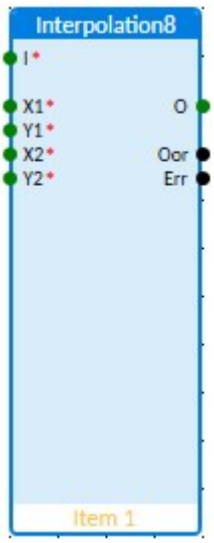
Interpolation8

PLC group		
Related FW	2.2.0	
Related applications	MINT, MPTM	
PLC Block ID	59	
Inputs		

Input	Type	Range	Function
Input	Analog	-2^{32} .. 2^{32}	Input value
X1	Analog	-2^{32} .. 2^{32}	X coordinate of the first point
Y1	Analog	-2^{32} .. 2^{32}	Y coordinate of the first point
X2	Analog	-2^{32} .. 2^{32}	X coordinate of the second point
Y2	Analog	-2^{32} .. 2^{32}	Y coordinate of the second point
...			
X8	Analog	-2^{32} .. 2^{32}	X coordinate of the eight point
Y8	Analog	-2^{32} .. 2^{32}	Y coordinate of the eight point

Outputs

Output	Type	Range	Function
Output	Analog	Y1 .. Y8	Transformed value
Out of Range	Binary	0/1	Closed when input is out of range <X1, X2>
Data Invalid	Binary	0/1	Closed when value on analog output is invalid

Description

This block performs a up-to-8-point interpolation of the input. The transformation function is defined by 2-8 pairs of points **[X1, Y1]** ,**[X2, Y2]** to **[X8, Y8]**. If the **Input** lies inside of the interval **<X1, X8>** the **Output** is given by the conversion. If the **Input** is lying outside of this interval, **Output** is saturated either on high or low limit given by **Y1** or **Y8** and Out of Range is closed. If any of the inputs gets invalid, Data Invalid is closed and **Output** is set to invalid value. The **Output**, **Y1**,... **Y8** has resolution and dimension based on settings of the block. The resolution and dimensions of the **X1**,... **X8** is same as resolution of the **Input**.

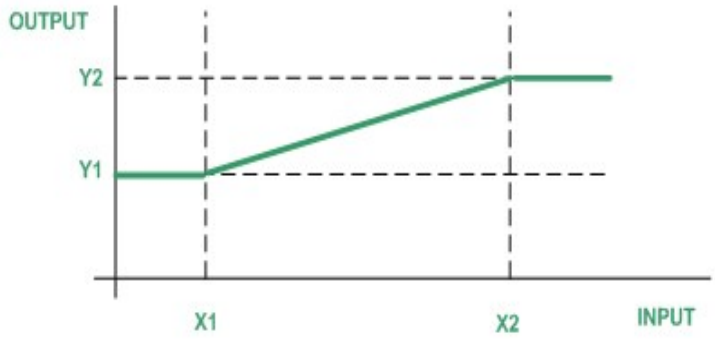


Image 22.57 Principle of Interpolation

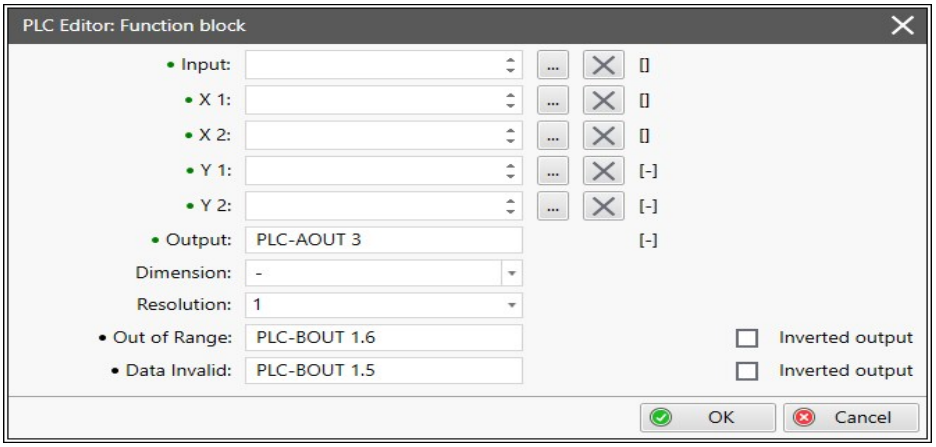


Image 22.58 Configuration of Interpolation block

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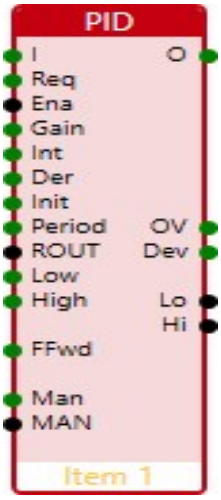
Group: Regulators

PID

PLC group		
Related FW	2.2.0	
Related applications	MINT, MPTM	
PLC Block ID	41	

Inputs

Input	Type	Negation	Range	Function
Input Value	Analog	No	-2^{32} .. 2^{32}	Actual (controlled) value "process value".
Requested Value	Analog	No	-2^{32} .. 2^{32}	Required value "setpoint value".
PID Enable	Binary	Yes	0/1	When PID Enable is not true or there is an invalid value on the Input Value of the controller the output of the PID block has a Init Value. If this input is not connected the controller is enabled.

Gain	Analog	No	-100,00 .. 100,00	Gain of the controller K. The value 0 turns the controller off. Negative values are not allowed, use the Reverse Output parameter for such a purpose.
Int	Analog	No	0,00 .. 120,00 s	Integration time constant of the controller Ti. The value 0 disables the integrating part.
Der	Analog	No	0,00 .. 4,00 s	Derivation time constant of the controller Td. The value 0 disables the derivating part.
Init Value	Analog	No	-10 000 .. 10 000	The output value is in the Init Value mode when PID Enable is not active or there is an invalid value on the Input Value of the controller. The Init Value is not limited by the Low Limit and High Limit. Output value in the Init mode is given in a whole range of regulator output (from -10 000 to 10 000).
Period	Analog	No	0,1 - 3250,0 s	Evaluation period (decimation factor of default PLC period = 100ms). The period should be adjusted according to the response speed of the system, e.g. longer period for slower systems, a shorter period for faster systems.
Reverse Output	Binary	Yes	0/1	Reverse Output: off - higher controller output → higher process value (default) on - higher controller output → lower process value
Low Limit	Analog	No	-10 000 .. 10 000	This value defines the low limit (minimum) of the controller output.
High Limit	Analog	No	-10 000 .. 10 000	This value defines the high limit (maximum) of the controller output.
FeedForward Value	Analog	No	-2^{32} .. 2^{32}	Feedforward control value.

FeedForward Weight	Analog	No	$-3{,}4^{\pm 38}$ .. $3{,}4^{\pm 38}$	Feedforward control value weight Wff (default 0 %) [Float data type]
Manual Value	Analog	No	-10 000 .. 10 000	Controller output value in MANual mode. There is a difference to the Init Value (inactive PID block) = manual value is available only while the PID Enable is true and is limited by the High Limit and Low Limit.
MANual Mode	Binary	Yes	0/1	Manual Mode: off - AUTomatic mode (default) on - MANual mode

Outputs

Output	Type	Negation	Range	Function
Output	Analog	No	-10 000 .. 10 000	Process value (controller output) "control value".
Output Velocity	Analog	No	-10 000 .. 10 000	Derivation of controller output "speed of control value".
Control Deviation	Analog	No	-10 000 .. 10 000	Control deviation (= "requested value" - "actual value").
Out Low Limit	Binary	Yes	0/1	Controller output reaches the Low Limit.
Out High Limit	Binary	Yes	0/1	Controller output reaches the High Limit.

Description

The PID block is a PID controller, created by combining a proportional, an integration and a derivative controller together (all forming the feed-back controller) with an optional forward control path (intended for the feedforward control).

The main purpose of using a PID controller is to eliminate the entry control deviation by changing the output control value (also called the manipulated value). The Control Deviation is evaluated as the difference between the Requested Value (setpoint value) and the Input Value (process value). If the controller is operating in automatic mode (MANual mode input is inactive), the action value is calculated according to the control law equation. In the case of manual control (MAN mode input is active), the value of the Manual Value is used instead. In both cases, the Output value is limited by the Low Limit and High Limit limit values.

The PID block features::

- Standard controller parameters (ISA Form).
- Limitation of the control (process) value (block output).
- Adjustable evaluation period.
- Feed-forward input (with feed-forward gain parameter).

- AUT/MAN switch with manual setpoint value.
- RACT switch (reversing of control value polarity).

The function of the PID controller can be disabled by the PID Enable. While the regulator is disabled, the output is set to a Init Value.

Note: *Negative values of Gain are not allowed, use the Reverse Output input for such a purpose.*

Note: *There is a difference between Init Value (inactive PID block) and Manual Value - Manual Value is available only while the PID Enable is true, MAN mode is enabled and is limited by the High Limit and low Limit.*

Rules for re-calculation

Parameter	ComAp	ISA form	ComAp → ISA form	ISA form → ComAp
Gain	[%]	[-]	isa_gain = comap_gain / 100.0	comap_gain = isa_gain * 100.0
Int	[%]	[s]	isa_int = 100 / comap_int	comap_int = 100 / isa_int
Der	[%]	[s]	isa_der = comap_der * 0.06	comap_der = isa_der / 0.06

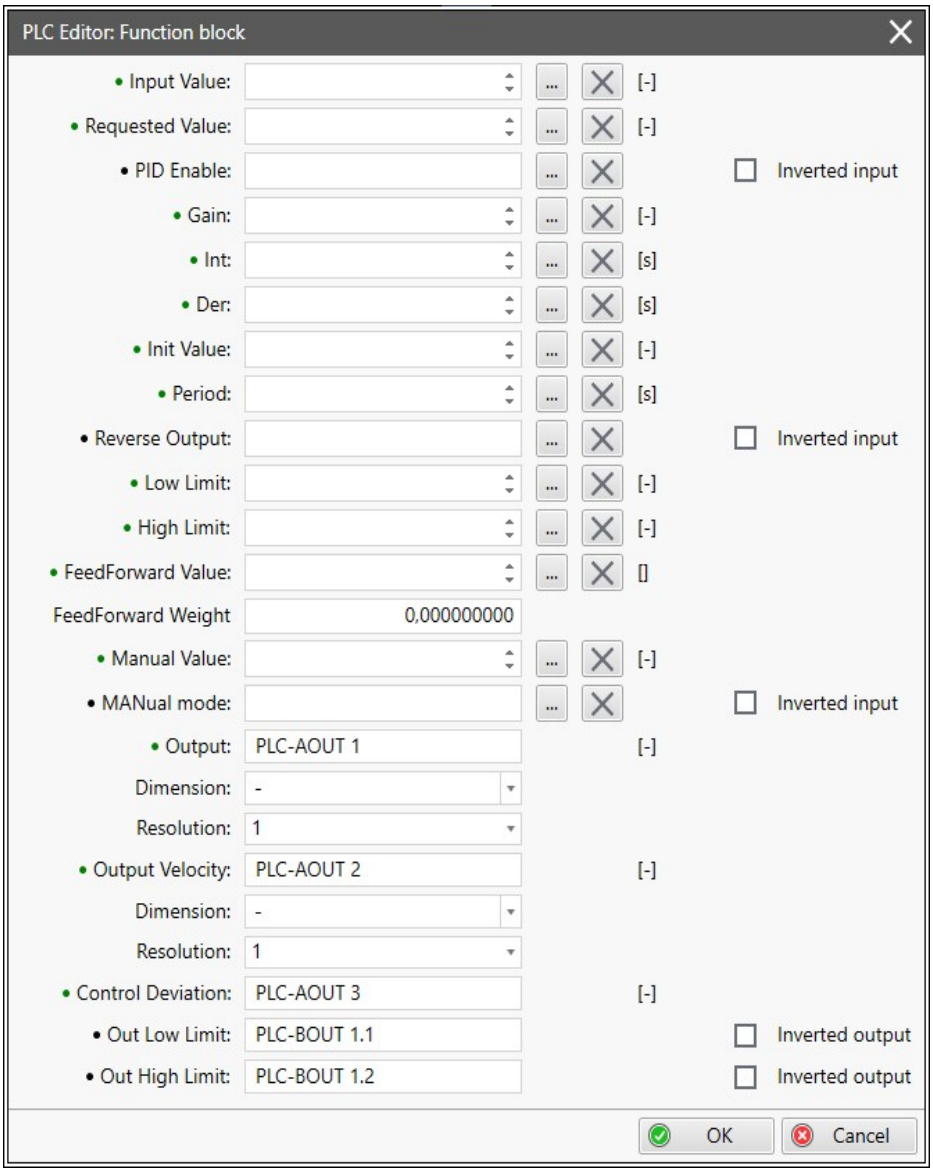


Image 22.59 Configuration of PID block

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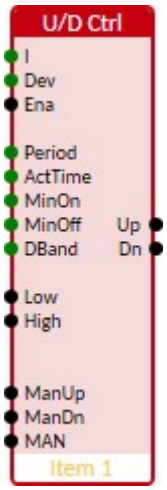
Up/Down Ctrl Block

PLC group		
Related FW	2.2.0	
Related applications	MINT, MPTM	
PLC Block ID	42	

Inputs

Input	Type	Negation	Range	Function
Input Value	Analog	No	-10 000 .. 10 000	Control value (Input) = obviously velocity output of antecedent PID control block.
Control deviation	Analog	No	-10 000 .. 10 000	Control deviation (= "requested value" - "actual value") of antecedent block (usually PID controller). Works with Deadband parameter.
U/D Enable	Binary	Yes	0/1	When U/D Enable is not true or there is an invalid value on the Input Value of the block, both the outputs (Output Up or Output Down) has a value off. If this input is not connected the controller is enabled.
Period	Analog	No	0,1 .. 3250,0 s	Period of evaluation (decimation factor of default PLC period 100ms). The time interval between the start time of one pulse to start time of the next pulse. The period should be adjusted according to the Actuator Time and shouldn't be shorter than the antecedent PID controller evaluation period.
Actuator Time	Analog	No	0,1 .. 3250,0 s	It is time that the actuator (servo, etc.) needs for changing its position from fully closed to fully open.
Min On Time	Analog	No	0,1 .. 3250,0 s	The minimum amount of time a relay is allowed to be closed (Output Up or Output Down is on).
Min Off Time	Analog	No	0,1 .. 3250,0 s	The minimum amount of time a relay is opened (Output Up or Output Down is off) during the constant switching control range. This time could be zero.

Deadband	Analog	No	-10 000 .. 10 000	Deadband range (of input Control deviation, presumed symmetrical interval) → both outputs (Output Up or Output Down) are inactive (off).
Low Limit	Binary	Yes	0/1	Antecedent controller output reaches the Low Limit.
High Limit	Binary	Yes	0/1	Antecedent controller output reaches the High Limit.
Manual Up	Binary	Yes	0/1	In MANual mode force the SCU to activate (Manual Down must be inactive) Output Up.
Manual Down	Binary	Yes	0/1	In MANual mode force the SCU to activate (Manual Up must be inactive) Output Down.
MANual Mode	Binary	Yes	0/1	Manual Mode: off - AUTomatic mode (default) on - MANual mode

Outputs

Output	Type	Negation	Range	Function
Output Up	Binary	Yes	0/1	Actuator control - Raise
Output Down	Binary	Yes	0/1	Actuator control - Lower

Description

The PLC block performs the function of Up/Down Control Unit (Relay Control block) with binary outputs Up/Down and adjustable regulation period. The function of the block can be disabled by the binary input U/D Enable. The Input signal corresponds to the speed (velocity = the change of the action variable) output of the primary controller (Output Velocity of the PID block). The input signal value is expected in range <-10000; +10000>.

If the Deadband parameter is non-zero, the switching of the outputs (Output Up or Output Down) is suppressed for input signal Control Deviation smaller than the value of Deadband. The remaining switching pulse length is still maintained for future evaluation.

If inputs Low Limit or High Limit (primary controller output reaches its limits - due to this the Input signal is zero), the remaining pulse time is maintained accordingly to perform appropriate output (Output Up or Output Down) switching.

By activating the binary input MAN, the inputs Manual Up or Manual Down are respected on the outputs (Output Up or Output Down) - when both the Manual Up or Manual Down is active, both the outputs Output Up and Output Down are inactive.

Use case:

- The U/D Ctrl block (Up/Down relay Control block) is intended for use as an output stage of the primary controller, converting its analog control action to up/down outputs (PWM controlled).
- Block parameters are therefore set according to the characteristics of the actuator connected onward.
- The PID block and U/D Ctrl block connected together thus forms PID controller with relay contrlled Up / Down outputs.
- The U/D Ctrl block itself could also act as converting block from analog value to PWM modulated

signals.

- If the U/D Ctrl block is operating in MANual mode, the manual setting of respective outputs (Output Up / Output Down) is possible.

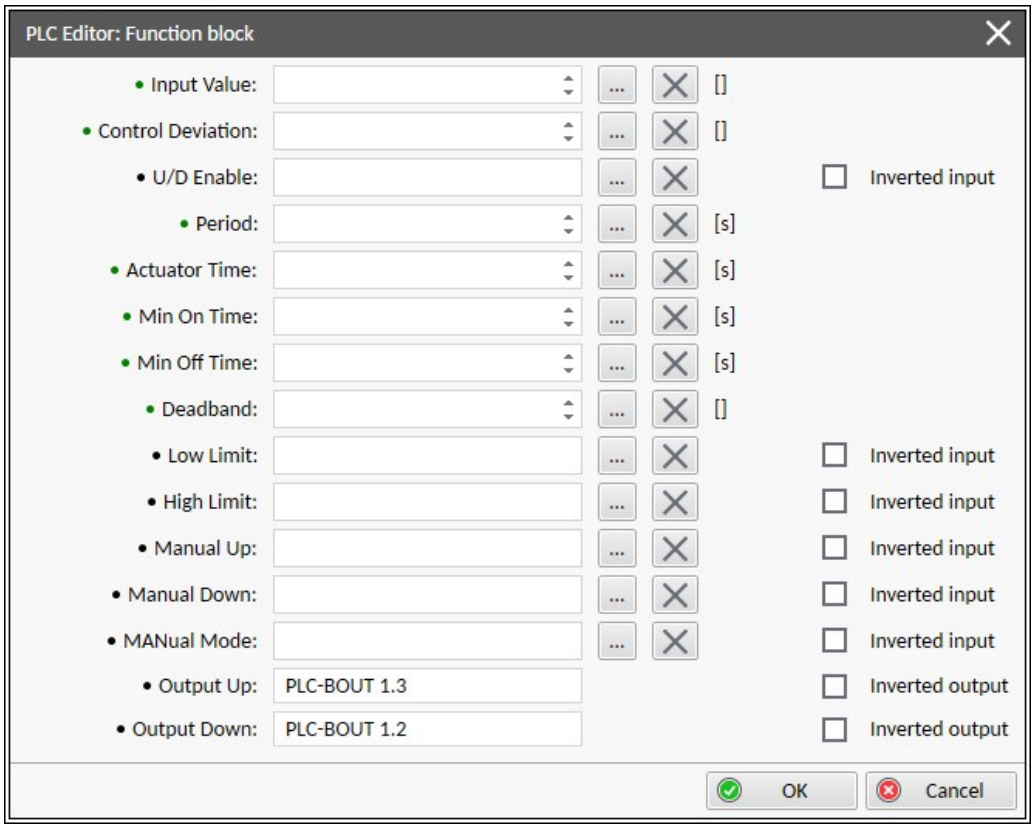


Image 22.60 Configuration of Up/Down Ctrl Block

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Group: Ramp functions

Inc/Dec

PLC group		
Related FW	2.2.0	
Related applications	MINT, MPTM	
PLC Block ID	22	

Inputs

Input	Type	Negation	Range	Function
Increment	Binary	No	0/1	Rising edge increase value of **Output** by 1
Decrement	Binary	No	0/1	Risinge edge decrease value of **Output** by 1
Reset	Binary	No	0/1	Rising edge resets **Output** to **Default**

Maximum	Analog	No	-2^{32} .. 2^{32}	Maximum value of **Output**
Default	Analog	No	-2^{32} .. 2^{32}	Initial value of **Output**

Outputs

Output	Type	Negation	Range	Function
Output	Analog	No	-2^{32} .. Maximum	Output value

Description

The block increments/decrements **Output** based on rising edge on **Increment/Decrement**.

If the Increment and Decrement edges arrive simultaneously, the Output value does not change.

- If the counter value is at Maximum and incrementation is coming, the counter will be 0 again.
- If the counter value is at 0 and decrementing is coming, the counter will have be at Maximum.

The Output can be reset by rising edge on Reset.

The Output has a Resolution and Dimension according to the block settings.

Note: *If both the inputs Increment and Decrement are active, the Output value is not changed.*

IMPORTANT: When the controller is powered off the Output value is not preserved.

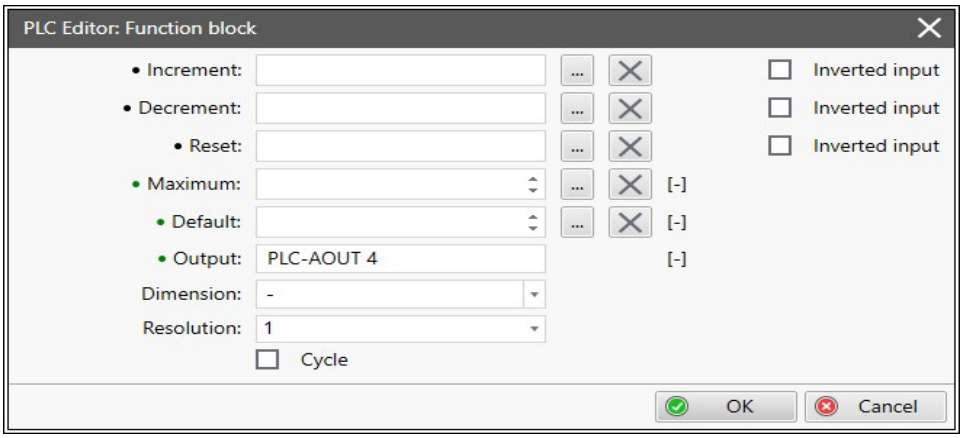

Image 22.61 Configuration of Inc/Dec block

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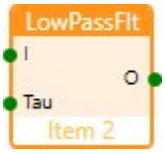
LowPassFlt

PLC group		
Related FW	2.2.0	
Related applications	MINT, MPTM	
PLC Block ID	40	

Inputs

Input	Type	Negation	Range	Function
Input	Analog	No	-2^{32} .. 2^{32}	Input Value
Tau	Analog	No	0,0 .. 60,0 [s]	Time Constant of the filter

Outputs

Output	Type	Negation	Range	Function
Output	Analog	No	-2^{32} .. 2^{32}	Filtered **Input**

Description

The block performs the function of the first-order low pass filter. Typical usage of this function is filtering of a value whose instantaneous value fluctuates rapidly around its mean, which is changing slower. The **Output** has resolution and dimension based on setting of the block.

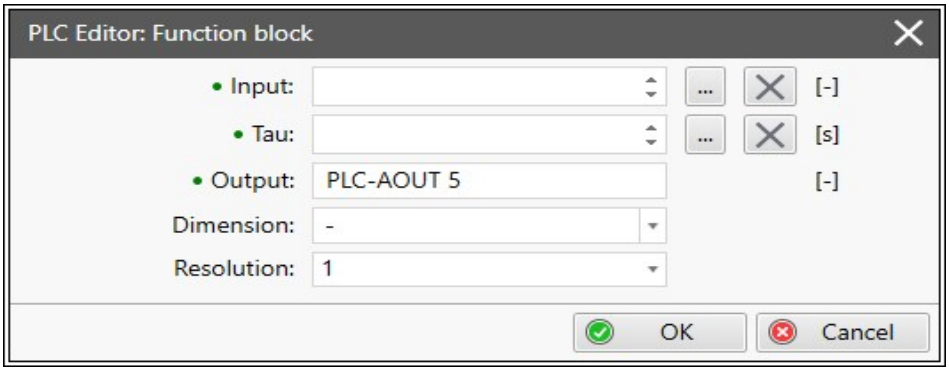


Image 22.62 Configuration of LowPassFlt block

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Mov Avg

PLC group		
Related FW	2.2.0	
Related applications	MINT, MPTM	
PLC Block ID	7	

Inputs

Input	Type	Negation	Range	Function
Input	Analog	No	-2^{32} .. 2^{32}	Input Value
Filter Length	Analog	No	1 .. 16	Filter length = length of sample train
Sampling Period	Analog	No	0,1 .. 3600,0 [s]	Time interval between samples
Reset	Binary	No	0/1	Reset (clearing) of filter internal memory
Enable	Binary	No	0/1	Filter processing enable (If this input is not connected the block is enabled.)

Outputs

Output	Type	Negation	Range	Function
Output	Analog	No	-2^{32} .. 2^{32}	Filtered **Input**

Description
The block calculates the arithmetic mean of the N most recent samples of the input value with a selectable sampling interval. The filter uses sample train (sequence of successive samples) for computation of the filtered value as arithmetic average of N last samples of the input value. The simple average computation is used: Typical usage of this function is filtering of a value whose instantaneous value fluctuates rapidly around its mean, which is changing slower. The **Output** has resolution and dimension based on setting of the block.

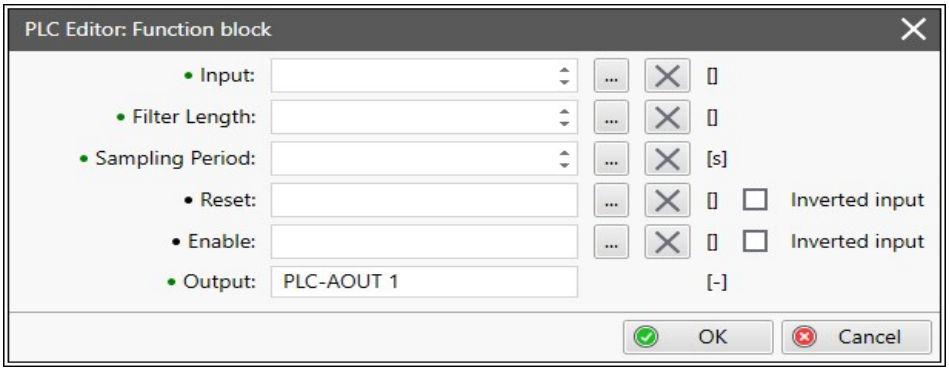

Image 22.63 Configuration of Moving Average block

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Ramp

PLC group		
Related FW	2.2.0	
Related applications	MINT, MPTM	
PLC Block ID	19	

Inputs

Input	Type	Negation	Range	Function
Input	Analog	No	-2^{32} .. 2^{32}	Value to be ramped
Up	Analog	No	-2^{32} .. 2^{32}	Maximal rising rate of the **Output** per second /minute (based on **Time unit** setting)
Down	Analog	No	-2^{32} .. 2^{32}	Maximal lowering rate of the **Output** per second/minute (based on **Time unit** setting)

Outputs

Output	Type	Negation	Range	Function
Output	Analog	No	-2^{32} .. 2^{32}	Ramped value

Description

This block limits maximal rate of change of **Output**. The maximal rates **Up** and **Down** are adjustable separately and ramping is based on enabled ramps. Time base of the Up/Down rate is defined by **Time**

unit setting. The **Output** has resolution and dimension based on setting of the block.

Function	Description
Enabled Up	**Output** can be ramped only up.
Enabled Down	**Output** can be ramped only down.
Enabled Up/Down	**Output** can be ramped up and down.

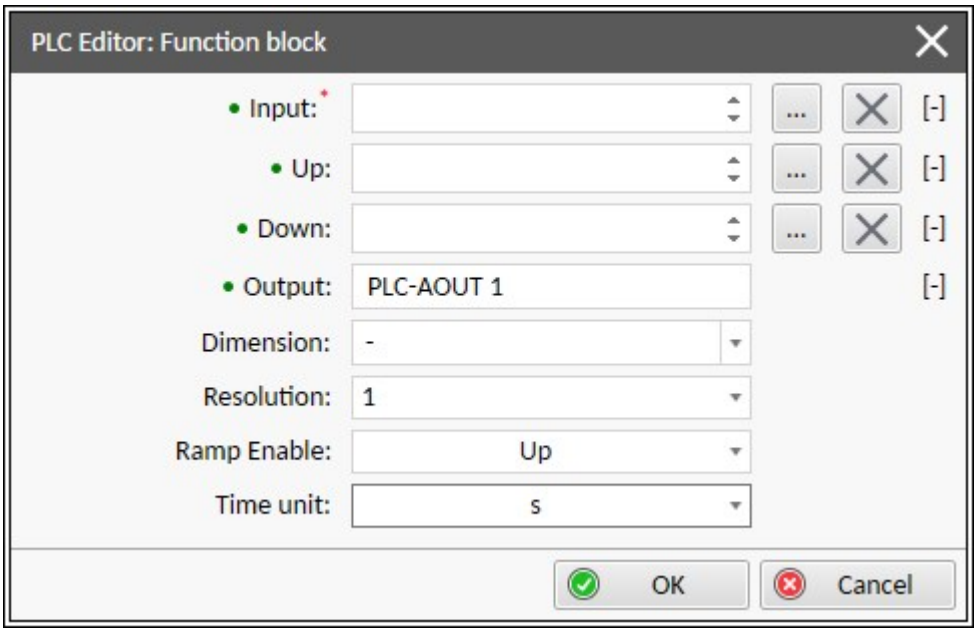

Image 22.64 Configuration of Ramp block

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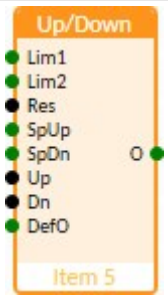
Up/Down

PLC group		
Related FW	2.2.0	
Related applications	MINT, MPTM	
PLC Block ID	20	

Inputs

Input	Type	Negation	Range	Function
Limit Low	Analog	No	-2^{32} .. 2^{32}	First limit of **Output**
Limit High	Analog	No	-2^{32} .. 2^{32}	Second limit of **Output**
Reset	Binary	No	0/1	Resets **Output** to **Default Output Value** when active

Speed Up	Analog	No	-2^{32} .. 2^{32}	Rising rate of **Output** per second
Speed Down	Analog	No	-2^{32} .. 2^{32}	Lowering rate of **Output** per second
Up	Binary	No	0/1	Activates rising of **Output**
Down	Binary	No	0/1	Activates lowering of **Output**
Default Output Value	Analog	No	-2^{32} .. 2^{32}	Initial value of **Output**

Outputs

Output	Type	Negation	Range	Function
Output	Analog	No	Limit 1 .. Limit 2	Output value

Description

This block works as an analog ramp controlled by binary inputs **Up** and **Down** with a defined rate of increase/decrease.

The ramp speed is adjusted by **Speed Up** and **Speed Down**.

Time unit of the speed of change is defined by **Time unit** setting.

The **Output** limitation is set by **Limit 1** and **Limit 2**. The default value of **Output** is set by **Default Output Value**.

Activate **Reset** to reset **Output** to **Default Output Value**. The **Output** has resolution and dimension based on setting of the block.

> **IMPORTANT: If both the inputs Up and Down are active, the Output is set to Default Output Value.**

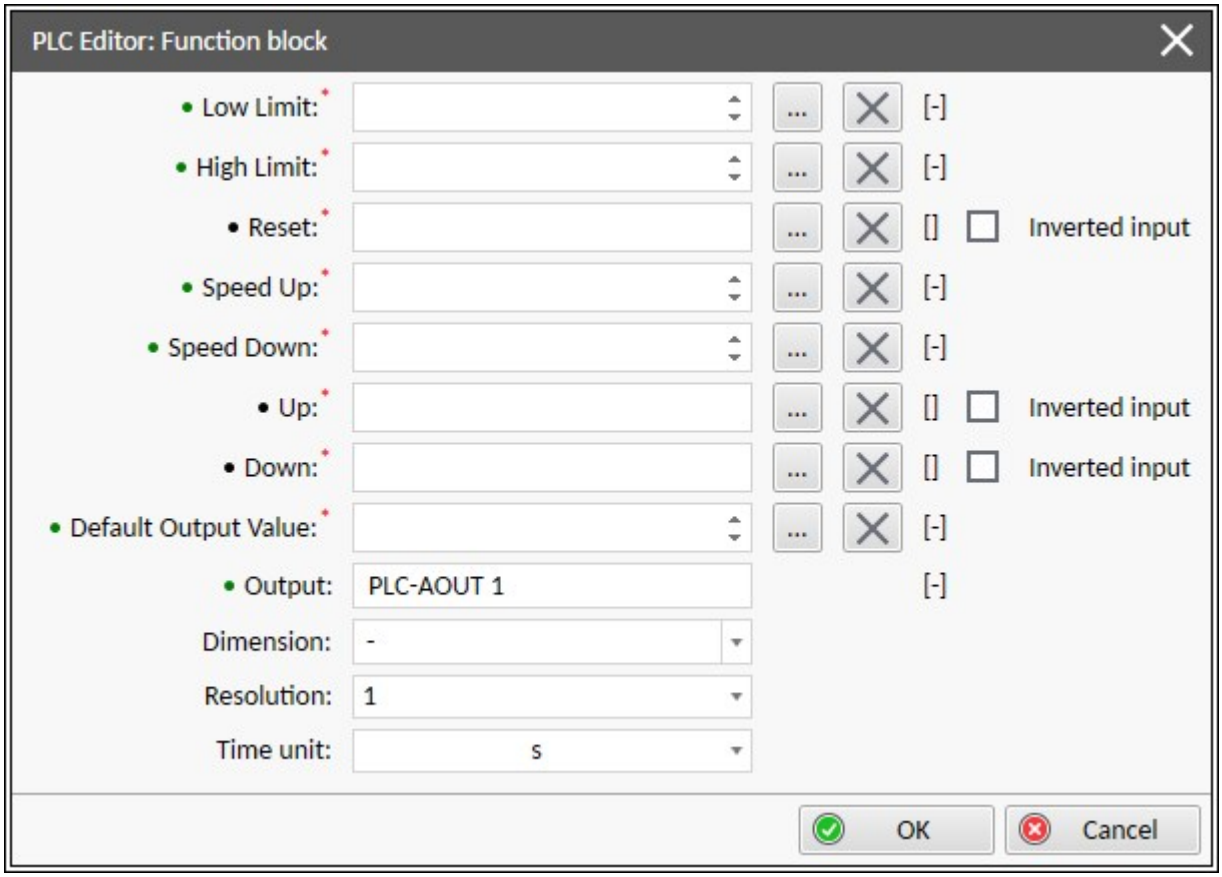


Image 22.65 Configuration of Up/Down block

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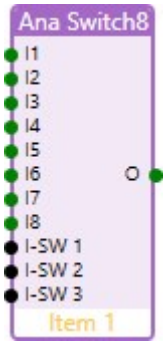
Group: Other functions

Analog Switch 8

PLC group	Others	
Related FW	2.2.0	
Related applications	MINT, MPTM	

Inputs

Input	Type	Negation	Range	Function
Input 1	Analog	No	-2^{32} .. 2^{32}	Input value 1
Input 2	Analog	No	-2^{32} .. 2^{32}	Input value 2
Input 3	Analog	No	-2^{32} .. 2^{32}	Input value 3 (optional)

Input 4	Analog	No	-2^{32} .. 2^{32}	Input value 4 (optional)
Input 5	Analog	No	-2^{32} .. 2^{32}	Input value 5 (optional)
Input 6	Analog	No	-2^{32} .. 2^{32}	Input value 6 (optional)
Input 7	Analog	No	-2^{32} .. 2^{32}	Input value 7 (optional)
Input 8	Analog	No	-2^{32} .. 2^{32}	Input value 8 (optional)
Input SW 1	Binary	No	0/1	Switch input 1
Input SW 2	Binary	No	0/1	Switch input 2
Input SW 3	Binary	No	0/1	Switch input 3

Outputs

Output	Type	Negation	Range	Function
Output	Analog	No	-2^{32} .. 2^{32}	Switch output according to the SW 1, SW 2 and SW 3

Description

The block works as an analog multiplexer. The output value could be selected from up to 8 inputs according to the 'Input SW 3', 'Input SW 2' and 'Input SW 1' state is appropriate input value copied to the output, see the table below.

Input SW 3	Input SW 2	Input SW 1	Output
0	0	0	Input 1
0	0	1	Input 2
0	1	0	Input 3
0	1	1	Input 4
1	0	0	Input 5
1	0	1	Input 6
1	1	0	Input 7
1	1	1	Input 8

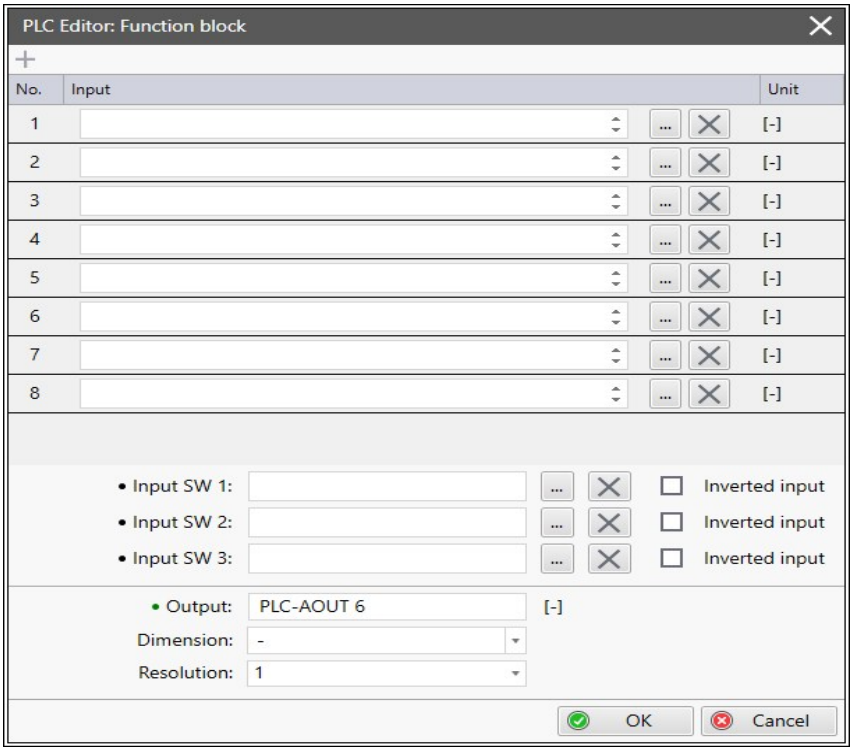


Image 22.66 Configuration of Analog Switch 8 block

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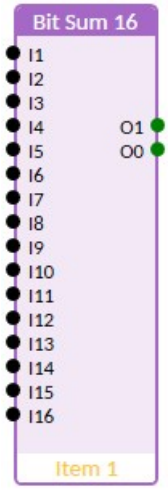
Bit Sum 16

PLC group	Others	
Related FW	2.2.0	
Related applications	MINT, MPTM	
PLC Block ID	53	

Inputs

Input	Type	Negation	Range	Function
Input 1	Binary	Yes	0/1	Input 1
Input 2	Binary	Yes	0/1	Input 2
Input 3	Binary	Yes	0/1	Input 3 (optional)
Input 4	Binary	Yes	0/1	Input 4 (optional)

Input 5	Binary	Yes	0/1	Input 5 (optional)
Input 6	Binary	Yes	0/1	Input 6 (optional)
Input 7	Binary	Yes	0/1	Input 7 (optional)
Input 8	Binary	Yes	0/1	Input 8 (optional)
Input 9	Binary	Yes	0/1	Input 9 (optional)
Input 10	Binary	Yes	0/1	Input 10 (optional)
Input 11	Binary	Yes	0/1	Input 11 (optional)
Input 12	Binary	Yes	0/1	Input 12 (optional)
Input 13	Binary	Yes	0/1	Input 13 (optional)
Input 14	Binary	Yes	0/1	Input 14 (optional)
Input 15	Binary	Yes	0/1	Input 15 (optional)
Input 16	Binary	Yes	0/1	Input 16 (optional)

Outputs

Output	Type	Negation	Range	Function
Output 1	Analog	No	0 .. Max [-]	Output value = sum of active inputs (InputX has value true)
Output 0	Analog	No	0 .. Max [-]	Output value = sum of inactive inputs (InputX has value false)

Description

The PLC block performs active/inactive inputs summation and it gives analog value output as a summary of activated Binary input signals or vice versa as secondary analog output summary of deactivated Binary input signals.

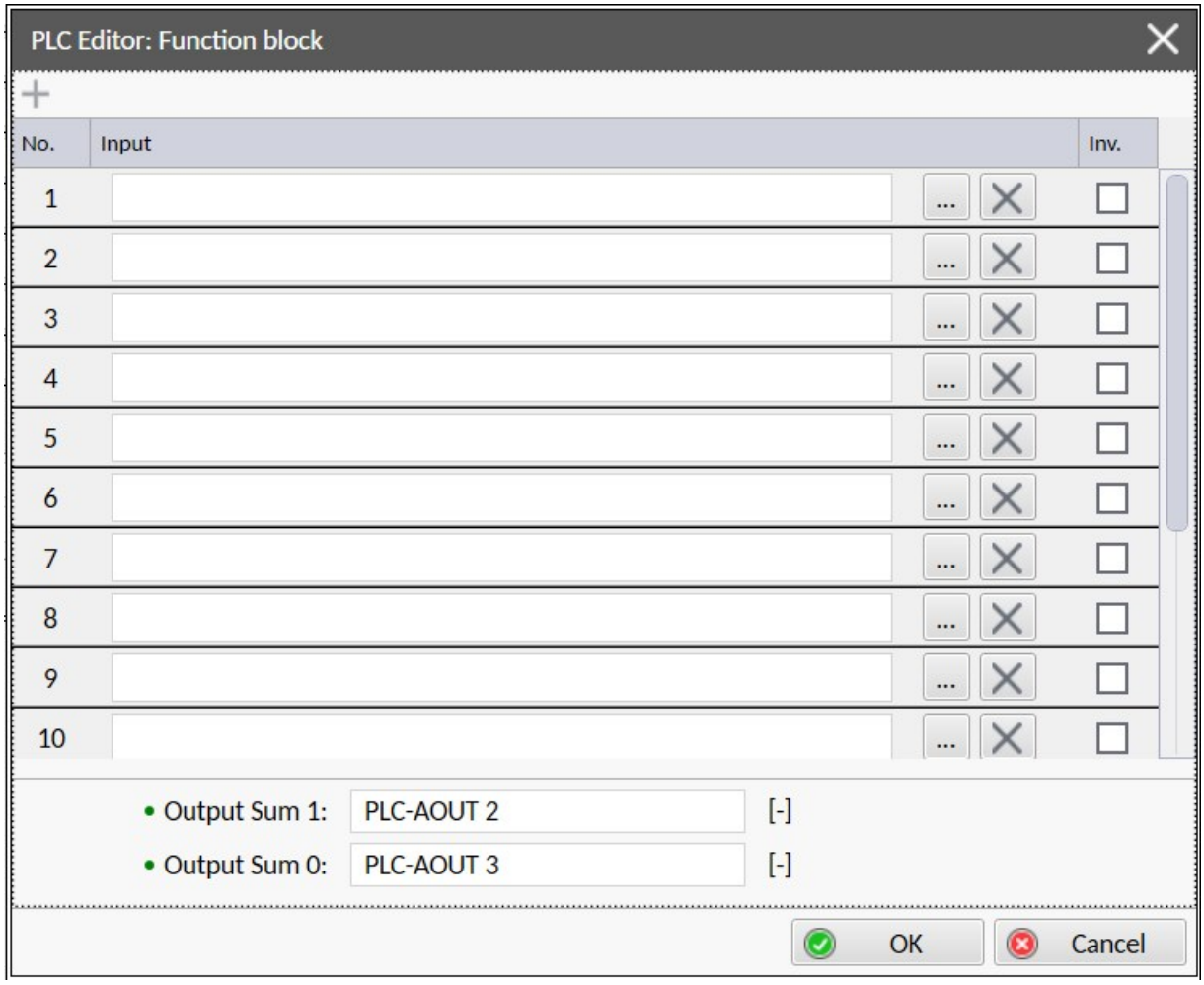


Image 22.67 Configuration of Bit Sum 16 block

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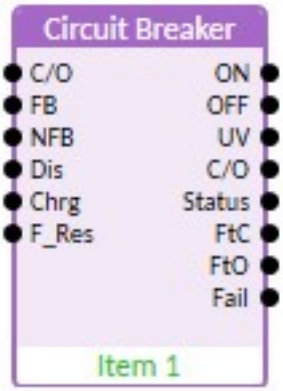
Circuit Breaker

PLC group	Others	
Related FW	2.2.0	
Related applications	MINT, MPTM	
PLC Block ID	65	
Inputs		

Input	Abbr.	Type	Range	Function
Close/Open	C/O	Binary	0/1	According to the Close/Open value the circuit breaker closes/opens (level control)
Feedback	FB	Binary	0/1	Feedback from breaker (aux.) contactor
Negative Feedback	NFB	Binary	0/1	Inverted Feedback
Disabled	Dis	Binary	0/1	Control (closing) disabled
Charged	Chrg	Binary	0/1	Breaker (spring) charged (has tension)
FaultReset	F_Res	Binary	0/1	If the breaker fall in the internal fail (signalized by outputs Fail to Open / Fail to Close / Fail) this input is intended to be used for fault reset.

Outputs

Output	Abbr.	Type	Range	Function
ON Coil	ON	Binary	0/1	On (switching) coil
OFF Coil	OFF	Binary	0/1	Off (tripping) coil
UV Coil	UV	Binary	0/1	Under voltage coil
Output Close/Open	C/O	Binary	0/1	Close / Open signal
Status Close/Open	Status	Binary	0/1	State of circuit breaker control
Fail to Close	FtC	Binary	0/1	CB failed to close. Active CB feedback was not recieved after closing attempt.
Fail to Open	FtO	Binary	0/1	CB failed to open. Inactive CB feedback was not recieved after opening attempt.
Fail	Fail	Binary	0/1	Other internal Fail. CB feedback changed unexpectedly.

Description

This block performs general **Circuit Breaker** (**CB**) control based on the state machine principle.

Inputs

- **Close/Open**: Input for level control of breaker close/open control. Since the block contains a state machine and the possibility of impulse (edge) control is required, an edge response is also introduced for level control as well, i.e., the rising edge is interpreted as a **CB** Close request and a falling edge as a **CB** Open request.
- **Feedback**: Feedback from auxiliary breaker contacts, not required to configure. (If not configured, the mismatch between requested and breaker state is not evaluated; it is assumed that the breaker is currently in the desired state).
- **Feedback Negative**: It is not required to be configured together with the **CBFeedback** input. However, if **Feedback Negative** is configured, the **Feedback** input must be configured too. Then, not only the mismatch between the desired state and the feedback is always evaluated, but also

the mismatch between the two feedbacks.

- **Disable**: If the **CB** is disconnected (opened), the **Disable** input will blocks its switching (closing). If the **CB** has already been switched on, this input does not open it. It is not necessary to configure this input = if the input is not configured, it is evaluated as inactive.
- **Charged**: This input has the same function (but in inverse logic) as **CBDisabled**, it is used only in conjunction with information about the breaker spring tension. Configuration of the input is not required; if the input is not configured, it is evaluated as active.
- **FaultReset** input clears fault conditions such as:
  - **Fail to Open (FtO)**
  - **Fail to Close (FtC)**
  - **General Fail**
  - When activated, it allows the breaker to attempt a new operation (open/close), even if the previous command is still active.
  - Reset is only successful if both the output C/O and the physical feedback are in LOW state (logic 0), indicating the breaker is open.

Outputs

- **ON Coil**: Switching signal for ON (closing) **CB** coil - pulse lenght of 5 sec (the feedback confirmation is expected within this 5 sec).
- **OFF Coil**: Tripping signal for OFF (opening) **CB**coil - pulse lenght of 5 sec (the feedback confirmation is expected within this 5 sec).
- **UV Coil**: Level signal for UV (under voltage) **CB** coil = remains on till the **CB** should be opened.
- **Output Close/Open**: Request signal for closing/opening the circuit breaker (level control).
- **Status Close/Open**: Information about the breaker status based on the evaluation of the Feedback and/or Feedback Negative signals.
- **Failed To Close**: This output is set when the breaker fails to close within the defined timeout after an open-to-close command. It remains active until a successful reset via the **FaultReset** input.
- **Failed To Open**:This output is set when the breaker fails to open within the defined timeout after a close-to-open command. It remains active until a successful reset via the **FaultReset** input.output.
- **Fail**: This output is activated when the breaker feedback unexpectedly changes state (e.g., feedback drops while breaker is closed). It signals a serious fault and forces the breaker to open. The output remains active until reset via **FaultReset**, provided both output C/O and feedback are in logic 0.

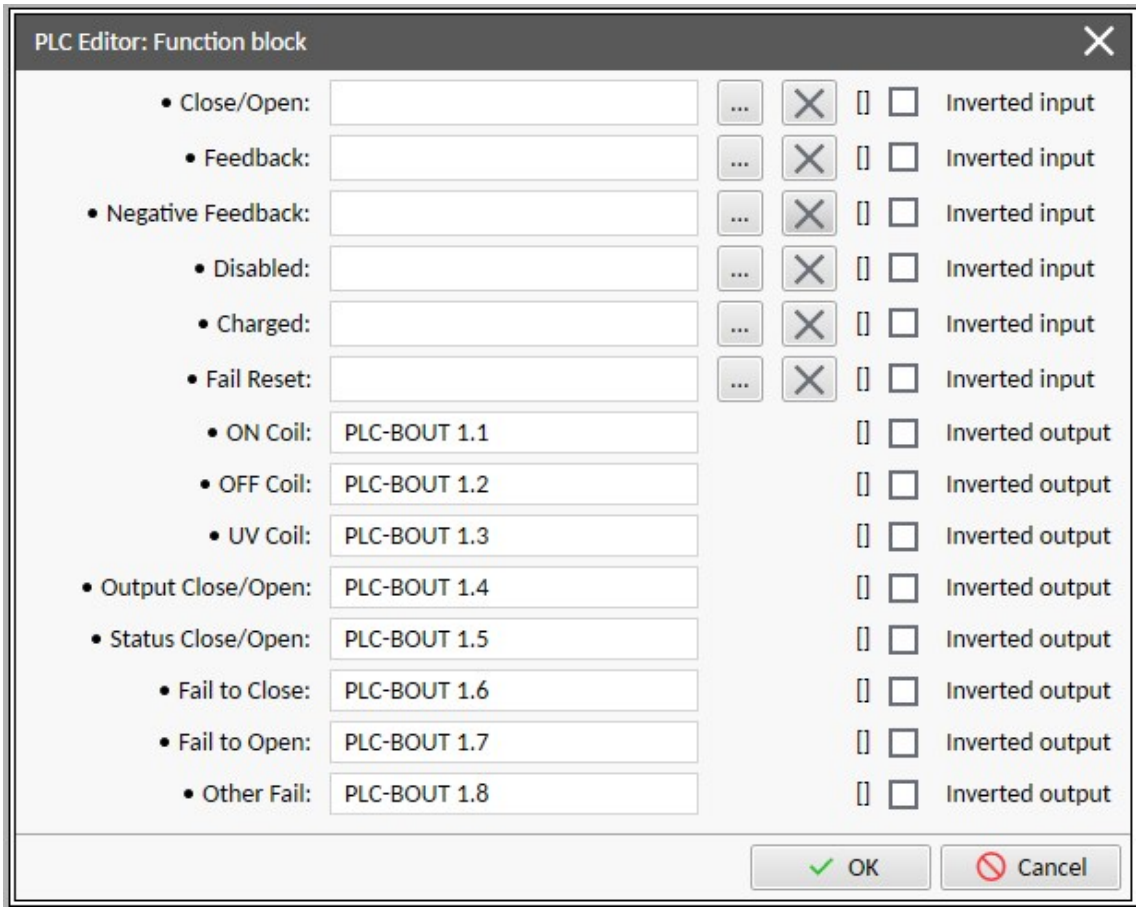


Image 22.68 Configuration of Circuit Breaker block

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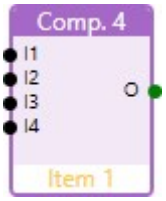
Comp. 4

PLC group	Others	
Related FW	2.2.0	
Related applications	MINT, MPTM	
PLC Block ID	49	

Inputs

Input	Type	Negation	Range	Function
Input 1	Binary	Yes	0/1	Bit 0,4,8,12,16,20,24,28 - according to selected group of bits.
Input 2	Binary	Yes	0/1	Bit 1,5,9,13,17,21,25,29 - according to selected group of bits.
Input 3	Binary	Yes	0/1	Bit 2,6,10,14,18,22,26,30 - according to selected group of bits.
Input 4	Binary	Yes	0/1	Bit 3,7,11,15,19,23,27,31 - according to selected group of bits.

Outputs

Output	Type	Negation	Range	Function
Output	Analog	No	-2 147 483 647 .. 2 147 483 647	Value to be "composed" to bits

Description

The block converts selected input bits to analog form and provides the output analog value.The resulting quad of bits is placed in the Output value within the selected bit range (Bits).

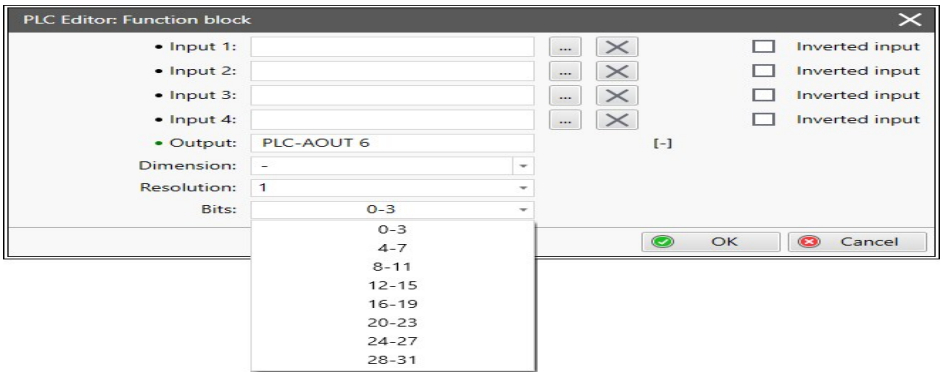


Image 22.69 Configuration of Comp. 4 block

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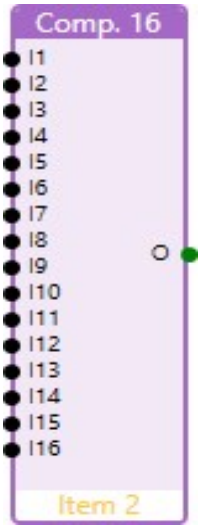
Comp. 16

PLC group	Others	
Related FW	2.2.0	
Related applications	MINT, MPTM	
PLC Block ID	50	

Inputs

Input	Type	Negation	Range	Function
Input 1	Binary	Yes	0/1	According to selected group of bits.
Input 2	Binary	Yes	0/1	According to selected group of bits.

...	...	...	...	...
Input 15	Binary	Yes	0/1	According to selected group of bits.
Input 16	Binary	Yes	0/1	According to selected group of bits.

Outputs

Output	Type	Negation	Range	Function
Output	Analog	No	-2 147 483 647 .. 2 147 483 647	Value to be "decomposed" to bits

Description

The block converts selected input bits to analog form and provides the output analog value.It is possible to select lower bits 0-15 or upper bits 16-31 so it is possible to compose 32 bit value by using of two composers.

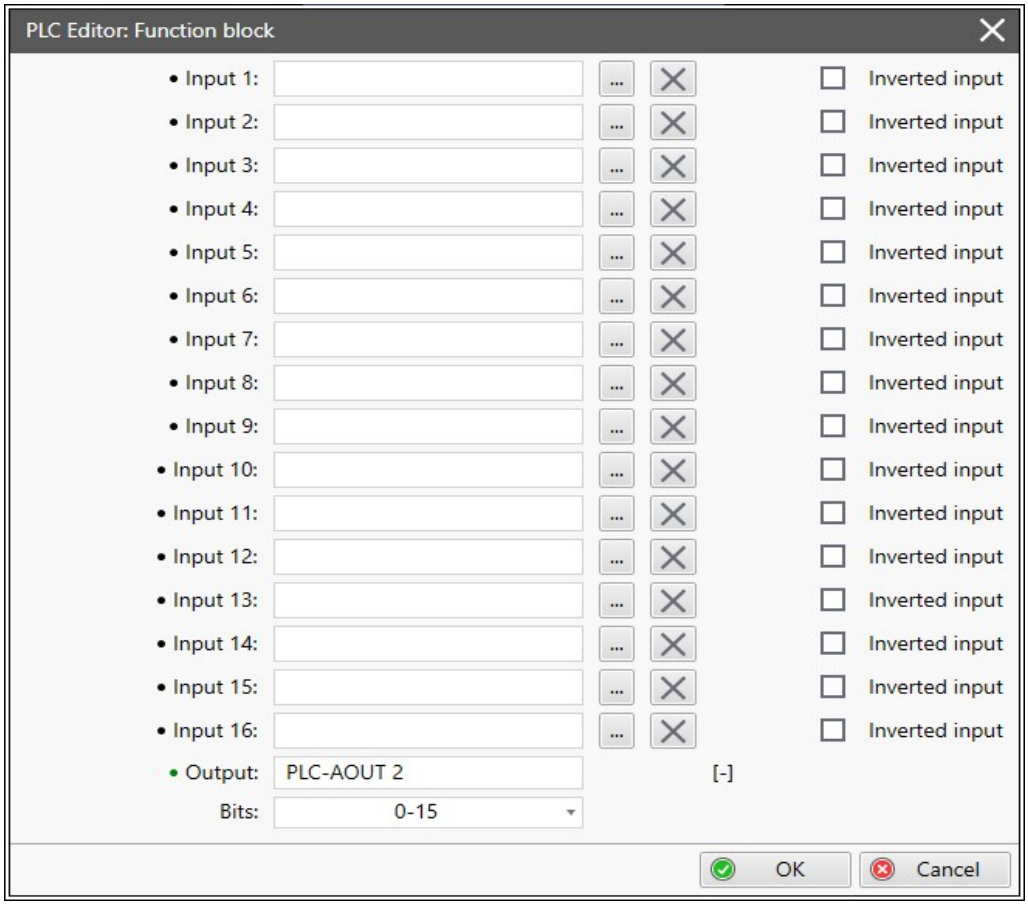


Image 22.70 Configuration of Comp. 16 block

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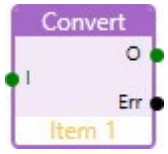
Convert

PLC group	Others	
Related FW	2.2.0	
Related applications	MINT, MPTM	
PLC Block ID	52	

Inputs

Input	Type	Negation	Range	Function
Input	Analog	No	-2^{32} .. 2^{32}	Input value

Outputs

Output	Type	Negation	Range	Function
Output	Analog	No	-2^{32} .. 2^{32}	Converted Input value
Output	Binary	Yes	0/1	The attribute of invalid data on output

Description

The block converts the Input based on selected resolution and dimension, and reflects it to the Output. Dimension is converted based on user configuration without any extra recalculation. Resolution is converted and recalculation is used.

> **Example:** If the input is 100,5 W and the convert block is used to convert dimensions to kW with resolution 1, the output shows 101 kW.

Note: *Conversion is done to Integer32, if the input value is out of Integer32 range, output value is set to invalid status and error output is activated.*

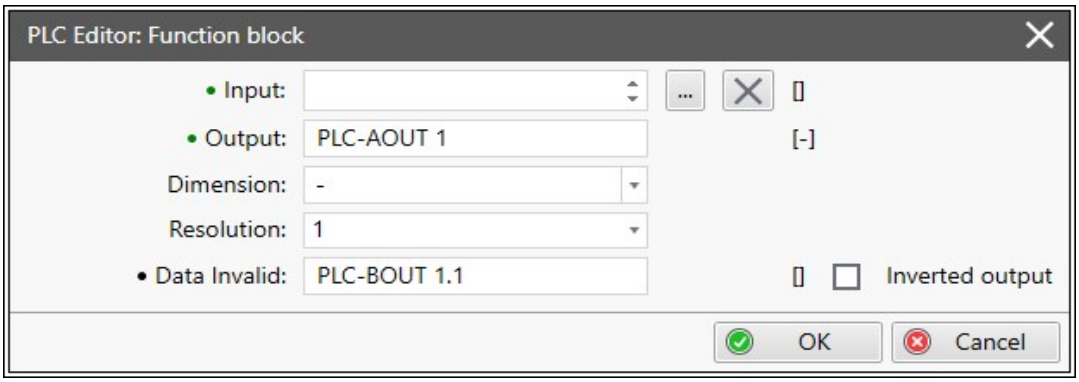


Image 22.71 Configuration of Convert block

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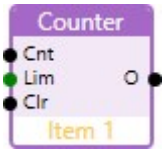
Counter

PLC group	Others	
Related FW	2.2.0	
Related applications	MINT, MPTM	
PLC Block ID	13	

Inputs

Input	Type	Negation	Range	Function
Input Count Up	Binary	No	0/1	Input at which the edges are counted
Input Preset Limit	Analog	No	$0 .. 2^{32}$	Counter value limit for activation of the output
Input Clear	Binary	No	0/1	Reset input

Outputs

Output	Type	Negation	Range	Function
Output	Binary	No	0/1	Output is activated when the counter value exceeds the limit
Actual Counter Value	Analog	No	N/A	Analog value that shows Actual Counter Value Lowest available value from: **<PLC Resource 1** to **PLC Resource 16>**

Description

The block works as a counter of edges (selectable rising, falling or both) with reset input and adjustable counting limit. The maximal counter value is 2 147 483 647. The counter value is lost when the controller is switched off. The output is activated when the counter value is equal to or higher than Input Preset Limit and stays active until the block reset is done using Input Clear. Activating of the Input Clear resets the counter value to 0 and deactivates the output. Holding the Input Clear active blocks the counting.

> **IMPORTANT: The counter value is lost when the controller is switched off.**

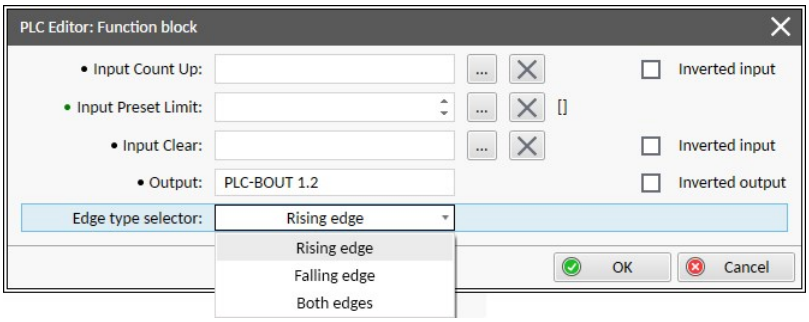


Image 22.72 Configuration of the Counter block

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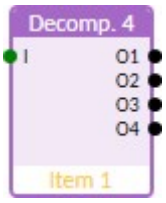
Decomp. 4

PLC group	Others	
Related FW	2.2.0	
Related applications	MINT, MPTM	
PLC Block ID	24	

Inputs

Input	Type	Negation	Range	Function
Input	Analog	No	-2^{32} .. 2^{32}	Value to be "decomposed" to bits

Outputs

Output	Type	Negation	Range	Function
Output 1	Binary	Yes	0/1	Bit 0,4,8,12,16,20,24,28 - according to selected group of bits.
Output 2	Binary	Yes	0/1	Bit 1,5,9,13,17,21,25,29 - according to selected group of bits.
Output 3	Binary	Yes	0/1	Bit 2,6,10,14,18,22,26,30 - according to selected group of bits.
Output 4	Binary	Yes	0/1	Bit 3,7,11,15,19,23,27,31 - according to selected group of bits.

Description

The block converts the input analog value to binary form and provides selected bits as binary outputs.The input four bits are selected by bit range selection (Bits).

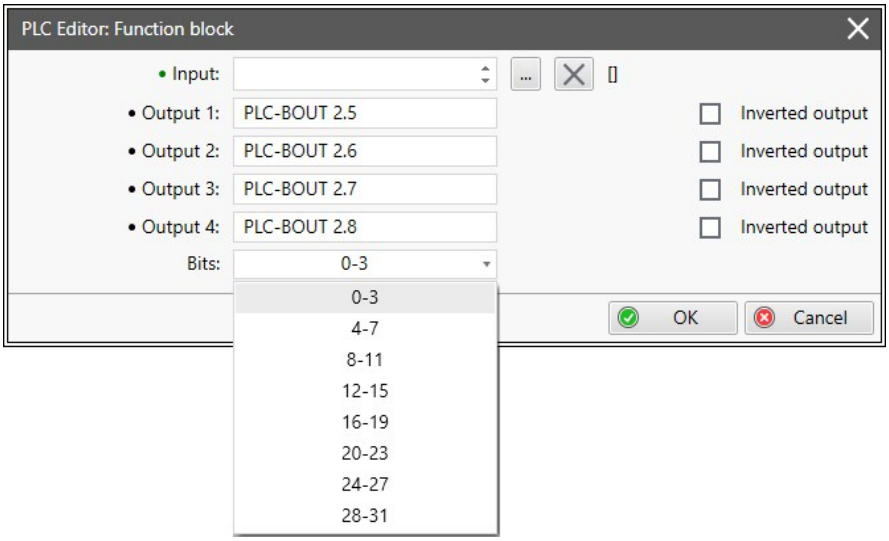


Image 22.73 Configuration of Decomp. 4 block

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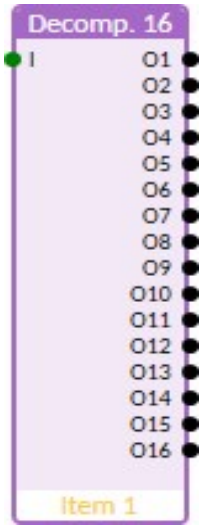
Decomp. 16

PLC group	Others	
Related FW	2.2.0	
Related applications	MINT, MPTM	
PLC Block ID	48	

Inputs

Input	Type	Negation	Range	Function
Input	Analog	No	-2^{32} .. 2^{32}	Value to be "decomposed" to bits

Outputs

Output	Type	Negation	Range	Function
Output 1	Binary	Yes	0/1	According to selected group of bits.
Output 2	Binary	Yes	0/1	According to selected group of bits.
...	...	...	...	...
Output 15	Binary	Yes	0/1	According to selected group of bits.
Output 16	Binary	Yes	0/1	According to selected group of bits.

Description

The block converts the input analog value to binary form and provides selected bits as binary outputs.It is possible to select lower bits 0-15 or upper bits 16-31 so it is possible to decompose 32 bit value by using of two decomposers.

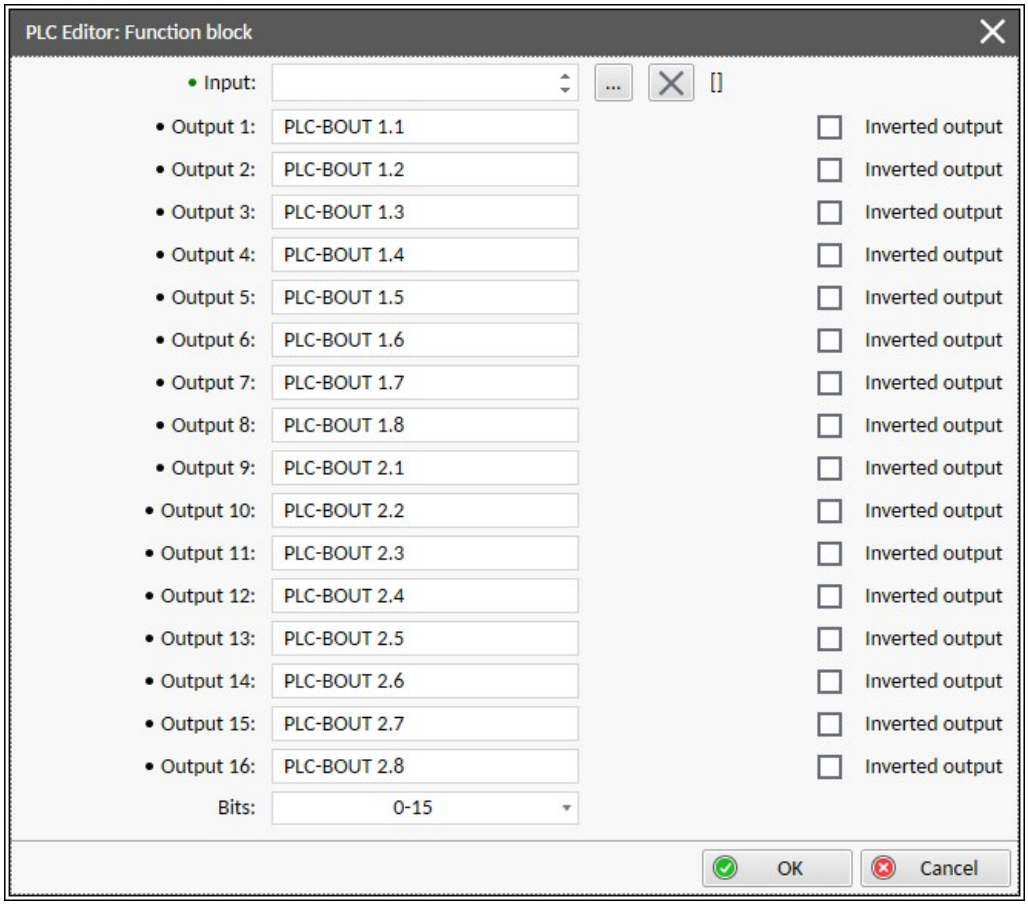


Image 22.74 Configuration of Decomp. 16 block

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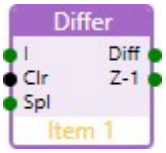
Differ

PLC group	Others	
Related FW	2.2.0	
Related applications	MINT, MPTM	
PLC Block ID	55	

Inputs

Input	Type	Negation	Range	Function
Input	Analog	No	$-2^{32}-1$ .. $+2^{32}-1$	Input value
Clear	Binary	Yes	0/1	Clear (reset) internalvalues
Sampling Interval	Analog	No	0,1 - 3600,0 s	Sampling period (interval between samples)

Outputs

Output	Type	Negation	Range	Function
Δ / Difference	Analog	No	$-2^{32}-1$ .. $+2^{32}-1$	Difference-by-Time of **Input** values evaluated over four samples
Z-1	Analog	No	$-2^{32}-1$ .. $+2^{32}-1$	The Input value sample delayed one step (given by the sampling interval parameter)

Description

The block performs difference-by-time evaluation of analog input. Internally the block have memory for 4 consecutive values (sample train), a one-step delayed sample is available at output **Z-1**. The time interval between the samples is a block parameter and is selected by the user during the block configuration. The sampling interval can be multiple of 0,1 sec only.

Output Δ is calculated from four successive internal values based on this equation :

$$\Delta k = \frac{e_k + 3e_{k-1} - 3e_{k-2} - e_{k-3}}{6\Delta T}$$

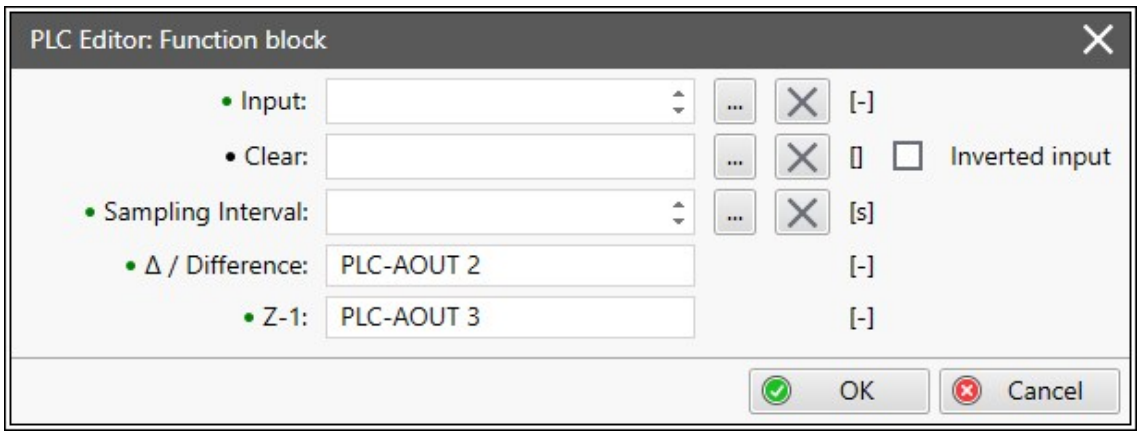


Image 22.75 Configuration of the Differ block

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Heartbeat

PLC group	Others	
Related FW	2.2.0	
Related applications	MINT, MPTM	
PLC Block ID	43	

Inputs

Input	Type	Negation	Range	Function
Input 1	Binary	Yes	0/1	Incoming binary (rising) edge leads to reset Heartbeat counter. If there is configured Input 2, the Reset action is dependent on the selected operation between inputs 1 and 2 (OR/ XOR).
Input 2	Binary	Yes	0/1	The optional input signal, if it is configured, the Reset action is dependent on the selected operation between inputs 1 and 2 (OR / XOR).
Checking Period	Analog	No	0,2 .. 6500,0 s	HeartBeat checking/counting period (max. approx. 100 min). It should be at least twice the incoming checked signal period (at least 2 PLC execution periods).
Reset Output	Binary	Yes	0/1	Active value of this input clear output to default (off) value.
Enable	Binary	Yes	0/1	Heartbeat block enable. When Enable is not active or there is an invalid value on Input 1 of the block, the output (Output) has a value off, the internal Heartbeat counter is reset to the default value. If this input is not connected the block is enabled.

Outputs

Output	Type	Negation	Range	Function
Output	Binary	Yes	0/1	Output value

Description

The PLC block performs Heart Beat signal checking.

The Checking Period parameter specifies both the Heart Beat checking period and the reload value of the internal counter. The resolution of the counter is 0,1 seconds.

The internal counter is re-set to the Checking Period value in the cases (Reset Action):

- The Enable input is false.
- The internal counter reaches the zero value.

The Heart Beat check operation is valid:

- On Input 1 is detected rising edge (only Input 1 is configured) or on the Input 2 is detected rising edge (only Input 2 is configured).
- Both Input 1 and Input 2 are configured:
  - OR mode:
    - If the rising edge is detected either on Input 1 or Input 2.
  - XOR mode:
    - If the rising edge is detected on Input 1 and followed by detecting the falling edge on Input

2.

- If the falling edge is detected on Input 2 and followed by detecting the rising edge on Input 1.

The above conditions must be met before the counter counts down to zero to ensure that the incoming heartbeat signal is live. The Output binary signal is set (on) if the internal counter counts down to zero. If the Reset Output input is configured and the input is active (Reset Output is set), the Output is cleared to the default (off) value. If the Reset Output input is not configured, the Output can be cleared by any successful check operation described above.

If the Enable input is configured and the input is inactive (Enable is reset), the internal counter is reloaded to the Checking Period value, counting stops and the Output is cleared to default (off) value. If the Enable input is not configured or the input is active (Enable is set), the internal counter is counting down and the Heart Beat checking functionality is excuted.

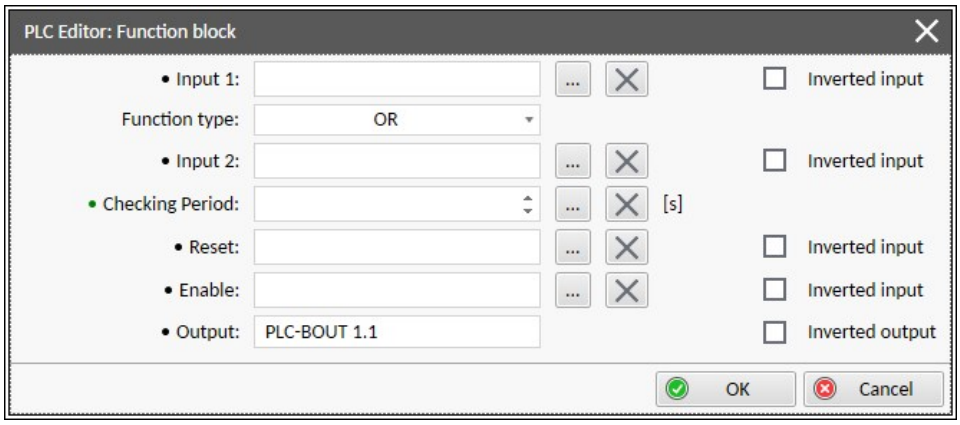

Image 22.76 Configuration of Heartbeat block

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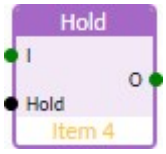
Hold

PLC group	Others	
Related FW	2.2.0	
Related applications	MINT, MPTM	
PLC Block ID	37	

Inputs

Input	Type	Negation	Range	Function
Input	Analog	No	-2^{32} .. 2^{32}	Input value
Hold	Binary	No	0/1	Input triggering the function

Outputs

Output	Type	Negation	Range	Function
Output	Analog	No	-2^{32} .. 2^{32}	Hold output

Description

The block is holding **Input** value based on value of **Hold** and selected mode. The Output has resolution and dimension based on setting of the block.

Mode	Description
Edge	The block behaves like analog memory. Input **Hold** behaves like the reload trigger and reacts on rising edge. The initial value of the **Output** after restart of the controller is 0.
Level	The block is like a mirror of the **Input** while the **Hold** is inactive. The value of **Output** is latched at the last value while **Hold** is active.

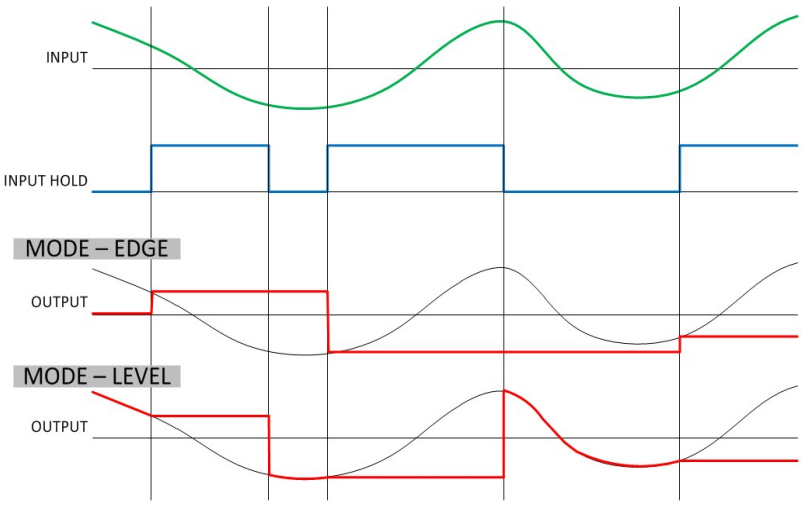


Image 22.77 Principle of the Hold modes

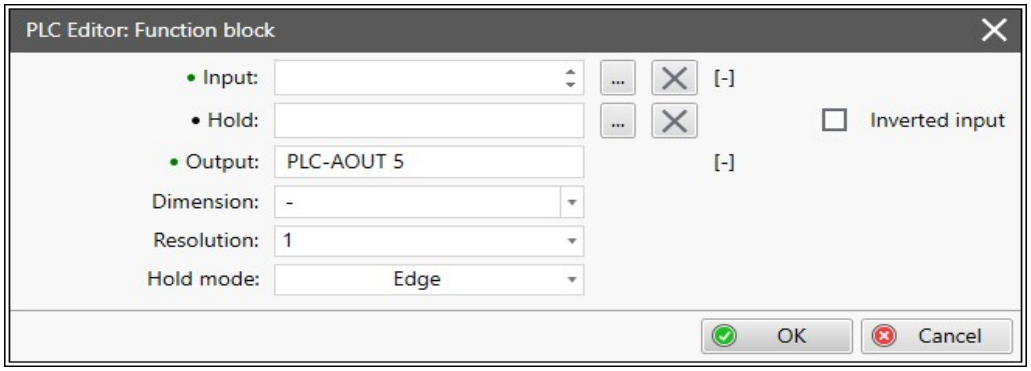


Image 22.78 Configuration of the Hold block

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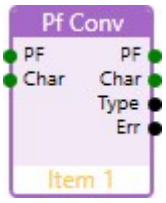
PF Conv

PLC group	Others	
Related FW	2.2.0	
Related applications	MINT, MPTM	
PLC Block ID	57	

Inputs

Input	Abbr.	Type	Range	Function
Input Power factor*	PF	Analog	$-2^{32}-1$ .. $+2^{32}-1$	Power Factor
Input Character	Char	Analog	$-2^{32}-1$ .. $+2^{32}-1$	PF ASCII annotation: "L" = inductive, lagging; "R" = resistive; "C" = capacitive, leading

Outputs

Output	Abbr.	Type	Range	Function
Output Power Factor	PF	Analog	$-2^{32}-1$ .. $+2^{32}-1$	Power Factor
Output Character	Char	Analog	$-2^{32}-1$ .. $+2^{32}-1$	PF ASCII annotation: "L" = inductive, lagging; "R" = resistive; "C" = capacitive, leading
Output Load Type	Type	Analog	$-2^{32}-1$ .. $+2^{32}-1$	Load type indication: 0 = inductive, lagging; 1 = capacitive, leading
Data Invalid	Err	Analog	$-2^{32}-1$ .. $+2^{32}-1$	Ramped value

Description

This block perform format conversion of **Input Power Factor** to **Output Power Factor** format. The conversion type is set using the **Conversion** option.

There are three power factor formats:

ComAp1 format: power factor value in the range <0,000 ; 2,000>

- value in the interval <0,000; 1,000) denotes the lagging (L) power factor
- value in the interval (1,000; 2,000> denotes the leading (C) power factor
- value 1,000 denotes the resistive (R) power factor

ComAp2 format: power factor value in the range <0,000; 1,000> + additional load character value {'L', 'R', 'C'} = 8 bit character

- value in the interval <0,000; 1,000) + 'L' character denotes the lagging (L) power factor
- value in the interval <0,000; 1,000) + 'C' denotes the leading (C) power factor
- value 1,000 + 'R' character denotes the resistive (R) power factor

R = 82 ASCII / L = 76 ASCII / C = 67 ASCII

EEI format: power factor value in the range <-1,000 ; 1,000>

- value in the interval <-1,000; 0,000) denotes the lagging (L) power factor
- value in the interval (0,000; 1,000> denotes the leading (C) power factor
- value 0,000 denotes the resistive (R) power factor

The following figure explains the relations between the power factor formats used.

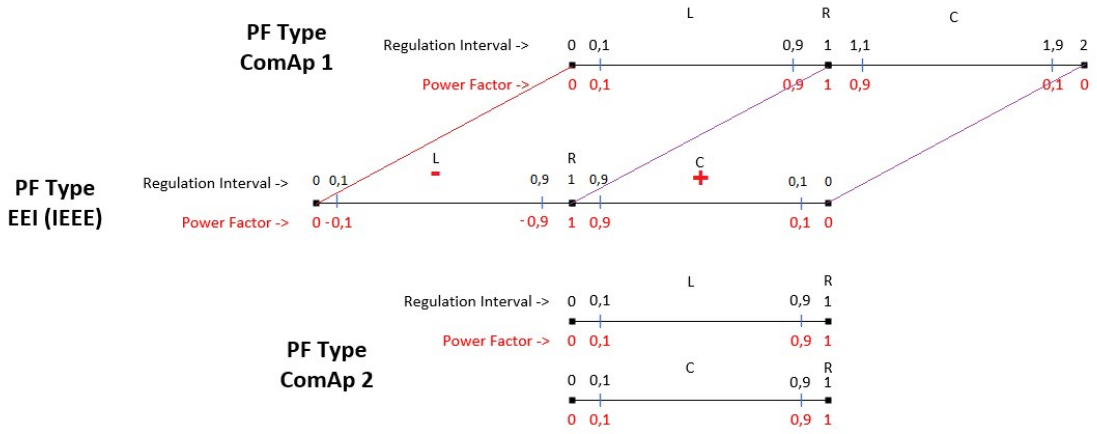


Image 22.79 Power factor formats ranges

The **Output** has a **Resolution** and **Dimension** according to the block settings.

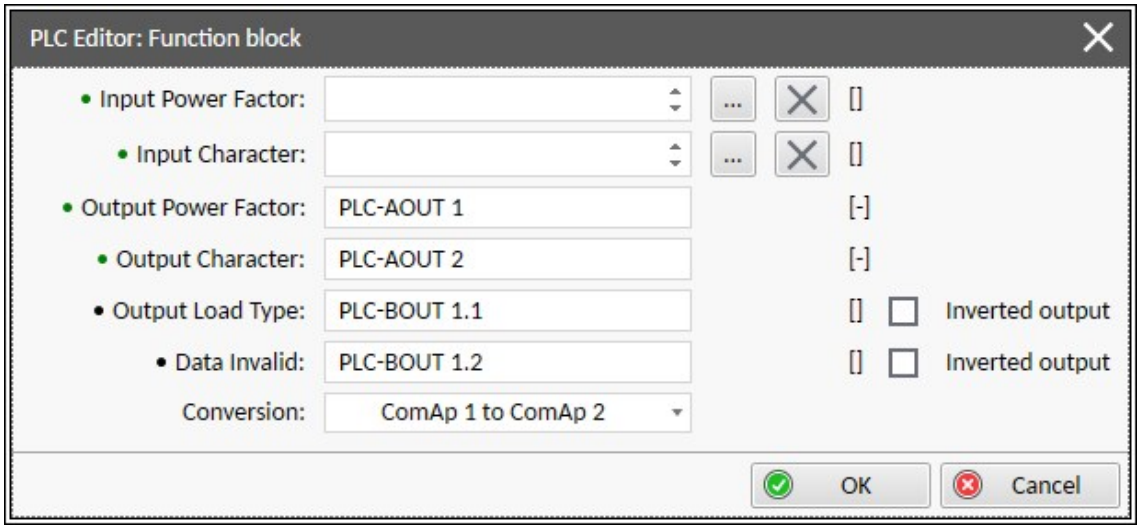
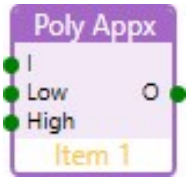


Image 22.80 Configuration of PfConv block

back to Groups of PLC Blocks

Poly Appx

PLC group	Others	
Related FW	2.2.0	
Related applications	MINT, MPTM	
PLC Block ID	47	

Inputs

Input	Type	Negation	Range	Function
Input 1	Analog	Yes	-2^{32} .. 2^{32}	Input value
Low Limit	Analog	Yes	Same as Input	Low limit of output value
High Limit	Analog	Yes	Same as Input	High limit of output value

Outputs

Output	Type	Negation	Range	Function
Output	Analog	No	-2^{32} .. 2^{32}	Result of the polynomial approximation of input value.

Description

The PLC block performs the polynomial approximation function of the input variable by calculating a polynomial (up to 6th order). The result is limited by lower and upper bound parameters (limitation) and passed to the output variable.

$$output = coeff0 + coeff1 * input1 + coeff2 * input2 + coeff3 * input3 + coeff4 * input4 +$$
$$+ coeff5 * input5 + coeff6 * input6$$

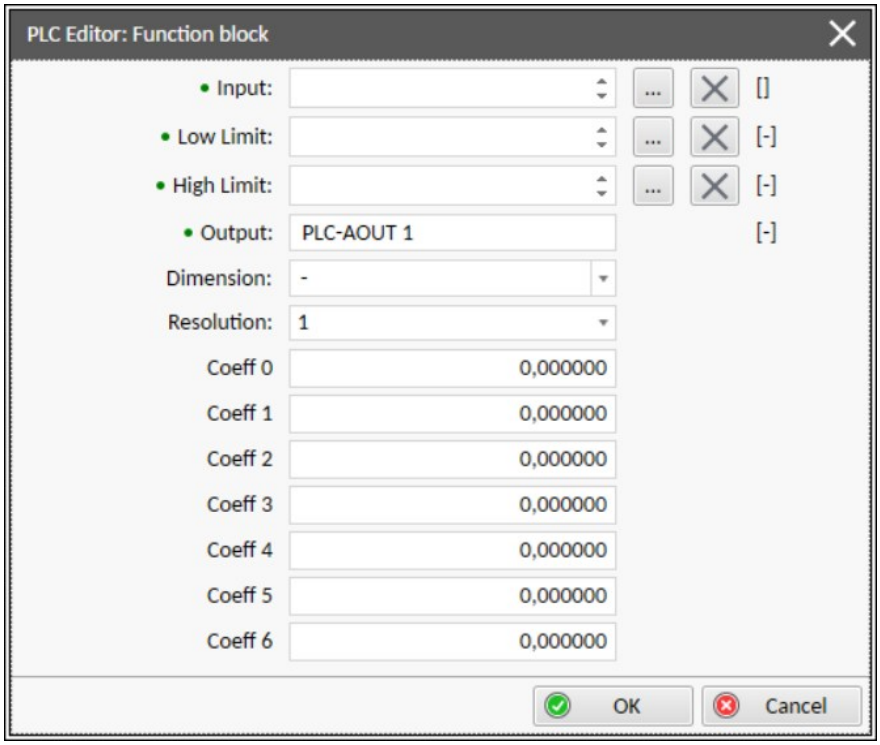
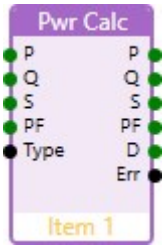


Image 22.81 Configuration of Polynomial Approximation block

back to List of PLC blocks

PWR Calc

PLC group	Others	
Related FW	2.2.0	
Related applications	MINT, MPTM	
PLC Block ID	56	

Inputs

Input	Abbr.	Type	Range	Function
Input Active Power	P	Analog	$-2^{32}-1$ .. $+2^{32}-1$	Active power
Input Reactive Power	Q	Analog	$-2^{32}-1$ .. $+2^{32}-1$	Reactive power
Input Apparent Power	S	Analog	$-2^{32}-1$ .. $+2^{32}-1$	Apparent power
Input Power Factor	PF	Analog	$-2^{32}-1$ .. $+2^{32}-1$	Power factor
Input Load Type	Type	Binary	$-2^{32}-1$ .. $+2^{32}-1$	Load type (0 = inductive, lagging; 1 = capacitive, leading)

Outputs

Output	Abbr.	Type	Range	Function
Output Active Power	P	Analog	$-2^{32}-1$ .. $+2^{32}-1$	Active power
Output Reactive Power	Q	Analog	$-2^{32}-1$ .. $+2^{32}-1$	Reactive power
Output Apparent Power	S	Analog	$-2^{32}-1$ .. $+2^{32}-1$	Apparent power
Output Power Factor	PF	Analog	$-2^{32}-1$ .. $+2^{32}-1$	Power Factor
Output Deformed Power	D	Analog	$-2^{32}-1$ .. $+2^{32}-1$	Deformed Power (only with all powers P, Q, S are provided)
Data Invalid	Err	Binary	$-2^{32}-1$ .. $+2^{32}-1$	Data invalid

Description

The block calculates the output power variable values from the selected input values (for example: needs of **Q** and **PF** from provided **P** and **S**). The calculation type is set using the **Calculation** option, the calculation of the remaining output values is performed if the necessary 2 analog inputs are set correctly.

Note: *The **Power Factor** input value is expected in the ComAp PF1 format (value in the range <0,000 ; 2,000>) with following meaning:*
- *value in the interval <0,000; 1,000) denotes the lagging (L) power factor*
- *value in the interval (1,000; 2,000> denotes the leading (C) power factor*
- *value 1,000 denotes the resistive (R) power factor*

The **Output** has a **Resolution** and **Dimension** according to the block settings.

Note: *The block performs the Resolution conversion.*

Oper	P	Q	S	PF	D
In P,Q Out S,PF	P	Q	$S=\sqrt{P^2+Q^2}$	$PF=\frac{\lvert P\rvert}{S}$	not valid
In P,S Out Q, PF	P	$Q=\sqrt{S^2-P^2}$	S	$PF=\frac{\lvert P\rvert}{S}$	not valid
In P,PF Out Q,S	P	$Q=P\frac{\sqrt{1-PF^2}}{PF}$	$S=\frac{\lvert P\rvert}{PF}$	PF	not valid

In Q,S Out P,PF	$P = \sqrt{S^2 - Q^2}$	Q	S	$PF = \frac{\lvert P \rvert}{S}$	not valid
In Q,PF Out P,S	$P = Q\frac{PF}{\sqrt{1-PF^2}}$	Q	$S = \frac{Q}{\sqrt{1-PF^2}}$	PF	not valid
In P,Q,S Out D,PF	P	Q	S	$PF = \frac{\lvert P \rvert}{S}$	$D = \sqrt{S^2 - P^2 - Q^2}$

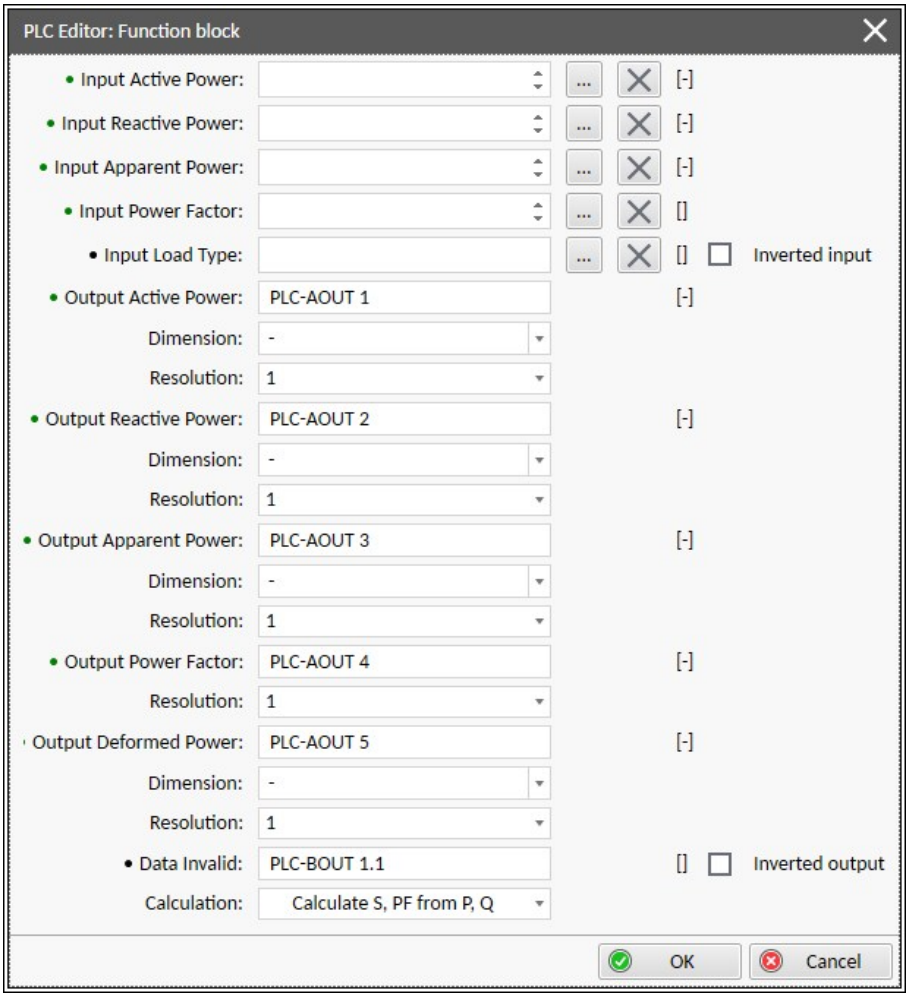
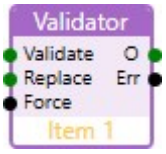


Image 22.82 Configuration of PWR Calc block

back to Groups of PLC Blocks

Validator

PLC group	Others	
Related FW	2.2.0	
Related applications	MINT, MPTM	
PLC Block ID	54	

Inputs

Input	Type	Negation	Range	Function
Validate	Analog	No	$-2^{32}-1$ .. $+2^{32}-1$	Input value
Replace	Analog	No	$-2^{32}-1$ .. $+2^{32}-1$	Replacement value
Force	Binary	Yes	0/1	Forcing of replacement

Outputs

Output	Type	Negation	Range	Function
Output	Analog	No	$-2^{32}-1$ .. $+2^{32}-1$	Output set to Validate or Replace based on the value of Validate and/or Force inputs
Invalid	Binary	Yes	0/1	Validate input has an invalid value

Description

Block checks (validate) if the input value has a valid value (i.e. is not marked with Invalid Flag). The **Output** value is determined according to the following rules:

Function Validate

Input Validate	Input Force	Output O	Output Err
Valid value	0	Validate	0
Invalid value	0	Replace	1
Valid value	1	Replace	0
Invalid value	1	Replace	1

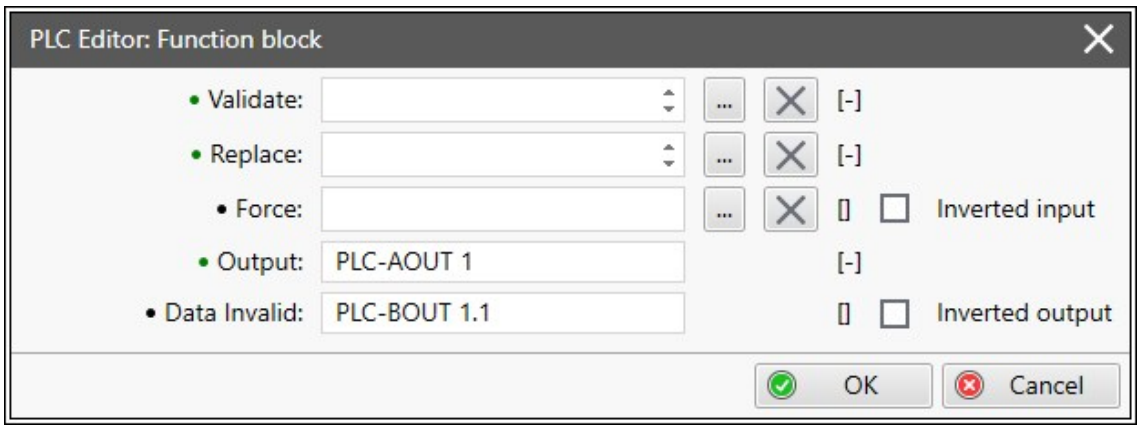
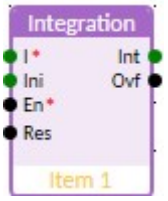


Image 22.83 Configuration of Validator block

back to List of PLC blocks

Integration

PLC group	Others	
Related FW	2.2.0	
Related applications	MINT, MPTM	
PLC Block ID	60	

Inputs

Input	Type	Negation	Range	Function
Input	Analog	No	-2 147 483 647 .. 2 147 843 647	Value for integration
Initial	Analog	No	-2 147 483 647 .. 2 147 843 647	Initial value of integrator
Enable	Binary	Yes	-	Enables integration
Reset	Binary	Yes	-	Reset value of integrator to initial value
Overflow	Binary	Yes	-	Integrated value inside the block oveflows (very rare situation, almost impossible)

Parameters

Parameter	Function
Memory	Adjust memory slot for integrated value
Dimension	Adjust dimension of output value
Resolution	Adjust resolution of output value

Outputs

Output	Type	Negation	Range	Function
Integration	Analog	No	-2 147 483 647 .. 2 147 843 647	Integrated value

Description

Block for integration of input analog value. Integrated value is saved in NV memory - adjusted by parameter memory. Block function is enabled/disabled by input enable. Integrated value can be reset to initial value by input reset.

Example: Input value is flow in l/h. Integrated value is total number of l.

Example: Input value is actual value of kW. Integrated value is total number of kWh.

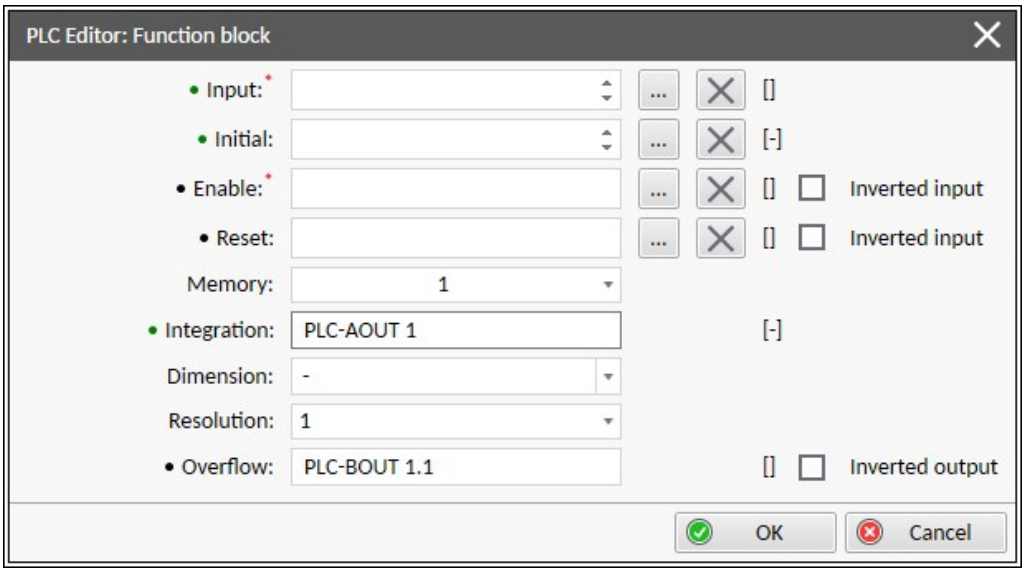


Image 22.84 Configuration of Integration block

back to List of PLC blocks

11.5 Alarms

What alarms are:

The controller evaluates two levels of alarms. For more information **see Alarm Management on page 129**.

11.5.1 Alarm levels in the controller

11.5.2 Alarms level 1 1501
11.5.3 Alarms level 2 1534
11.5.4 Other alarms 1557

11.5.2 Alarms level 1

What alarms level 1 are:

The level 1 alarm indicates that a value or parameter is out of normal limits, but has still not reached critical level.

List of alarms level 1

Warning 1504
Wrn Alarm e-mail 1 Fail . 1504
Wrn Alarm e-mail 2 Fail . 1504
Wrn Alarm e-mail 3 Fail . 1504
Wrn Alarm e-mail 4 Fail . 1504
Wrn Backup Controller Failed 1505
Wrn Backup Not Ready . 1505
Wrn Battery Overvoltage 1505
Wrn Battery Undervoltage 1506
Wrn Brute Force Protection Active 1506
Wrn CAN2 Empty 1506
Wrn Controller Restart Required 1507
Wrn Default Password ...1507
Wrn ECU Communication Fail 1507
Wrn Event e-mail 1 Fail ..1507
Wrn Event e-mail 2 Fail ..1508
Wrn Event e-mail 3 Fail ..1508
Wrn Event e-mail 4 Fail ..1508
Wrn Frequency Regulation Limit 1508
Wrn Hot Swap Configuration Incorrect ..1509
Wrn Hot Swap Data Synchro Fail 1509
Wrn Long Term History Fail 1509
Wrn Master Controller Failed 1510
Wrn MCB Fail 1510
Wrn MCB Fail To Close . 1511
Wrn MCB Fail To Open ..1512
Wrn Override All Sd 1512
Wrn Password reset e-mail addr is not set 1512
Wrn P for Q Fail 1513
Wrn P(Um) Fail 1513
Wrn PF Control Fail 1513
Wrn PF(Pm) Fail 1514
PVCB Fail To Close 1514
PVCB Fail To Open 1515
PVCB Fail 1516
Wrn Q Control Fail 1516
Wrn Q&U Protection 1517
Wrn Q(P) Fail 1517
Wrn Q(Um) Fail 1518
Wrn Qref/Ulim Fail 1518
Wrn Redundant CAN data mismatch 1519
Wrn RTC Battery Flat 1519
WrnHst Reverse Synchronization Fail 1520
Wrn SD Card Failed 1520
Wrn SD Card File System Failed 1520
Wrn SNMP TRAP 1 Fail .1520
Wrn SNMP TRAP 2 Fail .1521
Wrn SOC High Alarm 1521
Wrn SOC Low Alarm 1521
Soft Transfer Fail 1521
Wrn Stop Fail 1522
Wrn SW Key CAN Redundancy Error 1522
WrnALI SW Key Hot Swap Error 1522
Wrn Test UPQF 1523
Wrn Unsupported PMS Mode 1523
Wrn Universal Genset Overflow 1523
Wrn Voltage Regulation Limit 1523
Wrong PLC Configuration 1524
Alarm Only 1524
Dead Bus BCB Blocked .1524
Alarm List Indication 1525
ALI AC BusMains Ph L1 Inverted 1525
ALI AC BusMains Ph L2 Inverted 1525
ALI AC BusMains Ph L3 Inverted 1525
ALI BESS Ph Rotation Opposite 1525
ALI BCB Closing Is Blocked 1526
ALI CAN Mode Inconsistency 1526
Daily Battery Cycles Reached 1526
ALI BESS Ph L1 Inverted 1527
ALI BESS Ph L2 Inverted 1527
ALI BESS Ph L3 Inverted 1527
ALI BESS Ph Rotation Opposite 1528
ALI Wrn Redundant CAN Error 1528
ALI SD Card Not Compatible 1528
ALI SD Card In Slot 1529
ALI SD Card Full 1529
ALI SD Card Formatting/Mounting 1529
ALI AC MainsConverter Ph L1 Inverted 1530
ALI AC MainsConverter Ph L2 Inverted 1530
ALI AC MainsConverter Ph L3 Inverted 1530
ALI Mains Ph Rotation Opposite 1530
ALI Start Blocking 1531

ALI Manual Restore 1531
ALI Wrong Power Format 1531
Alarm List + History Indication 1532
SyncNotAllowed 1532
History Record Only 1532
Hst Pave 1532
Hst ROCOF 1 1532
Hst ROCOF2 1533
Hst ROCOF3 1533
Hst ROCOF4 1533
Hst Wrn Vector Shift 1533

back to Alarms

Warning

Wrn Alarm e-mail 1 Fail

Alarm Type	**Warning**
Alarmlist message	Wrn Alarm e-mail 1 Fail
Alarm evaluated	All the time
Related applications	MINT, MPTM
Alarm ID	815
Description	The alarm indicates that there was a request to send an alarm email to email address which is adjusted by setpoint **E-mail Address 1** and email wasn't send. This alarm has FPS - **Fixed Protections States 7**Fixed Protections States **4**This alarm has FPS - **Fixed Protections States 4**.

back to List of alarms level 1

Wrn Alarm e-mail 2 Fail

Alarm Type	**Warning**
Alarmlist message	Wrn Alarm e-mail 2 Fail
Alarm evaluated	All the time
Related applications	MINT, MPTM
Alarm ID	816
Description	The alarm indicates that there was a request to send an alarm email to email address which is adjusted by setpoint **E-mail Address 2** and email wasn't send. This alarm has FPS - **Fixed Protections States 7**Fixed Protections States **4**This alarm has FPS - **Fixed Protections States 4**.

back to List of alarms level 1

Wrn Alarm e-mail 3 Fail

Alarm Type	**Warning**
Alarmlist message	Wrn Alarm e-mail 3 Fail
Alarm evaluated	All the time
Related applications	MINT, MPTM
Alarm ID	817
Description	The alarm indicates that there was a request to send an alarm email to email address which is adjusted by setpoint **E-mail Address 3** and email wasn't send. This alarm has FPS - **Fixed Protections States 7**Fixed Protections States **4**This alarm has FPS - **Fixed Protections States 4**.

back to List of alarms level 1

Wrn Alarm e-mail 4 Fail

Alarm Type	**Warning**

Alarmlist message	Wrn Alarm e-mail 4 Fail
Alarm evaluated	All the time
Related applications	MINT, MPTM
Alarm ID	818
Description	The alarm indicates that there was a request to send an alarm email to email address which is adjusted by setpoint **E-mail Address 4** and email wasn't send. This alarm has FPS - **Fixed Protections States 7Fixed Protections States 4**This alarm has FPS - **Fixed Protections States 4**.

back to List of alarms level 1

Wrn Backup Controller Failed

Alarm Type	**Warning**
Alarmlist message	Wrn Backup Controller Failed
Alarm evaluated	Only if **Hot Swap Redundancy** != Disabled
Related applications	MINT, MPTM
Alarm ID	1289
Description	This alarm is activated on **Hot Swap Redundancy** master controller when master controller does not detect the **Hot Swap Heartbeat** signal from backup.

back to List of alarms level 1

Wrn Backup Not Ready

Alarm Type	**Warning**
Alarmlist message	Wrn Backup Not Ready
Alarm evaluated	Only if **Hot Swap Redundancy** = Master
Related applications	MINT, MPTM
Alarm ID	1146
Description	This alarm is related to the **Hot Swap Redundancy**. It is activated when the BACKUP controller has announced any 2nd level alarm while the MASTER controller does not indicate such alarm. In this case, the BACKUP is unable to take over the control if Master controller fails. This is a marginal issue and may be caused due to wrong configuration.

back to List of alarms level 1

Wrn Battery Overvoltage

Alarm Type	**WarningAlarm List + History Record Indication**
Alarmlist message	WrnAHI Battery Overvoltage
Alarm evaluated	All the time
Related applications	MINT, MPTM
Alarm ID	941
Description	This alarm is activated when **Battery Voltage** is over **Battery Overvoltage** for

	period longer than **Battery <> Voltage Delay**. This alarm has FPS - **FIXED PROTECTIONS STATES 1**

back to List of alarms level 1

Wrn Battery Undervoltage

Alarm Type	**WarningAlarm List + History Record Indication**
Alarmlist message	WrnAHI Battery Undervoltage
Alarm evaluated	All the time
Related applications	MINT, MPTM
Alarm ID	940
Description	This alarm is activated when **Battery Voltage** is below **Battery Undervoltage** for period longer than **Battery <> Voltage Delay**. This alarm has FPS - **FIXED PROTECTIONS STATES 1**

back to List of alarms level 1

Wrn Brute Force Protection Active

Alarm Type	**Warning**
Alarmlist message	Wrn Brute Force Protection Active
Alarm evaluated	All the time
Related applications	MINT, MPTM
Alarm ID	1237
Description	This alarm is activated when account break protection detects possible attack and at least one account is blocked according to **Account break protection** rules. This alarm has FPS - **FIXED PROTECTIONS STATES 1**. ***Note:*** *In case that the alarm stays active even that it should already be inactive, do the following to get rid of it:* 1. *Disconnect all peripheries (displays, ethernet, etc.)* 2. *Wait for 20 minutes - the alarm should become inactive* 3. *Connect with InteliConfig using USB - Quick connection* 4. *Acknowledge the alarm*

back to List of alarms level 1

Wrn CAN2 Empty

Alarm Type	**Warning**
Alarmlist message	Wrn CAN Intercontroller Empty
Alarm evaluated	Only if **CAN Intercontroller Empty Check** = Enabled
Related applications	MINT, MPTM
Alarm ID	46
Description	This alarm is activated when controller is alone on Intercontroller CAN (CAN2A and/or CAN2B) and setpoint **CAN Intercontroller Empty Check** = Enabled.

	This alarm has FPS - **Fixed Protections States 1**.

back to List of alarms level 1

Wrn Controller Restart Required

Alarm Type	**Warning**
Alarmlist message	Wrn Controller Restart Required
Alarm evaluated	All the time
Related applications	MPTM
Alarm ID	XYZ.
Description	There are several setpoint in the configuration which requires restart of the controller after their change. The Controller has to go over the initialization sequence to apply the change of the setpoint. Specificaly these setpoints are: **3Ph CT Location** and **Modbus/TCP Master Link**.

back to List of alarms level 1

Wrn Default Password

Alarm Type	**Warning**
Alarmlist message	Wrn Default Credentials
Alarm evaluated	All the time
Related applications	MINT, MPTM
Alarm ID	1071
Description	This alarm is active until the default password for administrator account is changed.

back to List of alarms level 1

Wrn ECU Communication Fail

Alarm Type	**Warning**
Alarmlist message	Wrn ECU Communication Fail
Alarm evaluated	With configured LBO **ECU Power Relay** - only when this LBO is active. Without configured LBO **ECU Power Relay** - all the time
Related applications	MINT, MPTM
Description	This alarm occurs when an ECU is configured, but the communication with the ECU is not established or has dropped out.

back to List of alarms level 1

Wrn Event e-mail 1 Fail

Alarm Type	**Warning**
Alarmlist message	Wrn Event e-mail 1 Fail
Alarm evaluated	All the time
Related applications	MINT, MPTM
Alarm ID	734
Description	The alarm indicates that there was a request to send an event email to email address which is adjusted by setpoint **E-mail Address 1** and email wasn't

	send.

back to List of alarms level 1

Wrn Event e-mail 2 Fail

Alarm Type	**Warning**
Alarmlist message	Wrn Event e-mail 2 Fail
Alarm evaluated	All the time
Related applications	MINT, MPTM
Alarm ID	735
Description	The alarm indicates that there was a request to send an event email to email address which is adjusted by setpoint **E-mail Address 2** and email wasn't send.

back to List of alarms level 1

Wrn Event e-mail 3 Fail

Alarm Type	**Warning**
Alarmlist message	Wrn Event e-mail 3 Fail
Alarm evaluated	All the time
Related applications	MINT, MPTM
Alarm ID	736
Description	The alarm indicates that there was a request to send an event email to email address which is adjusted by setpoint **E-mail Address 3** and email wasn't send.

back to List of alarms level 1

Wrn Event e-mail 4 Fail

Alarm Type	**Warning**
Alarmlist message	Wrn Event e-mail 4 Fail
Alarm evaluated	All the time
Related applications	MINT, MPTM
Alarm ID	737
Description	The alarm indicates that there was a request to send an event email to email address which is adjusted by setpoint **E-mail Address 4** and email wasn't send.

back to List of alarms level 1

Wrn Frequency Regulation Limit

Alarm Type	**WarningAlarm List + History Record Indication**
Alarmlist message	Wrn Frequency Regulation Limit
Alarm evaluated	While BESS is running
Related applications	MINT, MPTM
Alarm ID	151
Description	This alarm is activated when **Frequency Regulator Output** stays close to

	Frequency Governor Low Limit or **Frequency Governor High Limit** for at least 2 seconds and will remain active as long as the cause is present. This alarm has FPS - **Fixed Protections States 3Fixed Protections States 1**.

back to List of alarms level 1

Wrn Hot Swap Configuration Incorrect

Alarm Type	**Warning**
Alarmlist message	Wrn Hot Swap Configuration Incorrect
Alarm evaluated	Only if **Hot Swap Redundancy** != Disabled and **WrnALI SW Key Hot Swap Error** is not present in the alarmlist
Related applications	MINT, MPTM
Alarm ID	1465
Description	This alarm is activated when **Hot Swap Redundancy** is missing the correct configuration of mandatory LBI and LBO. List of mandatory objects: › LBI **Hot Swap Ctrl Block** › LBI **Hot Swap Heartbeat Detect** › LBO **Hot Swap Switch** › LBO **Hot Swap Heartbeat** **IMPORTANT: All mandatory objects have to be configured to physical input/output of the controller.**

back to List of alarms level 1

Wrn Hot Swap Data Synchro Fail

Alarm Type	**Warning**
Alarmlist message	Wrn Hot Swap Data Synchro Fail
Alarm evaluated	Only if **Hot Swap Redundancy** != Disabled
Related applications	MINT, MPTM
Alarm ID	1426
Description	This alarm is activated when communication between **Hot Swap Redundancy** master and backup controllers failed.This can be caused because of wrong configuration or wiring. While this alarm is active the backup controller doesn't have the data which needs for the smooth transition.

back to List of alarms level 1

Wrn Long Term History Fail

Alarm Type	**Warning**
Alarmlist message	Wrn Long Term History Fail
Alarm evaluated	Only when **Long Term History** = Enabled
Related applications	MINT, MPTM

Alarm ID	1281
Description	This alarm is activated when **Long Term History** = Enabled but for any reason it is not possible to write the history onto the SD card. This alarm has FPS - **FIXED PROTECTIONS STATES 1**

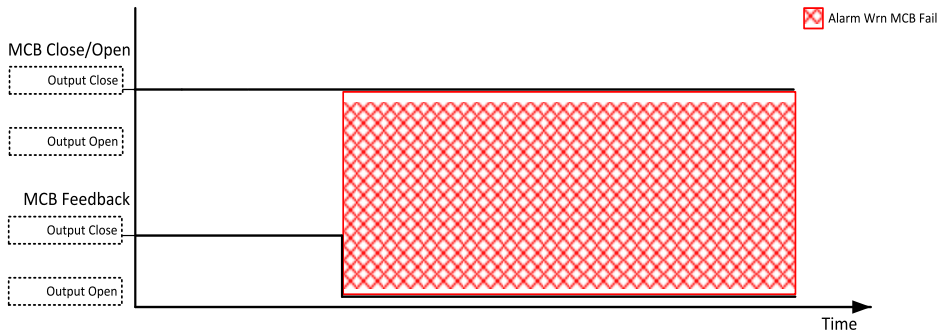
back to List of alarms level 1

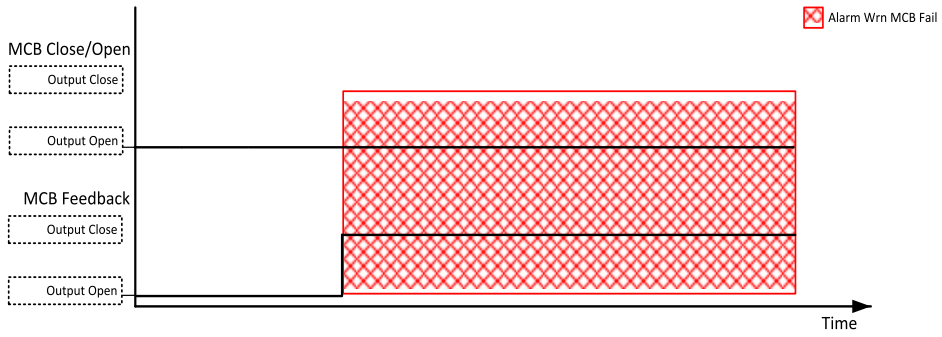
Wrn Master Controller Failed

Alarm Type	**Warning**
Alarmlist message	Wrn Master Controller Failed
Alarm evaluated	Only if **Hot Swap Redundancy** != Disabled
Related applications	MINT, MPTM
Alarm ID	1288
Description	This alarm is activated on **Hot Swap Redundancy** backup controller when backup controller does not detect the **HOT SWAP HEARTBEAT** signal from master.

back to List of alarms level 1

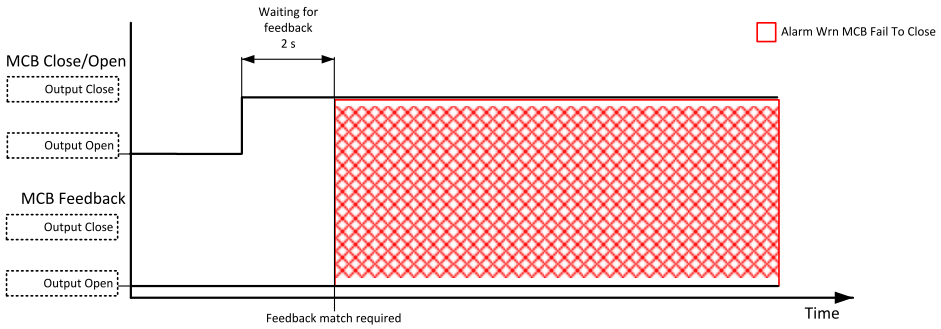
Wrn MCB Fail

Alarm Type	**WarningWarning**
Alarmlist message	WrnHst MCB Fail
Alarm evaluated	Only if **MCB Control Mode** = Internal
Related applications	MPTM
Alarm ID	90
Description	This alarm is activated when there is a problem with position of the circuit breaker. › LBI **MCB FEEDBACK** does not match expected position given by LBO **MCB CLOSE/OPEN**. › There is a mismatch between LBI **MCB FEEDBACK** and **MCB FEEDBACK NEGATIVE**. › **Self-closing of breaker with Mains parameters with limits** – not considered as fault, MCB close command is issued after **MCB Close Delay**. 

	 Image 22.85 MCB Fail This alarm has FPS - **Fixed Protections States 5**This alarm has FPS - **Fixed Protections States 3**.

back to List of alarms level 1

Wrn MCB Fail To Close

Alarm Type	**WarningWarning**
Alarmlist message	Wrn MCB Fail To Close
Alarm evaluated	Only if **MCB Control Mode** = Internal
Related applications	MPTM
Alarm ID	1553
Description	This alarm is activated when there is a problem with circuit breaker position while closing. › LBO **MCB Close/Open** closed but LBI **MCB Feedback** did not closed in 2 seconds. › **Self-closing of breaker with Mains parameters with limits** – not considered as fault, MCB close command is issued when Mains fails.  Image 22.86 MCB Fail To Close This alarm has FPS - **Fixed Protections States 7**This alarm has FPS - **Fixed Protections States 4**.

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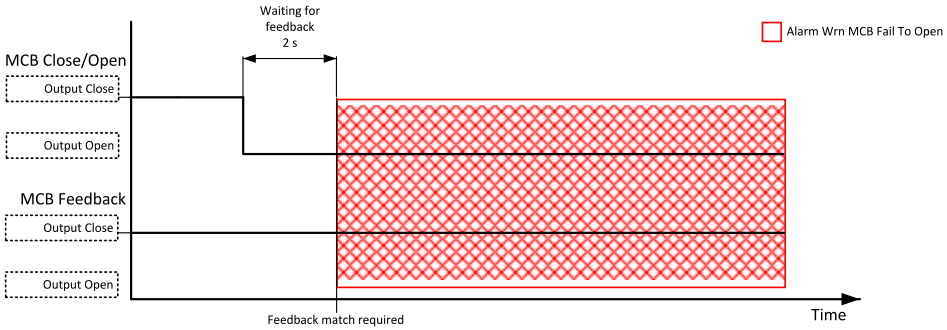
Wrn MCB Fail To Open

Alarm Type	**WarningWarning**
Alarmlist message	WrnHst MCB Fail To Open
Alarm evaluated	Only if **MCB Control Mode** = Internal
Related applications	MPTM
Alarm ID	1552
Description	This alarm is activated when there is a problem with circuit breaker position while opening. › LBO **MCB CLOSE/OPEN** opened but LBI **MCB FEEDBACK** did not opened in 2 seconds. › **Self-opening of breaker with Mains parameters without limits** - not considered as fault, MCB open command is issued when Mains fails .  Image 22.87 MCB Fail To Open This alarm has FPS - **FIXED PROTECTIONS STATES 7**This alarm has FPS - **FIXED PROTECTIONS STATES 4**.

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Wrn Override All Sd

Alarm Type	**Warning**
Alarmlist message	Override All Sd
Alarm evaluated	Only if LBI **SD OVERRIDE** is configured
Related applications	MINT, MPTM
Alarm ID	674
Description	This alarm is activated when LBI **SD OVERRIDE** is closed. This alarm has FPS - **FIXED PROTECTIONS STATES 1**.

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Wrn Password reset e-mail addr is not set

Alarm Type	**Warning**
Alarmlist message	Wrn Password reset e-mail addr is not set

Alarm evaluated	All the time
Related applications	MINT, MPTM
Alarm ID	1292
Description	This alarm is active when password reset e-mail address is not filled. Fill out the password reset e-mail via InteliConfig to remove this alarm.

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Wrn P for Q Fail

Alarm Type	**Warning**
Alarmlist message	Wrn P for Q Fail
Alarm evaluated	Only when **P For Q Limitation** = Enabled
Related applications	MPTM
Alarm ID	1106
Description	This alarm indicates P for Q Fail which can be caused by wrongly configured curves: › **P For Q UQ C** › **P For Q UQ L** › **P For Q PQ C** › **P For Q PQ L** This alarm has FPS - **Fixed Protections States 5**This alarm has FPS - **Fixed Protections States 1**

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Wrn P(Um) Fail

Alarm Type	**Warning**
Alarmlist message	Wrn P(Um) Fail
Alarm evaluated	Only if **P(Um)** != Disabled
Related applications	MPTM
Alarm ID	1255
Description	This alarm indicates **Power Regulation Based On Actual Mains Voltage** fail. Application Curve **P(Um)** is either not configured or invalid. This alarm has FPS - **Fixed Protections States 1**.

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Wrn PF Control Fail

Alarm Type	**Warning**
Alarmlist message	Wrn PF Control Fail
Alarm evaluated	Only when **PF/Q Request Source** = Analog External Value, **PF/Q Control PTM Mode** = PF Control and **Breaker state** = ParalOper
Related applications	MINT, MPTM

Alarm ID	1053
Description	This alarm indicates PF Control Fail which can be caused by: › If **PF/Q Regulation Type** = Base PF/Q Control LBI is **not** active » LAI **PF Control: ANEXT Base PF** is not configured » Value from LAI **PF Control: ANEXT Base PF** is out of sensor range (i.e. "###") › If **PF/Q Regulation Type** » LAI **PF Control: ANEXT Imp/Exp PF** is not configured » Value from LAI **PF Control: ANEXT Imp/Exp PF** is out of sensor range (i.e. "###") When this alarm is active, **BESS Required PF** is taken from **Base Power Factor** or **Import Power Factor**, based on setpoints setting. This alarm has FPS - **Fixed Protections States 1**

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Wrn PF(Pm) Fail

Alarm Type	**Warning**
Alarmlist message	Wrn PF(Pm) Fail
Alarm evaluated	Only when **PF/Q Control PTM Mode** = PF(Pm)
Related applications	MPTM
Alarm ID	1048
Description	This alarm indicates PF(Pm) Control Fail which can be caused by: › **PF/Q Request Source** = Analog External Value and **Breaker state** = ParalOper ***Note:*** *Function is evaluated as **PF/Q Request Source** = Setpoint* › curve is not available in configuration - evaluated during controller initialization **only** ***Note:*** *Function is evaluated as **PF/Q Control PTM Mode** = PF Control* › curve has changed resolution This alarm has FPS - **Fixed Protections States 1**.

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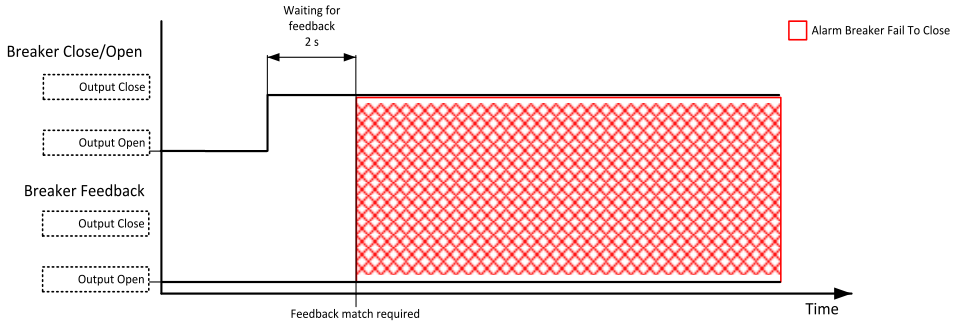
PVCB Fail To Close

Alarm Type	**Warning**
Alarmlist message	Wrn PVCB Fail To Close
Alarm evaluated	Only if **MCB Control Mode** = Internal
Related applications	MINT, MPTM

Alarm ID	1591
Description	This alarm is activated when there is a problem with circuit breaker position while closing. › LBO **PVCB CLOSE/OPEN** closed but LBI **PVCB FEEDBACK** did not closed in 2 seconds.  Image 22.88 PVCB Fail To Close

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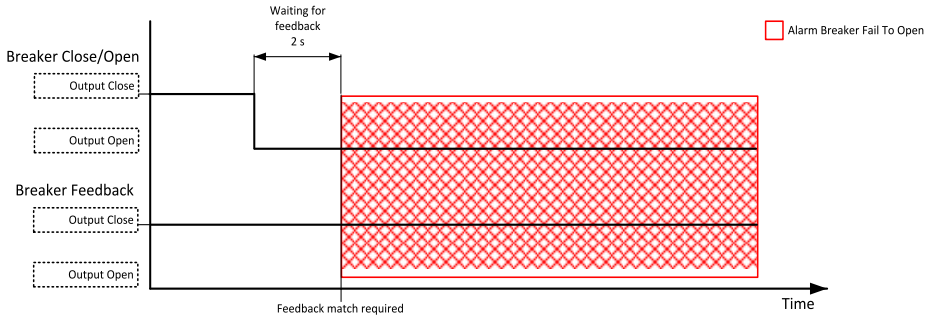
PVCB Fail To Open

Alarm Type	**Warning**
Alarmlist message	Wrn PVCB Fail To Open
Alarm evaluated	Only if **MCB Control Mode** = Internal
Related applications	MINT, MPTM
Alarm ID	1590
Description	This alarm is activated when there is a problem with circuit breaker position while opening. › LBO **PVCB CLOSE/OPEN** opened but LBI **PVCB FEEDBACK** did not opened in 2 seconds.  Image 22.89 PVCB Fail To Open

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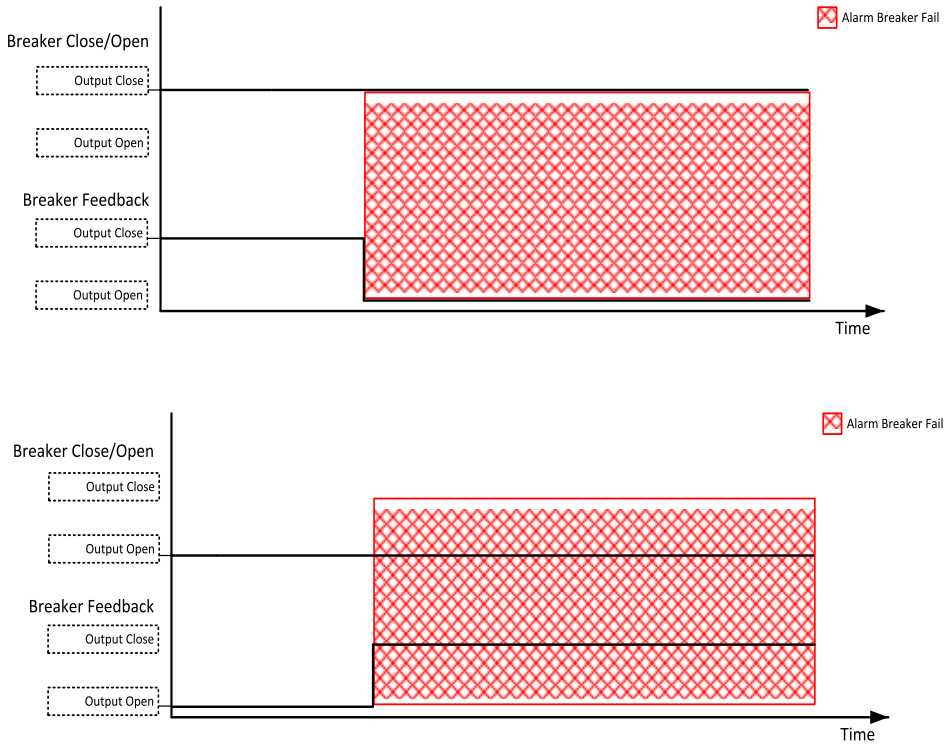
PVCB Fail

Alarm Type	**Warning**
Alarmlist message	Wrn PVCB Fail
Alarm evaluated	Only if **MCB Control Mode** = Internal
Related applications	MINT, MPTM
Alarm ID	1589
Description	This alarm is activated when there is a problem with position of the circuit breaker. › LBI **PVCB FEEDBACK** does not match expected position given by LBO **PVCB CLOSE/OPEN**. › There is a mismatch between LBI **PVCB FEEDBACK** and **PVCB FEEDBACK NEGATIVE**.  Image 22.90 PVCB Fail

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Wrn Q Control Fail

Alarm Type	**Warning**
Alarmlist message	Wrn Q Control Fail
Alarm evaluated	Only when **PF/Q Request Source** = Analog External Value, **PF/Q Control PTM Mode** = Q Control and **Breaker state** = ParalOper
Related applications	MINT, MPTM

Alarm ID	1049
Description	This alarm indicates Q Control Fail which can be caused by: › If **PF/Q Regulation Type** » LAI **Q CONTROL: ANEXT BASE Q** is not configured » Value from LAI **Q CONTROL: ANEXT BASE Q** is out of sensor range (i.e. "###") › If **PF/Q Regulation Type** » LAI **Q CONTROL: ANEXT IMP/EXP Q** is not configured » Value from LAI **Q CONTROL: ANEXT IMP/EXP Q** is out of sensor range (i.e. "###") This alarm has FPS - **FIXED PROTECTIONS STATES 1**.

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Wrn Q&U Protection

Alarm Type	**Warning**
Alarmlist message	Wrn Q&U Protection
Alarm evaluated	Only when **Q&U Protection** = Enabled and **Breaker state** = ParalOper
Related applications	MPTM
Alarm ID	584
Description	This alarm indicates active**Q&U Protection**. At least one actual mains voltage value is lower than allowed relative ratio (Uactual/Unominal) set by **Q&U < V** and value **BESS QTotal Running Q** is lower than **Q&U < Q** for longer time then **Q&U Protection Delay**. This alarm has FPS - **FIXED PROTECTIONS STATES 5**This alarm has FPS - **FIXED PROTECTIONS STATES 1**

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Wrn Q(P) Fail

Alarm Type	**Warning**
Alarmlist message	Wrn Q(P) Fail
Alarm evaluated	Only when **PF/Q Control PTM Mode** = Q(P) and at least one Gen-set is excited
Related applications	MPTM
Alarm ID	1051
Description	This alarm indicates Q(P) Control Fail which can be caused by: › **PF/Q Request Source** = Analog External Value and **Breaker state** = ParalOper ***Note:*** *Function is evaluated as **PF/Q Request Source** = Setpoint* › **Q(P)** curve is not available in configuration - evaluated during controller initialization **only**. ***Note:*** *Function is evaluated as **PF/Q Control PTM Mode** = PF Control*

	› **Q(P)** curve has changed resolution This alarm has FPS - **Fixed Protections States 1**.

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Wrn Q(Um) Fail

Alarm Type	**Warning**
Alarmlist message	Wrn Q(Um) Fail
Alarm evaluated	Only if **PF/Q Control PTM Mode** = Q(Um)
Related applications	MPTM
Alarm ID	1050
Description	This alarm indicates Q(Um) Control Fail which can be caused by: › If **PF/Q Request Source** = Analog External Value and **Breaker state** = ParalOper » If **PF/Q Regulation Type** = Base PF/Q Control ● LAI **Q(Um): 0 Ref ANEXT Base Q** is not configured ● Value LAI **Q(Um): 0 Ref ANEXT Base Q** is out of sensor range (i.e. "###") » If **PF/Q Regulation Type** = Import/Export PF/Q Control ● LAI **Q(Um): 0 Ref ANEXT Imp/Exp Q** is not configured ● Value LAI **Q(Um): 0 Ref ANEXT Imp/Exp Q** is out of sensor range (i.e. "###") ***Note:*** *In both cases is the function evaluated as **PF/Q Request Source** = Setpoint* › **Q(Um)** curve is not available in configuration - evaluated during controller initialization **only**. ***Note:*** *Function is evaluated as **PF/Q Control PTM Mode** = PF Control* › **Q(Um)** curve has changed resolution This alarm has FPS - **Fixed Protections States 1**.

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Wrn Qref/Ulim Fail

Alarm Type	**Warning**
Alarmlist message	Wrn Qref/Ulim Fail
Alarm evaluated	Only if **PF/Q Control PTM Mode** = Qref/Ulim and at least one Gen-set is excited
Related applications	MPTM
Alarm ID	1052
Description	This alarm indicates Qref/Ulim Control Fail which can be caused by: › If **PF/Q Request Source** = Analog External Value and **Breaker state** = ParalOper

	» If **PF/Q Regulation Type** = Base PF/Q Control ● LAI **QREF/ULIM: ANEXT QREF/PNOM B Q** is not configured ● Value LAI **QREF/ULIM: ANEXT QREF/PNOM B Q** is out of sensor range (i.e. "###") » If **PF/Q Regulation Type** = Import/Export PF/Q Control ● LAI **QREF/ULIM: ANEXT QREF/PNOM I/E Q** is not configured ● Value LAI **QREF/ULIM: ANEXT QREF/PNOM I/E Q** is out of sensor range (i.e. "###") ***Note:*** *In both cases is the function evaluated as **PF/Q Request Source** = Setpoint* › **QREF/ULIM** curve is not available in configuration - evaluated during controller initialization **only**. ***Note:*** *Function is evaluated as **PF/Q Control PTM Mode** = PF Control* › **QREF/ULIM** curve has changed resolution This alarm has FPS - **FIXED PROTECTIONS STATES 1**.

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Wrn Redundant CAN data mismatch

Alarm Type	**Warning**
Alarmlist message	Wrn Redundant CAN inconsistency
Alarm evaluated	Only when **CAN Intercontroller Comm Redund** = Enabled
Related applications	MINT, MPTM
Alarm ID	1079
Description	This alarm is issued when there is inconsistency between **CAN2A** and **Communication peripherals**. This alarm has FPS - **FIXED PROTECTIONS STATES 1**.

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Wrn RTC Battery Flat

Alarm Type	**Warning**
Alarmlist message	Wrn RTC Battery Flat
Alarm evaluated	Only during power-on of the controller
Related applications	MINT, MPTM
Alarm ID	42
Description	This alarm indicates that the controller detected a flat RTC Battery during power-on. The RTC battery is considered to be flat if its voltage drops below 2.8 V. To remove this alarm follow the **Backup battery replacement**.

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WrnHst Reverse Synchronization Fail

Alarm Type	**WarningWarning**
Alarmlist message	WrnHst Reverse Synchro Fail
Alarm evaluated	Only if LBO **Reverse Synchronization** is closed
Related applications	MINT, MPTM
Alarm ID	93
Description	This alarm is activated when Reverse Synchronization fails. Reverse Synchronization is activated when synchronization is done over MCB breaker. This alarm has FPS - **Fixed Protections States 3**.

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Wrn SD Card Failed

Alarm Type	**Warning**
Alarmlist message	Wrn SD Card Fail
Alarm evaluated	Only when **Long Term History** = Mount or Format
Related applications	MINT, MPTM
Alarm ID	1280
Description	This alarm is activated when it is not possible to read or write to the SD card. The alarm is also displayed in case that the setpoint **SD Card File System** is set to Mount or Format but the SD card is not inserted. This alarm will not be activated if the card is not compatible (**ALI SD Card Not Compatible** is active). This alarm has FPS - **Fixed Protections States 1**

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Wrn SD Card File System Failed

Alarm Type	**Warning**
Alarmlist message	Wrn SD Card File System Failed
Alarm evaluated	Only when **Long Term History** = Mount
Related applications	MINT, MPTM
Alarm ID	1639
Description	This alarm is activated when there is a wrong file system on the SD Card. The alarm is not activated if the SDcard is not compatible. This alarm has FPS - **Fixed Protections States 5Fixed Protections States 1Fixed Protections States 1**.

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Wrn SNMP TRAP 1 Fail

Alarm Type	**Warning**
Alarmlist message	Wrn SNMP TRAP 1 Fail
Alarm evaluated	Only when **SNMP Agent** = Enabled and **SNMP Traps IP Address 1** is set.
Related applications	MINT, MPTM

Alarm ID	823
Description	This alarm is activated if sending of SNMP trap to IP address set by **SNMP Traps IP Address 1** failed. This alarm has FPS - **Fixed Protections States 7**Fixed Protections States **4**This alarm has FPS - **Fixed Protections States 4**.

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Wrn SNMP TRAP 2 Fail

Alarm Type	**Warning**
Alarmlist message	Wrn SNMP TRAP 2 Fail
Alarm evaluated	Only when **SNMP Agent** = Enabled and **SNMP Traps IP Address 2** is set.
Related applications	MINT, MPTM
Alarm ID	824
Description	This alarm is activated if sending of SNMP trap to IP address set by **SNMP Traps IP Address 2** failed. This alarm has FPS - **Fixed Protections States 7**Fixed Protections States **4**This alarm has FPS - **Fixed Protections States 4**.

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Wrn SOC High Alarm

Alarm Type	**Warning**
Alarmlist message	Wrn SOC High Alarm
Alarm evaluated	Only if **BESS** = Installed
Related applications	MINT, MPTM
Alarm ID	1595
Description	This alarm is activated by **BESS >SOC Protection**. This alarm has FPS - **Fixed Protections States 3**.

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Wrn SOC Low Alarm

Alarm Type	**Warning**
Alarmlist message	Wrn SOC Low Alarm
Alarm evaluated	Only if **BESS** = Installed
Related applications	MINT, MPTM
Alarm ID	1594
Description	This alarm is activated by **BESS <SOC Protection**. This alarm has FPS - **Fixed Protections States 3**.

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Soft Transfer Fail

Alarm Type	**Warning**

Alarmlist message	Wrn Hst Soft Transfer Fail
Alarm evaluated	During transition of load
Related applications	MPTM
Alarm ID	852
Description	This alarm is activated when loading/unloading was not finished in time **Soft Unload Ramp** +10%. This alarm has FPS - **Fixed Protections States 5**This alarm has FPS - **Fixed Protections States 1**

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Wrn Stop Fail

Alarm Type	**Warning**
Alarmlist message	Wrn Stop Fail
Alarm evaluated	Only when BESS should be stopped
Related applications	MINT, MPTM
Alarm ID	48
Description	This alarm is activated when BESS is expected to be stopped but there is at least one symptom such as too high voltage or frequency which is not fulfilled. ***Note:*** *BESS cannot be started while this alarm is active.* This alarm has FPS - **Fixed Protections States 3**.

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Wrn SW Key CAN Redundancy Error

Alarm Type	**Warning**
Alarmlist message	Wrn SW Key CAN Redundancy Error
Alarm evaluated	Only when **CAN Intercontroller Comm Redund** = Enabled
Related applications	MINT, MPTM
Alarm ID	1463
Description	This alarm is activated when there is an attempt to enable premium feature **CAN Intercontroller Communication Redundancy** without of valid **SW Key**.

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WrnALI SW Key Hot Swap Error

Alarm Type	**WarningAlarm List Indication**
Alarmlist message	WrnALI SW Key Hot Swap Error
Alarm evaluated	Only if **Hot Swap Redundancy** != Disabled
Related applications	MINT, MPTM
Alarm ID	1461

Description	This alarm is activated when there is an attempt to enable premium feature **Hot Swap Redundancy** without valid **SW Key**.

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Wrn Test UPQF

Alarm Type	**Warning**
Alarmlist message	Wrn Test UPQF
Alarm evaluated	All the time
Related applications	MPTM
Alarm ID	583
Description	This alarm has informative meaning. It indicates, that Test mode for U, P, Q and f is enabled, i.e. **Grid Codes Test** = Enabled. This alarm has FPS - **Fixed Protections States 5**This alarm has FPS - **Fixed Protections States 1**

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Wrn Unsupported PMS Mode

Alarm Type	**Warning**
Alarmlist message	Wrn Unsupported PMS Mode
Alarm evaluated	All the time
Related applications	MINT, MPTM
Alarm ID	1044
Description	This alarm is active if setpoint **#Power Management Mode** = N/A Mode.

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Wrn Universal Genset Overflow

Alarm Type	**Warning**
Alarmlist message	Wrn Universal Genset Overflow
Alarm evaluated	All the time
Related applications	MINT, MPTM
Alarm ID	2691
Description	The sum of active power or Nominal Power of all universal gensets implemented via InteliNeo exceeded the maximal limit which is 32000 kW (3200,0 kW or 320,00 MW according to selected power format). The proper power format should be used to prevent this situation.

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Wrn Voltage Regulation Limit

Alarm Type	**WarningAlarm List + History Record Indication**
Alarmlist message	Wrn Voltage Regulation Limit
Alarm evaluated	While BESS is running
Related applications	MINT, MPTM

Alarm ID	152
Description	This alarm is issued when **Voltage Regulator Output** stays close to **Voltage Regulator Low Limit** or **Voltage Regulator High Limit** for at least 2 seconds and will remain active as long as the cause is present. This alarm has FPS - **FIXED PROTECTIONS STATES 3FIXED PROTECTIONS STATES 1**.

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Wrong PLC Configuration

Alarm Type	**Warning**
Alarmlist message	Wrong PLC Configuration
Alarm evaluated	Always
Related applications	MINT, MPTM
Alarm ID	41
Description	This alarm is activated when the **PLC - Programmable Logic Controller** configuration is invalid.Once the alarm is active the whole PLC does not work. This alarm will be active until the PLC configuration is not fixed and the archive is written to the controller.

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Wrn Production Mode

Alarm Type	WRN
Alarmlist message	Wrn Production Mode
Alarm evaluated	All the time
Related applications	MINT, MPTM
Description	Alarm is active when the controller has turned on Production mode. In turned on Production mode the user has the highest level 3 access without performing log in.

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Alarm Only

Dead Bus BCB Blocked

Alarm Type	**Alarm Only**
Alarmlist message	Dead Bus BCB Blocked
Alarm evaluated	While BESS is running
Related applications	MINT
Alarm ID	458
Description	This alarm is activated when **Controller Mode** = AUTO Droop occurs This alarm has FPS - **FIXED PROTECTIONS STATES 3**.

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Alarm List Indication

ALI AC BusMains Ph L1 Inverted

Alarm Type	Alarm List Indication
Alarmlist message	ALI AC BusMains Ph L1 Inverted
Alarm evaluated	All the time
Related applications	MINT, MPTM
Alarm ID	928
Description	This alarm is activated when AC BusMains Phase L1 is inverted.

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ALI AC BusMains Ph L2 Inverted

Alarm Type	Alarm List Indication
Alarmlist message	ALI AC BusMains Ph L2 Inverted
Alarm evaluated	All the time
Related applications	MINT, MPTM
Alarm ID	929
Description	This alarm is activated when AC BusMains Phase L2 is inverted.

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ALI AC BusMains Ph L3 Inverted

Alarm Type	Alarm List Indication
Alarmlist message	ALI AC BusMains Ph L3 Inverted
Alarm evaluated	All the time
Related applications	MINT, MPTM
Alarm ID	930
Description	This alarm is activated when AC BusMains Phase L3 is inverted.

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ALI BESS Ph Rotation Opposite

Alarm Type	Alarm List Indication
Alarmlist message	ALI AC BusMains Ph Rotation Opposite
Alarm evaluated	All the time
Related applications	MINT, MPTM
Alarm ID	847
Description	This alarm is activated when controller detects wrong phase rotation, e.g. **Phase Rotation** is set to Clockwise and actual rotation is Counterclockwise, on the AC BusMains side. This alarm has FPS - **Fixed Protections States 1**.

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ALI BCB Closing Is Blocked

Alarm Type	**Alarm List Indication**
Alarmlist message	ALI BCB Closing Is Blocked
Alarm evaluated	All the time
Related applications	MINT, MPTM
Alarm ID	2339
Description	Alarm is active in case the BCB breaker is blocked due to some of the generator protections being disabled: › **BESS <f Protection** › **BESS >f Protection** › **BESS <V Protection** › **BESS >V** and **BESS >>V Protection** › **Short Circuit Protection**

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ALI CAN Mode Inconsistency

Alarm Type	**Alarm List Indication**
Alarmlist message	ALI CAN Mode Inconsistency
Alarm evaluated	All the time
Related applications	MINT, MPTM
Alarm ID	1291
Description	This alarm is active when there is mismatch between setpoint **CAN ICC Mode** and value **CAN Intercontroller Comm Mode**. After changing the setpoint **CAN ICC Mode**, it is needed to power cycle the controller to get rid of the alarm.

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Daily Battery Cycles Reached

Alarm Type	**Alarm List Indication**
Alarmlist message	Daily Battery Cycles Reached
Alarm evaluated	Only if **BESS** = Installed
Related applications	MINT, MPTM
Alarm ID	1605
Description	This alarm is activated if number of daily battery cycles specified by the setpoint **Max Battery Cycles Per Day** is reached.

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ALI BESS Ph L1 Inverted

Alarm Type	Alarm List Indication
Alarmlist message	ALIBESS Ph L1 Inverted
Alarm evaluated	All the time
Related applications	MINT, MPTM
Alarm ID	922
Description	This alarm is activated whenBESS Phase L1 is inverted. ***Note:*** *Inverted phase means that "cold" end of Gen wiring which should be connected to the neutral is swapped with "hot" end which should be connected to the Load and Voltage measurement. In this case the CU see inverted voltage phasor.*

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ALI BESS Ph L2 Inverted

Alarm Type	Alarm List Indication
Alarmlist message	ALIBESS Ph L2 Inverted
Alarm evaluated	All the time
Related applications	MINT, MPTM
Alarm ID	923
Description	This alarm is activated whenBESS Phase L2 is inverted. ***Note:*** *Inverted phase means that "cold" end of Gen wiring which should be connected to the neutral is swapped with "hot" end which should be connected to the Load and Voltage measurement. In this case the CU see inverted voltage phasor.*

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ALI BESS Ph L3 Inverted

Alarm Type	Alarm List Indication
Alarmlist message	ALI BESS Ph L3 Inverted
Alarm evaluated	All the time
Related applications	MINT, MPTM
Alarm ID	924
Description	This alarm is activated when BESS Phase L3 is inverted. ***Note:*** *Inverted phase means that "cold" end of Gen wiring which should be connected to the neutral is swapped with "hot" end which should be connected to the Load and Voltage measurement. In this case the CU see inverted voltage phasor.*

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ALI BESS Ph Rotation Opposite

Alarm Type	Alarm List Indication
Alarmlist message	ALI BESS Ph Rotation Opposite
Alarm evaluated	All the time
Related applications	MINT, MPTM
Alarm ID	154
Description	This alarm is activated when controller detects wrong phase rotation, e.g. **Phase Rotation** is set to Clockwise and actual rotation is Counterclockwise, on the BESS side. This alarm has FPS - **Fixed Protections States 2**.

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ALI Wrn Redundant CAN Error

Alarm Type	Alarm List Indication
Alarmlist message	ALI Wrn Redundant CAN Error
Alarm evaluated	All the time
Related applications	MINT, MPTM
Alarm ID	1290
Description	This alarm is active when Value **CAN Intercontroller Comm Redundancy** and Setpoint **CAN Intercontroller Comm Redund** does not match. After changing the setpoint **CAN Intercontroller Comm Redund**, it is needed to power cycle the controller to get rid of the alarm.

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ALI SD Card Not Compatible

Alarm Type	Alarm List Indication
Alarmlist message	ALI SD Card Not Compatible
Alarm evaluated	Only when **Long Term History** = Mount or Format
Related applications	MINT, MPTM
Alarm ID	1610
Description	This alarm is activated when the value **SD Card Status** shows Status: Not Supported. Alarm is active all the time until the card is unmounted, or a compatible card is inserted. This alarm has FPS - **Fixed Protections States 7Fixed Protections States 1 Fixed Protections States 4**.

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ALI SD Card In Slot

Alarm Type	Alarm List Indication
Alarmlist message	ALI SD Card In Slot
Alarm evaluated	Only when **Long Term History** = Unmount
Related applications	MINT, MPTM
Alarm ID	1611
Description	This alarm is activated when **SD Card File System** is set to Unmount but SD Card is detected in the slot. This alarm has FPS - **Fixed Protections States 7Fixed Protections States 1 Fixed Protections States 4**.

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ALI SD Card Full

Alarm Type	Alarm List Indication
Alarmlist message	ALI SD Card Full
Alarm evaluated	Only when **Long Term History** = Mount
Related applications	MINT, MPTM
Alarm ID	1621
Description	This alarm is activated if value **SD Card Free Space** drops below 10 %. This alarm has FPS - **Fixed Protections States 7**.

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ALI SD Card Formatting/Mounting

Alarm Type	Alarm List Indication
Alarmlist message	ALI SD Card Formating/Mounting
Alarm evaluated	Only when **Long Term History** = Mount or Format
Related applications	MINT, MPTM
Alarm ID	1638
Description	This alarm is activated when the process of mounting or formatting is active. This alarm has FPS - **Fixed Protections States 7**.

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ALI AC MainsConverter Ph L1 Inverted

Alarm Type	Alarm List Indication
Alarmlist message	ALI AC MainsConverter Ph L1 Inverted
Alarm evaluated	All the time
Related applications	MINT, MPTM
Alarm ID	925
Description	This alarm is activated when AC MainsConverter Phase L1 is inverted.

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ALI AC MainsConverter Ph L2 Inverted

Alarm Type	Alarm List Indication
Alarmlist message	ALI AC MainsConverter Ph L2 Inverted
Alarm evaluated	All the time
Related applications	MINT, MPTM
Alarm ID	926
Description	This alarm is activated when AC MainsConverter Phase L2 is inverted.

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ALI AC MainsConverter Ph L3 Inverted

Alarm Type	Alarm List Indication
Alarmlist message	ALI AC MainsConverter Ph L3 Inverted
Alarm evaluated	All the time
Related applications	MINT, MPTM
Alarm ID	927
Description	This alarm is activated when AC MainsConverter Phase L3 is inverted.

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ALI Mains Ph Rotation Opposite

Alarm Type	Alarm List Indication
Alarmlist message	ALI AC MainsConverter Ph Rotation Opposite
Alarm evaluated	All the time
Related applications	MINT, MPTM
Alarm ID	158
Description	This alarm is activated when controller detects wrong phase rotation, e.g. **Phase Rotation** is set to Clockwise and actual rotation is Counterclockwise, on the AC MainsConverter side. This alarm has FPS - **Fixed Protections States 5**This alarm has FPS - **Fixed Protections States 3**.

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ALI Start Blocking

Alarm Type	Alarm List Indication
Alarmlist message	ALI Start Blocking
Alarm evaluated	Only if LBI **BESS Start Blocking** is configured
Related applications	MINT, MPTM
Alarm ID	56
Description	This alarm is active if LBI **BESS Start Blocking** is closed before BESS is started.

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ALI Manual Restore

Alarm Type	Alarm List Indication
Alarmlist message	ALI Manual Restore
Alarm evaluated	Only if **Controller Mode** = AUTO
Related applications	, SPTM
Alarm ID	783
Description	This alarm is activated after **Mains/Bus HealthyMains Healthy** is closed and Gen-sets are loaded. This alarm has FPS - **Fixed Protections States 3**.

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ALI Wrong Power Format

Alarm Type	Alarm List Indication
Alarmlist message	ALI Wrong Power Format
Alarm evaluated	All the time
Related applications	MINT, MPTM
Alarm ID	149
Description	This alarm is activated when there is inconsistency of **Power Formats And Units** on any controller which is connected via **CAN2A** or **Communication peripherals**.

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Alarm List + History Indication

SyncNotAllowed

Alarm Type	**Alarm List + History Record Indication**
Alarmlist message	AHI SyncNotAllowed
Alarm evaluated	When **MAINS/BUS HEALTHYMAINS HEALTHY** = 1 and **Mains Params/MP Synchronization** = Enabled
Related applications	MPTM
Alarm ID	452
Description	This alarm is activated when synchronization of BESS with MainsAC Converter with AC Bus is blocked by **Synchronization & Connection Conditions**. This alarm has FPS - **FIXED PROTECTIONS STATES 5**This alarm has FPS - **FIXED PROTECTIONS STATES 1**

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History Record Only

Hst Pave

Alarm Type	**History Record Only**
Alarmlist message	Hst Pave
Alarm evaluated	Only if **Pave Protection** != Disabled
Related applications	MPTM
Alarm ID	1078
Description	This alarm is activated when value **Pmom/Pave** is equal to or bigger than 1 for period longer that is allowed by application curve **P Mom/Pave Max** and MCB gets opened.

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Hst ROCOF 1

Alarm Type	**History Record Only**
Alarmlist message	Hst ROCOF 1
Alarm evaluated	Only if **ROCOF1 Protection** = Enabled or (**ROCOF1 Protection** = Parallel Only and **MCB FEEDBACK** is active)
Related applications	MINT, MPTM
Alarm ID	851
Description	This alarm is activated by **ROCOF1 Protection**. ***Note:*** *There are 4 ROCOF Protections which can be enabled.* › **ROCOF1 Protection** › **ROCOF2 Protection** › **ROCOF3 Protection** › **ROCOF4 Protection**

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Hst ROCOF2

Alarm Type	**History Record Only**
Alarmlist message	Hst ROCOF2
Alarm evaluated	Only if **ROCOF2 Protection** = Enabled or (**ROCOF2 Protection** = Parallel Only and **MCB FEEDBACK** is active)
Related applications	MINT, MPTM
Alarm ID	1112
Description	This alarm is activated by **ROCOF2 Protection**

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Hst ROCOF3

Alarm Type	**History Record Only**
Alarmlist message	Hst ROCOF3
Alarm evaluated	Only if **ROCOF3 Protection** = Enabled or (**ROCOF3 Protection** = Parallel Only and **MCB FEEDBACK** is active)
Related applications	MINT, MPTM
Alarm ID	1113
Description	This alarm is activated by **ROCOF3 Protection**

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Hst ROCOF4

Alarm Type	**History Record Only**
Alarmlist message	Hst ROCOF4
Alarm evaluated	Only if **ROCOF4 Protection** = Enabled or (**ROCOF4 Protection** = Parallel Only and **MCB FEEDBACK** is active)
Related applications	MINT, MPTM
Alarm ID	1114
Description	This alarm is activated by **ROCOF4 Protection**

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Hst Wrn Vector Shift

Alarm Type	**History Record Only** **Warning**
Alarmlist message	Hst Wrn Vector Shift
Alarm evaluated	Only if **Vector Shift Protection** = Enabled or (**Vector Shift Protection** = Parallel Only and **MCB FEEDBACK** is closed)
Related applications	MINT, MPTM
Alarm ID	850
Description	This alarm is activated when **Vector shift** is detected.

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11.5.3 Alarms level 2

What alarms level 2 are:

The level 2 level alarm indicates that a critical level of the respective value or parameter has been reached.

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Stp BCB Secondary Fail To Open 1553
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Shutdown

BOC Fence 1 Alarm

Alarm Type	BOC / History
Alarmlist message	BOC Fence 1 Alarm
Alarm evaluated	Only if **Geo-Fencing** != Disabled
Related applications	MINT, MPTM
Alarm ID	812
Description	This alarm evaluates the GPS position of Gen-set. The following setpoints are related to it: › **Geo-Fencing** › **Fence 1 Protection** › **Fence 1 Radius**

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BOC Fence 2 Alarm

Alarm Type	BOC / History
Alarmlist message	BOC Fence 2 Alarm
Alarm evaluated	Only if **Geo-Fencing** != Disabled
Related applications	MINT, MPTM
Alarm ID	814
Description	This alarm evaluates the GPS position of Gen-set. The following setpoints are related to it: › **Geo-Fencing** › **Fence 2 Protection** › **Fence 2 Radius**

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Emergency Stop

Alarm Type	**ShutdownShutdownProtection types**
Alarmlist message	GPR Emergency Stop
Alarm evaluated	Only if **Emergency Stop** is configured
Related applications	MINT, MPTM
Alarm ID	44
Description	This alarm is activated by LBI **Emergency Stop**. The BESS shuts down in the moment the input is activated and starting is blocked until the input is deactivated and fault reset is pressed. ***Note:*** *Use red emergency button placed on the switchboard door and connect it to a binary input of the controller. Then configure the function* ***Emergency Stop*** *to that binary input. It is recommended to use NC contact of the button.* ***Note:*** *The MCB control is not affected by this alarm.*

	This alarm has FPS - **Fixed Protections States 3Fixed Protections States 1**.

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E-STOP

Alarm Type	**Shutdown**
Alarmlist message	E-STOP
Alarm evaluated	All the time
Related applications	MINT, MPTM
Alarm ID	853
Description	Alarm is activated when dedicated **E-STOP** input is not closed. The BESS shuts down in the moment the input is opened and starting is blocked until the input is closed and fault reset is pressed.

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BESS Anti Islanding

Alarm Type	History Record
Alarmlist message	BESS Anti Islanding
Alarm evaluated	All the time
Related applications	MINT, MPTM
Alarm ID	1602
Description	This alarm is activated at the moment when there is no grid forming source of power such as Mains or Gen-set on the Bus and the BESS is controlled by P-Q method (grid support mode). When the system is configured with the setpoint **Starting Sequence BCB Control** = Start with Opened BCB" and the LBI **BESS Output Control Mode U-f/P-Q** activated, but the BESS is already connected to the AC bus with the BCB closed (indicated by LBI **BCB Feedback** = 1) during single island operation, the BESS operating in P-Q mode will not be able to energize the bus. In this scenario, the controller will log the sd BESS Anti-Islanding" event and will automatically open the BCB breaker, preventing the BESS from participating in grid formation—even though the control mode remains set to P-Q.

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Sd BCB Feedback Not Closed

Alarm Type	**Shutdown**
Alarmlist message	BCB Feedback Not Closed
Alarm evaluated	
Related applications	MINT, MPTM
Alarm ID	3487
Description	XYZ.

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Sd DC Circuit Close Fail

Alarm Type	**Warning**
Alarmlist message	Sd DC Circuit Close Fail
Alarm evaluated	
Related applications	MINT, MPTM
Alarm ID	1655
Description	This alarm gets active anytime when the BESS DC circuit is expected to be closed but the LBI **Precharge Finished** gets inactive (DC circuit is opened) unexpectedly.

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Sd ECU Communication Fail

Alarm Type	**ShutdownProtection types**
Alarmlist message	Sd ECU Communication Fail
Alarm evaluated	With configured LBO **ECU Power Relay** - Only when this LBO is active Without configured LBO **ECU Power Relay** - All the time
Related applications	MINT, MPTM
Description	This alarm occurs when an ECU is configured, but the communication with the ECU is not established or has dropped out.

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Sd BESS >>V L1-N

Alarm Type	**ShutdownProtection types** MPR
Alarmlist message	Sd BESS >>V L1-N
Alarm evaluated	Only if **BESS >>V Protection** != Disabled
Related applications	MINT, MPTM
Alarm ID	1098
Description	This alarm is activated by **BESS >>V Protection**. This alarm has FPS - **Fixed Protections States 2**.

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Sd BESS >>V L2-N

Alarm Type	**ShutdownProtection types** MPR
Alarmlist message	Sd BESS >>V L2-N
Alarm evaluated	Only if **BESS >>V Protection** != Disabled
Related applications	MINT, MPTM
Alarm ID	1099
Description	This alarm is activated by **BESS >>V Protection**. This alarm has FPS - **Fixed Protections States 2**.

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Sd BESS >>V L3-N

Alarm Type	**ShutdownProtection types** MPR
Alarmlist message	Sd BESS >>V L3-N
Alarm evaluated	Only if **BESS >>V Protection** != Disabled
Related applications	MINT, MPTM
Alarm ID	1100
Description	This alarm is activated by **BESS >>V Protection**. This alarm has FPS - **FIXED PROTECTIONS STATES 2**.

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Sd BESS >>V L1-L2

Alarm Type	**ShutdownProtection types** MPR
Alarmlist message	Sd BESS >>V L1-L2
Alarm evaluated	Only if **BESS >>V Protection** != Disabled
Related applications	MINT, MPTM
Alarm ID	1101
Description	This alarm is activated by **BESS >>V Protection**. This alarm has FPS - **FIXED PROTECTIONS STATES 2**.

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Sd BESS >>V L2-L3

Alarm Type	**ShutdownProtection types** MPR
Alarmlist message	Sd BESS >>V L2-L3
Alarm evaluated	Only if **BESS >>V Protection** != Disabled
Related applications	MINT, MPTM
Alarm ID	1102
Description	This alarm is activated by **BESS >>V Protection**. This alarm has FPS - **FIXED PROTECTIONS STATES 2**.

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Sd BESS >>V L3-L1

Alarm Type	**ShutdownProtection types** MPR
Alarmlist message	Sd BESS >>V L3-L1
Alarm evaluated	Only if **BESS >>V Protection** != Disabled
Related applications	MINT, MPTM
Alarm ID	1103
Description	This alarm is activated by **BESS >>V Protection**. This alarm has FPS - **FIXED PROTECTIONS STATES 2**.

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Sd BESS SOC Not Configured

Alarm Type	**Shutdown**
Alarmlist message	BESS SOC Not Configured
Alarm evaluated	Only if **BESS** = Installed
Related applications	MINT, MPTM
Alarm ID	1652
Description	This alarm activation is based on setpoint **BESS SOC Not Configured**.

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Sd BESS >V L1-N

Alarm Type	**ShutdownProtection types Warning**
Alarmlist message	Sd BESS >V L1-N
Alarm evaluated	Only if **BESS >V** != Disabled
Related applications	MINT, MPTM
Alarm ID	98
Description	This alarm is activated by **BESS >V**. This alarm has FPS - **Fixed Protections States 2**This alarm has FPS - **Fixed Protections States 3**.

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Sd BESS >V L2-N

Alarm Type	**ShutdownProtection types Warning**
Alarmlist message	Sd BESS >V L2-N
Alarm evaluated	Only if **BESS >V**!= Disabled
Related applications	MINT, MPTM
Alarm ID	99
Description	This alarm is activated by **BESS >V**. This alarm has FPS - **Fixed Protections States 2**This alarm has FPS - **Fixed Protections States 3**.

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Sd BESS >V L3-N

Alarm Type	**ShutdownProtection types Warning**
Alarmlist message	Sd BESS >V L3-N
Alarm evaluated	Only if **BESS >V**!= Disabled
Related applications	MINT, MPTM
Alarm ID	100
Description	This alarm is activated by **BESS >V**. This alarm has FPS - **Fixed Protections States 2**This alarm has FPS - **Fixed Protections States 3**.

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SdBESS >V L1-L2

Alarm Type	**ShutdownProtection types Warning**
Alarmlist message	Sd BESS >V L1-L2
Alarm evaluated	Only if **BESS >V**!= Disabled
Related applications	MINT, MPTM
Alarm ID	107
Description	This alarm is activated by **BESS >V**. This alarm has FPS - **FIXED PROTECTIONS STATES 2**This alarm has FPS - **FIXED PROTECTIONS STATES 3**.

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Sd BESS >V L2-L3

Alarm Type	**ShutdownProtection types Warning**
Alarmlist message	Sd BESS >V L2-L3
Alarm evaluated	Only if **BESS >V**!= Disabled
Related applications	MINT, MPTM
Alarm ID	108
Description	This alarm is activated by **BESS >V**. This alarm has FPS - **FIXED PROTECTIONS STATES 2**This alarm has FPS - **FIXED PROTECTIONS STATES 3**.

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Sd BESS >V L3-L1

Alarm Type	**ShutdownProtection types Warning**
Alarmlist message	Sd BESS >V L3-L1
Alarm evaluated	Only if **BESS >V**!= Disabled
Related applications	MINT, MPTM
Alarm ID	109
Description	This alarm is activated by **BESS >V**. This alarm has FPS - **FIXED PROTECTIONS STATES 2**This alarm has FPS - **FIXED PROTECTIONS STATES 3**.

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Sd BESS <V L1-N

Alarm Type	**ShutdownProtection types Warning**
Alarmlist message	Sd BESS <V L1-N
Alarm evaluated	Only if **BESS >V**!= Disabled
Related applications	MINT, MPTM
Alarm ID	95
Description	This alarm is activated by **BESS >V**. This alarm has FPS - **FIXED PROTECTIONS STATES 2**This alarm has FPS - **FIXED**

	PROTECTIONS STATES 3.

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Sd BESS <V L2-N

Alarm Type	**ShutdownProtection types Warning**
Alarmlist message	Sd BESS <V L2-N
Alarm evaluated	Only if **BESS >V**!= Disabled
Related applications	MINT, MPTM
Alarm ID	96
Description	This alarm is activated by **BESS >V**. This alarm has FPS - **FIXED PROTECTIONS STATES 2**This alarm has FPS - **FIXED PROTECTIONS STATES 3**.

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Sd BESS <V L3-N

Alarm Type	**ShutdownProtection types Warning**
Alarmlist message	Sd BESS <V L3-N
Alarm evaluated	Only if **BESS >V**!= Disabled
Related applications	MINT, MPTM
Alarm ID	97
Description	This alarm is activated by **BESS <V Protection**. This alarm has FPS - **FIXED PROTECTIONS STATES 2**This alarm has FPS - **FIXED PROTECTIONS STATES 3**.

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Sd BESSMains <V L1-L2

Alarm Type	**ShutdownProtection types Warning**
Alarmlist message	Sd BESS <V L1-L2
Alarm evaluated	Only if **BESS >V**!= Disabled
Related applications	MINT, MPTM
Alarm ID	104
Description	This alarm is activated by **BESS <V Protection**. This alarm has FPS - **FIXED PROTECTIONS STATES 2**This alarm has FPS - **FIXED PROTECTIONS STATES 3**.

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Sd BESSMains <V L2-L3

Alarm Type	**ShutdownProtection types Warning**
Alarmlist message	Sd BESS <V L2-L3
Alarm evaluated	Only if **BESS >V**!= Disabled
Related applications	MINT, MPTM

Alarm ID	105
Description	This alarm is activated by **BESS <V Protection**. This alarm has FPS - **Fixed Protections States 2**This alarm has FPS - **Fixed Protections States 3**.

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Sd BESSMains <V L3-L1

Alarm Type	**ShutdownProtection types Warning**
Alarmlist message	Sd BESS <V L3-L1
Alarm evaluated	Only if **BESS >V**!= Disabled
Related applications	MINT, MPTM
Alarm ID	106
Description	This alarm is activated by **BESS <V Protection**. This alarm has FPS - **Fixed Protections States 2**This alarm has FPS - **Fixed Protections States 3**.

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Sd BESS >f

Alarm Type	**ShutdownProtection types Warning**
Alarmlist message	Sd BESS >f
Alarm evaluated	Only if **BESS >f Protection** != Disabled
Related applications	MINT, MPTM
Alarm ID	121
Description	This alarm is activated by **BESS >f Protection**. This alarm has FPS - **Fixed Protections States 2**This alarm has FPS - **Fixed Protections States 3**.

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Sd BESS <f

Alarm Type	**ShutdownProtection types Warning**
Alarmlist message	Sd BESS <f
Alarm evaluated	Only if **BESS >f Protection** != Disabled
Related applications	MINT, MPTM
Alarm ID	120
Description	This alarm is activated by **BESS <f Protection**. This alarm has FPS - **Fixed Protections States 2**This alarm has FPS - **Fixed Protections States 3**.

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Sd BESS V Unbalance Ph-N

Alarm Type	**ShutdownProtection types**

Alarmlist message	Sd BESS V Unbalance Ph-N
Alarm evaluated	Only if **BESS >V**!= Disabled
Related applications	MINT, MPTM
Alarm ID	589
Description	This alarm is activated by **BESS V Unbalance Protection**. This alarm has FPS - **FIXED PROTECTIONS STATES 2**This alarm has FPS - **FIXED PROTECTIONS STATES 3**.

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Sd BESS V Unbalance Ph-Ph

Alarm Type	**ShutdownProtection types**
Alarmlist message	Sd BESSMains V Unbalance Ph-Ph
Alarm evaluated	Only if **BESS >V**!= Disabled
Related applications	MINT, MPTM
Alarm ID	588
Description	This alarm is activated by **BESS V Unbalance Protection**. This alarm has FPS - **FIXED PROTECTIONS STATES 2**This alarm has FPS - **FIXED PROTECTIONS STATES 3**.

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Sd BESS Current Unbalance

Alarm Type	**Shutdown Protection types**
Alarmlist message	SdGPR BESS Current Unbalance
Alarm evaluated	Only if **BESS Current Unbalance Protection** != Disabled
Related applications	MINT, MPTM
Alarm ID	591
Description	This alarm is activated by **BESS Current Unbalance Protection**. This alarm has FPS - **FIXED PROTECTIONS STATES 2**.

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Sd IDMT Earth Fault Current

Alarm Type	**ShutdownProtection types**
Alarmlist message	Sd IDMT Earth Fault Current
Alarm evaluated	Only if **Earth Fault Current Protection** != Disabled
Related applications	MINT, MPTM
Alarm ID	598
Description	This alarm is activated by **Earth Fault Current Protection**. This alarm has FPS - **FIXED PROTECTIONS STATES 2**.

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Sd IDMT BESS >A

Alarm Type	**ShutdownProtection types**
Alarmlist message	SdGPR IDMT BESS >A
Alarm evaluated	While BESS is loaded, if **IDMT BESS >A Protection** != Disabled
Related applications	MINT, MPTM
Alarm ID	597
Description	This alarm is activated by **IDMT BESS >A Protection**. This alarm has FPS - **FIXED PROTECTIONS STATES 2**.

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Sd IDMT Overload

Alarm Type	**ShutdownProtection types Protection types**
Alarmlist message	SdSDGPR IDMT Overload
Alarm evaluated	Only if **IDMT Overload Protection** != Disabled
Related applications	MINT, MPTM
Alarm ID	147
Description	This alarm is activated by **IDMT Overload Protection**. This alarm has FPS - **FIXED PROTECTIONS STATES 2**This alarm has FPS - **FIXED PROTECTIONS STATES 3**.

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Sd NCB Fail

Alarm Type	**Shutdown**
Alarmlist message	Sd NCB Fail
Alarm evaluated	Only if **NCB FEEDBACK** is configured
Related applications	MINT, MPTM
Alarm ID	148
Description	This alarm is activated when LBI **NCB FEEDBACK** does not match expected position given by LBO **NCB CLOSE/OPEN**. This alarm has FPS - **FIXED PROTECTIONS STATES 3FIXED PROTECTIONS STATES 1**.

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Sd Short Circuit

Alarm Type	**ShutdownProtection types**
Alarmlist message	PVBO Short Circuit
Alarm evaluated	Only if **Short Circuit Protection** != Disabled
Related applications	MINT, MPTM
Alarm ID	595
Description	This alarm is activated by **Short Circuit Protection**. This alarm has FPS - **FIXED PROTECTIONS STATES 2**.

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Sd SOC Critical High

Alarm Type	**Shutdown**
Alarmlist message	Sd SOC Critical High
Alarm evaluated	Only if **BESS** = Installed
Related applications	MINT, MPTM
Alarm ID	1597
Description	This alarm is activated by **BESS >>SOC Protection**. This alarm has FPS - **FIXED PROTECTIONS STATES 3**.

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Sd SOC Critical Low

Alarm Type	**Shutdown**
Alarmlist message	Sd SOC Critical Low
Alarm evaluated	Only if **BESS** = Installed
Related applications	MINT, MPTM
Alarm ID	1596
Description	This alarm is activated by **BESS <<SOC Protection**. This alarm has FPS - **FIXED PROTECTIONS STATES 3**.

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SD Wrong BCB Control Setting

Alarm Type	**Shutdown**
Alarmlist message	Sd Wrong BCB Control Setting
Alarm evaluated	Before the start of the application or during running if setpoints are changed.
Related applications	MINT
Alarm ID	XYZ
Description	This alarm will be issued based on certain conditions. The conditions that activate the alarm are as follows: › if setpoints and their settings set to **Starting Sequence BCB Control** = Start with BCB Opened and **BCB Type**= Fuse/Disc If the BCB is not physically installed, this combination is excluded.

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SD Wrong P-Q Control Settings

Alarm Type	**Shutdown**
Alarmlist message	SD Wrong P-Q Control Settings
Alarm evaluated	Before the start of the application or during running if setpoints or conditions are changed.
Related applications	MINT

Alarm ID	
Description	This alarm detects a discrepancy in the BESS startup sequence settings and the set active power control mode of the BESS. The BESS operates in the so-called P-Q mode (see BESS Output Control Mode U-f/P-Q). A BESS operating in P-Q mode likely does not support the grid-forming function in this mode and therefore cannot independently power the bus (load). Similarly, in this mode, the controller lacks the control signals to synchronize the BESS through an open BCB to a live bus. This alarm will be issued based on certain conditions. The conditions that activate the alarm are as follows: › Setpoint **Starting Sequence BCB Control** = Start with Opened BCB and LBI **PCS Output Control Mode u-f/P-Q** is activated. Having this setup before the start will not allow to start the BESS. › Setpoint **Starting Sequence BCB Control** = Start with Opened BCB and LBI **PCS Output Control Mode u-f/P-Q** is activated when the BESS is starting. This setup already during starting will make the BESS to stop due activation of the alarm.

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SD Wrong Precharge Settings

Alarm Type	**Shutdown**
Alarmlist message	Sd Wrong Precharge Settings
Alarm evaluated	Before the start of the application or during running if setpoints are changed.
Related applications	MINT
Alarm ID	
Description	This alarm will be issued based on certain conditions. The conditions that activate the alarm are as follows: if setpoints and their settings set to **Precharge Sequence**= Internal and **ESCB type** = Fuse/Disc

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BESS Start Fail

Alarm Type	**Shutdown**
Alarmlist message	BESS Start Fail
Alarm evaluated	During starting of BESS
Related applications	MINT, MPTM
Alarm ID	55
Description	This alarm is activated after attempt to start BESS failed. (BESS Ready To Load TO elapsed). This alarm has FPS - **Fixed Protections States 3**.

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Wrn Fence 1 Alarm

Alarm Type	Warning / Shutdown
Alarmlist message	Fence 1 Alarm
Alarm evaluated	Only if **Geo-Fencing** != Disabled
Related applications	MINT, MPTM
Alarm ID	811
Description	This alarm evaluates the GPS position of BESS. ***Note:*** *This alarm has FPS - **Fixed Protections States 5***

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Fence 2 Alarm

Alarm Type	Warning / Shutdown
Alarmlist message	Sd Fence 2 Alarm
Alarm evaluated	Only if **Geo-Fencing** != Disabled
Related applications	MINT, MPTM
Alarm ID	813
Description	This alarm evaluates the GPS position of BESS. ***Note:*** *This alarm has FPS - **Fixed Protections States 5***

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SlowSystem Stop Offload System Protection

Stp BESS SOC Not Available

Alarm Type	**Shutdown**
Alarmlist message	BESS SOC Not Available
Alarm evaluated	Only if **BESS** = Installed
Related applications	MINT, MPTM
Alarm ID	1653
Description	This alarm activation is based on setpoint **BESS SOC Not Available**.

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Bus Meas Error

Alarm Type	**Slow Stop Protection types**
Alarmlist message	Bus Meas Error
Alarm evaluated	**Bus Meas Error** != Disabled
Related applications	MINT, MPTM
Alarm ID	143
Description	This protection is activated in case that voltage mismatch on Bus side is detected for longer than 20 seconds.The mismatch is detected according to the conditions below: › Own BCB was closed › **MCB FEEDBACK** was detected (physically or via CAN2) → Breaker State = MultParOp, **MAINS/BUS HEALTHYMAINS HEALTHY** is active and **Controller Mode** = AUTO › Any other controller in **Control Group** closed BCB ***Note:*** *Alarm is activated after 20 s, but BCB closing is blocked immediately.* › BTB connected another Control Group with MCB Feedback or controller with closed BCB This alarm has FPS - **FIXED PROTECTIONS STATES 5FIXED PROTECTIONS STATES 1**This alarm has FPS - **FIXED PROTECTIONS STATES 3**.

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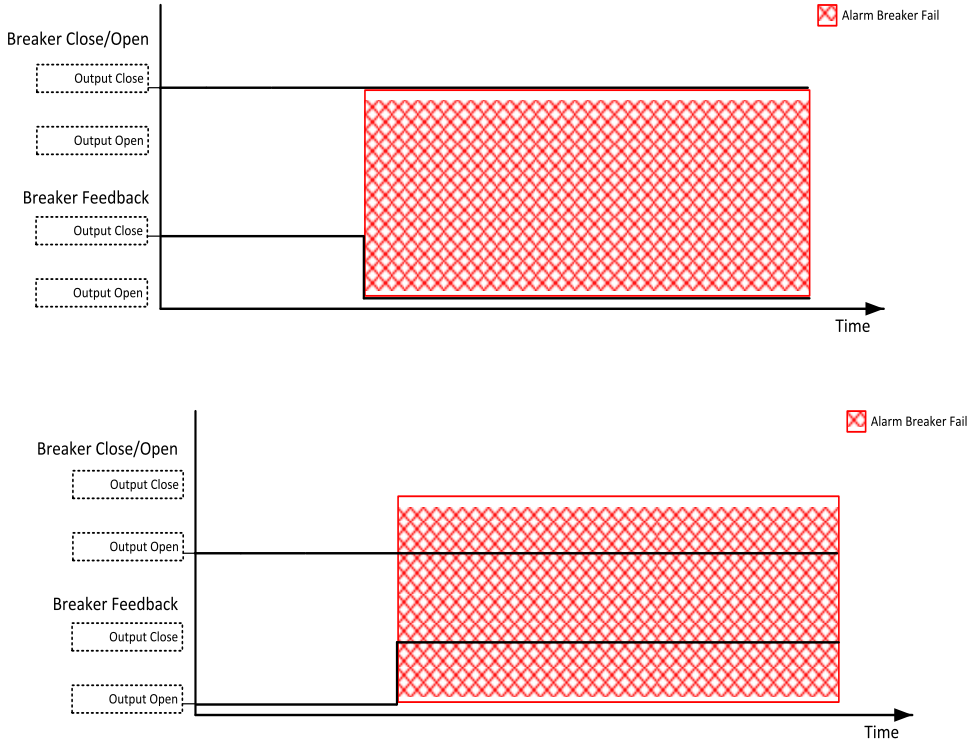
Stp BCB Fail

Alarm Type	**Slow Stop / History Record Only**
Alarmlist message	Stp BCB Fail
Alarm evaluated	Only if **BCB Control Mode** != External
Related applications	MINT, MPTM
Alarm ID	91

Description	This alarm is activated when there is a problem with position of the circuit breaker.  Image 22.91 BCB Fail This alarm has FPS - **Fixed Protections States 3Fixed Protections States 1**.

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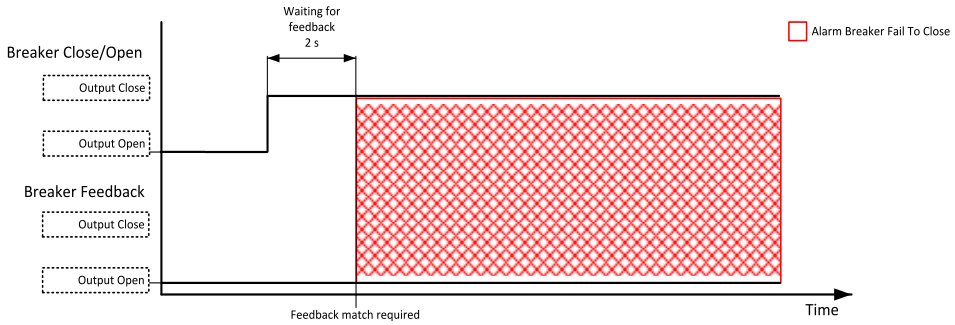
Sd BCB Fail To Close

Alarm Type	**Slow Stop History Record Only**
Alarmlist message	Sd BCB Fail To Close
Alarm evaluated	Only if **BCB Control Mode** != ExternalOnly if **Application Mode** = MGCB and **BCB Control Mode** != External
Related applications	MINT, MPTM
Alarm ID	1555
Description	This alarm is activated when there is a problem with circuit breaker position while closing. › LBO **BCB Close/Open** closed but LBI **BCB Feedback** did not closed during the time defined by Waiting For Breaker Feedback.

	 Image 22.92 BCB Fail To Close This alarm has FPS - **Fixed Protections States 7**Fixed Protections States 1This alarm has FPS - **Fixed Protections States 4**.

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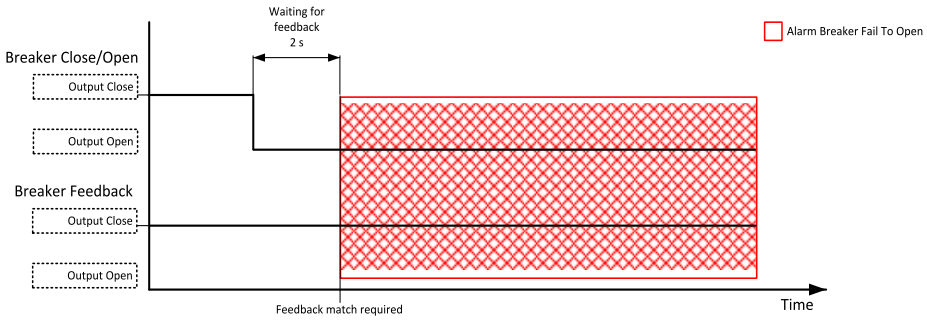
Sd BCB Fail To Open

Alarm Type	**Slow StopHistory Record Only**
Alarmlist message	Sd BCB Fail To Open
Alarm evaluated	Only if **BCB Control Mode** != External Only if **Application Mode** = MGCB and **BCB Control Mode** != External
Related applications	MINT, MPTM
Alarm ID	1554
Description	This alarm is activated when there is a problem with circuit breaker position while opening. › LBO **BCB Close/Open** opened but LBI **BCB Feedback** did not opened in 2 seconds.  Image 22.93 BCB Fail To Open This alarm has FPS - **Fixed Protections States 7**Fixed Protections States 1This alarm has FPS - **Fixed Protections States 4**.

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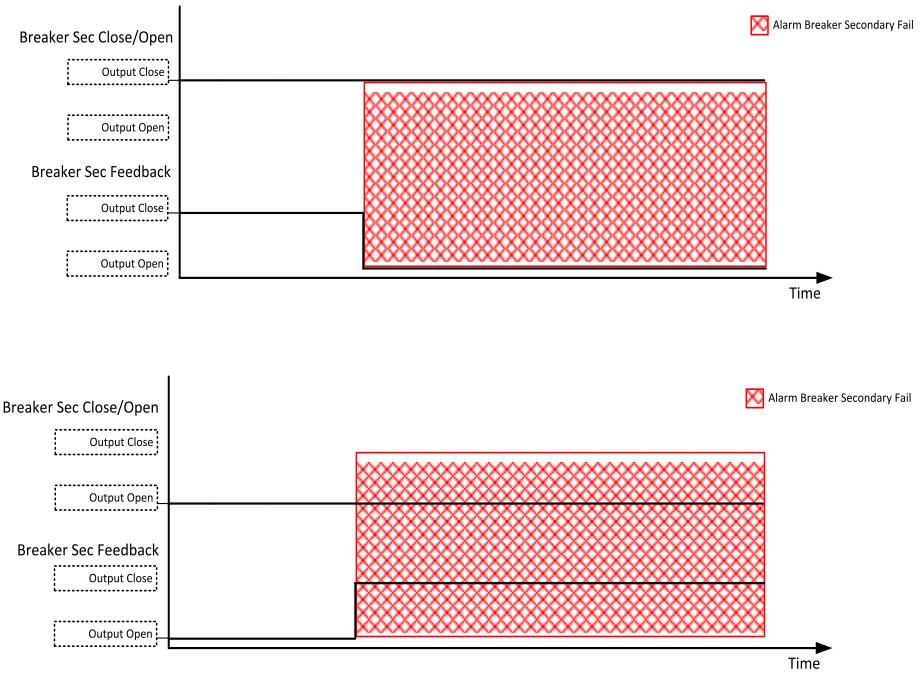
Stp BCB Secondary Fail

Alarm Type	**Slow StopHistory Record Only**
Alarmlist message	Stp BCB Secondary Fail
Alarm evaluated	Only if LBI **BCB Secondary Feedback** or LBI **BCB Secondary Feedback Negative** or **BCB Close/Open Secondary** is configured Only if **Application Mode** = MGCB, **BCB Control Mode** != External and LBI **BCB Secondary Feedback**, LBI **BCB Secondary Feedback Negative** or LBO **BCB Close/Open Secondary** is configured
Related applications	MINT, MPTM
Alarm ID	451
Description	This alarm is activated when there is a problem with position of the circuit breaker. › LBI **BCB Secondary Feedback** does not match expected position given by LBO **BCB Close/Open Secondary**. › There is a mismatch between LBI **BCB Secondary Feedback** and **BCB Secondary Feedback Negative**.  Image 22.94 BCB Secondary Fail This alarm has FPS - **Fixed Protections States 3Fixed Protections States 1**.

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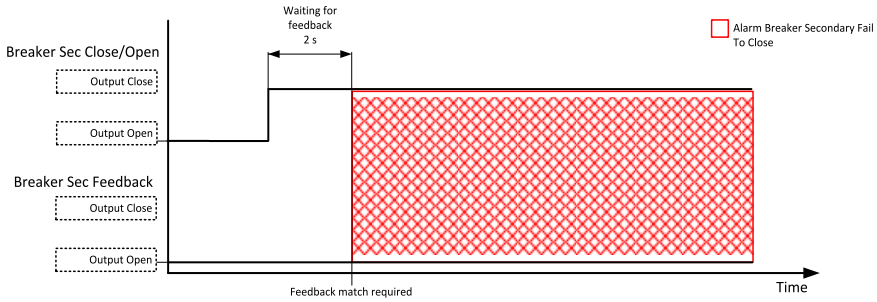
Stp BCB Secondary Fail To Close

Alarm Type	**Slow StopHistory Record Only**
Alarmlist message	Stp BCB Secondary Fail To Close

Alarm evaluated	Only if LBI **BCB Secondary Feedback** or LBI **BCB Secondary Feedback Negative** or **BCB Close/Open Secondary** is configured Only if **Application Mode** = MGCB, **BCB Control Mode** != External and LBI **BCB Secondary Feedback**, LBI **BCB Secondary Feedback Negative** or LBO **BCB Close/Open Secondary** is configured
Related applications	MINT, MPTM
Alarm ID	1557
Description	This alarm is activated when there is a problem with circuit breaker position while closing. › LBO **BCB Close/Open Secondary** closed but LBI **BCB Secondary Feedback** did not closed during the time defined by Waiting For Breaker Feedback.  Image 22.95 BCB Secondary Fail To Close This alarm has FPS - **Fixed Protections States 7**Fixed Protections States **1**This alarm has FPS - **Fixed Protections States 4**.

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Stp BCB Secondary Fail To Open

Alarm Type	**Slow StopHistory Record Only**
Alarmlist message	Stp BCB Secondary Fail To Open
Alarm evaluated	Only if LBI **BCB Secondary Feedback** or LBI **BCB Secondary Feedback Negative** or **BCB Close/Open Secondary** is configured Only if **Application Mode** = MGCB, **BCB Control Mode** != External and LBI **BCB Secondary Feedback**, LBI **BCB Secondary Feedback Negative** or LBO **BCB Close/Open Secondary** is configured
Related applications	MINT, MPTM
Alarm ID	1556
Description	This alarm is activated when there is a problem with circuit breaker position while opening. › LBO **BCB Close/Open Secondary** opened but LBI **BCB Secondary Feedback** did not opened in 2 seconds.

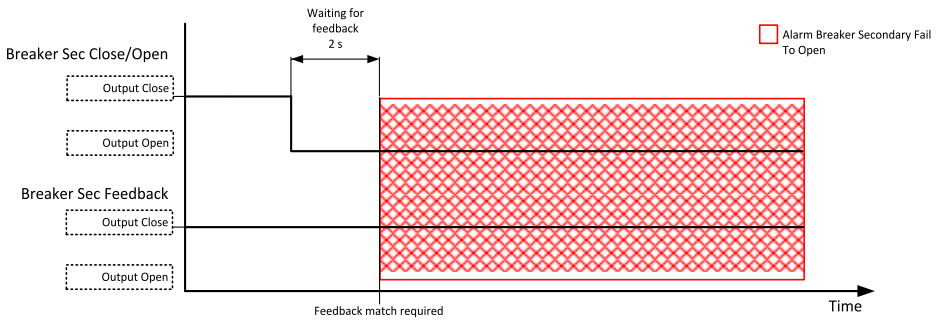

Image 22.96 BCB Secondary Fail To Open

This alarm has FPS - **Fixed Protections States 7**Fixed Protections States 1This alarm has FPS - **Fixed Protections States 4**.

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Stp Synchronization Fail

Alarm Type	**Slow StopHistory Record Only**
Alarmlist message	Stp Synchronization Fail
Alarm evaluated	During synchronization
Related applications	MINT, MPTM
Alarm ID	94
Description	This alarm is activated if the synchronization fails, e.g. **Synchronization Timeout** elapses. This alarm has FPS - **Fixed Protections States 3**Fixed Protections States **1**.

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Mains Protection

Mains Avg >V L1-N

Alarm Type	**Mains Protection**
Alarmlist message	Mains Avg >V L1-N
Alarm evaluated	Only if **Mains 10min Avg >V** != Disabled
Related applications	MPTM
Alarm ID	1466
Description	This alarm is activated by **Mains 10min Avg >V** protection. This alarm has FPS - **Fixed Protections States 4**This alarm has FPS - **Fixed Protections States 2**.

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Mains Avg >V L2-N

Alarm Type	**Mains Protection**
Alarmlist message	Mains Avg >V L2-N
Alarm evaluated	Only if **Mains 10min Avg >V** != Disabled
Related applications	MPTM
Alarm ID	1467
Description	This alarm is activated by **Mains 10min Avg >V** protection. This alarm has FPS - **Fixed Protections States 4**This alarm has FPS - **Fixed Protections States 2**.

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Mains Avg >V L3-N

Alarm Type	**Mains Protection**
Alarmlist message	Mains Avg >V L3-N
Alarm evaluated	Only if **Mains 10min Avg >V** != Disabled
Related applications	MPTM
Alarm ID	1468
Description	This alarm is activated by **Mains 10min Avg >V** protection. This alarm has FPS - **Fixed Protections States 4**This alarm has FPS - **Fixed Protections States 2**.

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Mains Avg >V L1-L2

Alarm Type	**Mains Protection**
Alarmlist message	Mains Avg >V L1-L2
Alarm evaluated	Only if **Mains 10min Avg >V** is not Disabled
Related applications	MPTM
Alarm ID	1144
Description	This alarm is activated by **Mains 10min Avg >V** protection.

	This alarm has FPS - **Fixed Protections States 4**This alarm has FPS - **Fixed Protections States 2**.

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Mains Avg >V L2-L3

Alarm Type	**Mains Protection**
Alarmlist message	Mains Avg >V L2-L3
Alarm evaluated	Only if **Mains 10min Avg >V** is not Disabled
Related applications	MPTM
Alarm ID	1145
Description	This alarm is activated by **Mains 10min Avg >V** protection. This alarm has FPS - **Fixed Protections States 4**This alarm has FPS - **Fixed Protections States 2**.

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Mains Avg >V L3-L1

Alarm Type	**Mains Protection**
Alarmlist message	Mains Avg >V L3-L1
Alarm evaluated	Only if **Mains 10min Avg >V** is not Disabled
Related applications	MPTM
Alarm ID	1146
Description	This alarm is activated by **Mains 10min Avg >V** protection. This alarm has FPS - **Fixed Protections States 4**This alarm has FPS - **Fixed Protections States 2**.

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PV Breaker Open

PV Anti Islanding

Alarm Type	PV Braker Open
Alarmlist message	PV Anti Islanding
Alarm evaluated	All the time
Related applications	MINT, MPTM
Alarm ID	1593
Description	This alarm is activated at the moment when there is no grid forming source of power such as Mains, Gen-set, or BESS controlled by U-f method on the Bus and the PV inverter is alone on the Bus.

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PV Not Operable

Alarm Type	PV Braker Open
Alarmlist message	PV Not Operable

Alarm evaluated	All the time
Related applications	MINT, MPTM
Alarm ID	1592
Description	This alarm is activated when the PV is not operable because its inverter is in the fault state.

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11.5.4 Other alarms

List of other alarms

Mains/Bus >V L1-N 1560
Mains/Bus >V L2-N 1560
Mains/Bus >V L3-N 1561
Mains/Bus >V L1-L2 1562
Mains/Bus >V L2-L3 1562
Mains/Bus >V L3-L1 1563
Mains/Bus >>V L1-N 1564
Mains/Bus >>V L2-N 1564
Mains/Bus >>V L3-N 1565
Mains/Bus >>V L1-L2 1566
Mains/Bus >>V L2-L3 1566
Mains/Bus >>V L3-L1 1567
Mains/Bus <V L1-N 1568
Mains/Bus <V L2-N 1568
Mains/Bus <V L3-N 1569
Mains/Bus <V L1-L2 1570
Mains/Bus <V L2-L3 1570
Mains/Bus <V L3-L1 1571
Mains/Bus <<V L1-N 1572
Mains/Bus <<V L2-N 1572
Mains/Bus <<V L3-N 1573
Mains/Bus <<V L1-L2 1574
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Mains/Bus <f 1577
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Mains/Bus V Unbalance Ph-N 1578
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Maintenance 1 Interval 1579
Maintenance Timer 1 RunHours 1579
Maintenance 2 Interval 1580
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Maintenance 3 Interval 1580
Maintenance 3 RunHours 1581
Maintenance 4 Interval 1581
Maintenance 4 RunHours 1581
Wrn DISTIN 01 1582
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Wrn DISTIN 03 1582
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Wrn DISTIN 05 1583
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Wrn DISTOUT 1598
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Wrn ECU 10 Comm Fail ... 1601
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Wrn ECU 15 Comm Fail ...1603
Wrn ECU 16 Comm Fail ...1603
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Wrn SHAIN 2 1603
Wrn SHAIN Collision 1604
Wrn SHBIN 1 1604
Wrn SHBIN 2 1604
Wrn SHBIN 3 1604
Wrn SHBIN 4 1605
Wrn SHBIN 5 1605
Wrn SHBIN 6 1605
Wrn SHBIN Collision 1605
MP VRT Protection Trip ... 1606

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Mains/Bus >V L1-N

Alarm Type	<table><tr><th>Application Mode</th><th>Alarm Type</th></tr><tr><td>MPTM</td><td>**Mains Protection**</td></tr><tr><td>MINT</td><td>**History Record Only**</td></tr></table> **Warning**
Alarmlist message	Mains/Bus >V L1-N
Alarm evaluated	<table><tr><th>Application Mode</th><th>Evaluated</th></tr><tr><td>MPTM</td><td>Only if **Mains >V Protection**!= Disabled</td></tr><tr><td>MINT</td><td>All the time</td></tr></table> Only if **Mains >V Protection**!= Disabled
Related applications	MINT, MPTM
Alarm ID	125
Description	This alarm is activated by **Mains >V Protection**. This alarm is activated when **Mains/Bus Voltage L1-N** rises over preset value. <table><tr><th>Application Mode</th><th>Behavior</th></tr><tr><td>MPTM</td><td>Alarm is activated by **Mains >V Protection**</td></tr><tr><td>MINT</td><td>Protection is always active. Alarm is activated when relative value of **Mains/Bus Voltage L1-N** related to **Mains/Bus Nominal Voltage Ph-N** rises over **BESS >V** for period longer than **BESS >V Delay**.</td></tr></table> This alarm has FPS - **Fixed Protections States 4**This alarm has FPS - **Fixed Protections States 2**.

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Mains/Bus >V L2-N

Alarm Type	<table><tr><th>Application Mode</th><th>Alarm Type</th></tr><tr><td>MPTM</td><td>**Mains Protection**</td></tr><tr><td>MINT</td><td>**History Record Only**</td></tr></table> **Warning**
Alarmlist message	Mains/Bus >V L2-N
Alarm evaluated	<table><tr><th>Application Mode</th><th>Evaluated</th></tr><tr><td>MPTM</td><td>Only if **Mains >V Protection**!= Disabled</td></tr><tr><td>MINT</td><td>All the time</td></tr></table> Only if **Mains >V Protection**!= Disabled
Related applications	MINT, MPTM

Alarm ID	126
Description	This alarm is activated by **Mains >V Protection**. This alarm is activated when **Mains/Bus Voltage L2-N** rises above preset value. **Application Mode** / **Behavior** MPTM: Alarm is activated by **Mains >V Protection** MINT: Protection is always active. Alarm is activated when relative value of **Mains/Bus Voltage L2-N** related to **Mains/Bus Nominal Voltage Ph-N** rises over **BESS >V** for period longer than **BESS >V Delay**. This alarm has FPS - **FIXED PROTECTIONS STATES 4**This alarm has FPS - **FIXED PROTECTIONS STATES 2**.

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Mains/Bus >V L3-N

Alarm Type	**Application Mode** / **Alarm Type** MPTM: **Mains Protection** MINT: **History Record Only** **Warning**
Alarmlist message	Mains/Bus >V L3-N
Alarm evaluated	**Application Mode** / **Evaluated** MPTM: Only if **Mains >V Protection**!= Disabled MINT: All the time Only if **Mains >V Protection**!= Disabled
Related applications	MINT, MPTM
Alarm ID	127
Description	This alarm is activated by **Mains >V Protection**. This alarm is activated when **Mains/Bus Voltage L3-N** rises over preset value. **Application Mode** / **Behavior** MPTM: Alarm is activated by **Mains >V Protection** MINT: Protection is always active. Alarm is activated when relative value of **Mains/Bus Voltage L3-N** related to **Mains/Bus Nominal Voltage Ph-N** rises over **BESS >V** for period longer than **BESS >V Delay**. This alarm has FPS - **FIXED PROTECTIONS STATES 4**This alarm has FPS - **FIXED PROTECTIONS STATES 2**.

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Mains/Bus >V L1-L2

Alarm Type	<table><tr><th>Application Mode</th><th>Alarm Type</th></tr><tr><td>MPTM</td><td>**Mains Protection**</td></tr><tr><td>MINT</td><td>**History Record Only**</td></tr></table> **Warning**
Alarmlist message	AC Mains/BusConverter >V L1-L2
Alarm evaluated	<table><tr><th>Application Mode</th><th>Evaluated</th></tr><tr><td>MPTM</td><td>Only if **Mains >V Protection** != Disabled</td></tr><tr><td>MINT</td><td>All the time</td></tr></table> Only if **Mains >V Protection** != Disabled
Related applications	MINT, MPTM
Alarm ID	131
Description	This alarm is activated by **Mains >V Protection**. This alarm is activated when **Mains/Bus Voltage L1-L2** rises over preset value. <table><tr><th>Application Mode</th><th>Behavior</th></tr><tr><td>MPTM</td><td>Alarm is activated by **Mains >V Protection**</td></tr><tr><td>MINT</td><td>Protection is always active. Alarm is activated when relative value of **Mains/Bus Voltage L1-L2** related to **Mains/Bus Nominal Voltage Ph-Ph** rises over **BESS >V** for period longer than **BESS >V Delay**.</td></tr></table> This alarm has FPS - **Fixed Protections States 4**This alarm has FPS - **Fixed Protections States 2**.

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Mains/Bus >V L2-L3

Alarm Type	<table><tr><th>Application Mode</th><th>Alarm Type</th></tr><tr><td>MPTM</td><td>**Mains Protection**</td></tr><tr><td>MINT</td><td>**History Record Only**</td></tr></table> **Warning**
Alarmlist message	AC Mains/BusConverter >V L2-L3
Alarm evaluated	<table><tr><th>Application Mode</th><th>Evaluated</th></tr><tr><td>MPTM</td><td>Only if **Mains >V Protection**!= Disabled</td></tr><tr><td>MINT</td><td>All the time</td></tr></table> Only if **Mains >V Protection**!= Disabled
Related applications	MINT, MPTM

Alarm ID	132
Description	This alarm is activated by **Mains >V Protection**. This alarm is activated when **Mains/Bus Voltage L2-L3** rises over preset value. **Application Mode** / **Behavior** MPTM: Alarm is activated by **Mains >V Protection** MINT: Protection is always active. Alarm is activated when relative value of **Mains/Bus Voltage L2-L3** related to **Mains/Bus Nominal Voltage Ph-Ph** rises over **BESS >V** for period longer than **BESS >V Delay**. This alarm has FPS - **FIXED PROTECTIONS STATES 4**This alarm has FPS - **FIXED PROTECTIONS STATES 2**.

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Mains/Bus >V L3-L1

Alarm Type	**Application Mode** / **Alarm Type** MPTM: **Mains Protection** MINT: **History Record Only** **Warning**
Alarmlist message	AC Mains/BusConverter >V L3-L1
Alarm evaluated	**Application Mode** / **Evaluated** MPTM: Only if **Mains >V Protection**!= Disabled MINT: All the time Only if **Mains >V Protection**!= Disabled
Related applications	MINT, MPTM
Alarm ID	133
Description	This alarm is activated by **Mains >V Protection**. This alarm is activated when **Mains/Bus Voltage L3-L1** rises over preset value. **Application Mode** / **Behavior** MPTM: Alarm is activated by **Mains >V Protection** MINT: Protection is always active. Alarm is activated when relative value of **Mains/Bus Voltage L3-L1** related to **Mains/Bus Nominal Voltage Ph-Ph** rises over **BESS >V** for period longer than **BESS >V Delay**. This alarm has FPS - **FIXED PROTECTIONS STATES 4**This alarm has FPS - **FIXED PROTECTIONS STATES 2**.

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Mains/Bus >>V L1-N

Alarm Type	<table><tr><th>Application Mode</th><th>Alarm Type</th></tr><tr><td>MPTM</td><td>**Mains Protection**</td></tr><tr><td>MINT</td><td>**History Record Only**</td></tr></table> **Warning**
Alarmlist message	Mains/Bus >>V L1-N
Alarm evaluated	<table><tr><th>Application Mode</th><th>Evaluated</th></tr><tr><td>MPTM</td><td>Only if **Mains >>V Protection**!= Disabled</td></tr><tr><td>MINT</td><td>All the time</td></tr></table> Only if **Mains >>V Protection**!= Disabled
Related applications	MINT, MPTM
Alarm ID	1080
Description	This alarm is activated by **Mains >>V Protection**. This alarm is activated when **Mains/Bus Voltage L1-N** rises over preset value. <table><tr><th>Application Mode</th><th>Behavior</th></tr><tr><td>MPTM</td><td>Alarm is activated by **Mains >>V Protection**</td></tr><tr><td>MINT</td><td>Protection is always active. Alarm is activated when relative value of **Mains/Bus Voltage L1-N** related to **Mains/Bus Nominal Voltage Ph-N** rises over **BESS >>V** for period longer than **BESS >>V Delay**.</td></tr></table> This alarm has FPS - **Fixed Protections States 4**This alarm has FPS - **Fixed Protections States 2**.

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Mains/Bus >>V L2-N

Alarm Type	<table><tr><th>Application Mode</th><th>Alarm Type</th></tr><tr><td>MPTM</td><td>**Mains Protection**</td></tr><tr><td>MINT</td><td>**History Record Only**</td></tr></table> **Warning**
Alarmlist message	Mains/Bus >>V L2-N
Alarm evaluated	<table><tr><th>Application Mode</th><th>Evaluated</th></tr><tr><td>MPTM</td><td>Only if **Mains >>V Protection**!= Disabled</td></tr><tr><td>MINT</td><td>All the time</td></tr></table> Only if **Mains >>V Protection**!= Disabled
Related applications	MINT, MPTM
Alarm ID	1082

Description	This alarm is activated by **Mains >>V Protection**. This alarm is activated when **Mains/Bus Voltage L2-N** rises over preset value. **Application Mode** / **Behavior** MPTM: Alarm is activated by **Mains >V Protection** MINT: Protection is always active. Alarm is activated when relative value of **Mains/Bus Voltage L2-N** related to **Mains/Bus Nominal Voltage Ph-N** rises over **BESS >>V** for period longer than **BESS >>V Delay**. This alarm has FPS - **Fixed Protections States 4**This alarm has FPS - **Fixed Protections States 2**.

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Mains/Bus >>V L3-N

Alarm Type	**Application Mode** / **Alarm Type** MPTM: **Mains Protection** MINT: **History Record Only** **Warning**
Alarmlist message	M Mains/Bus >>V L3-N
Alarm evaluated	**Application Mode** / **Evaluated** MPTM: Only if **Mains >>V Protection**!= Disabled MINT: All the time Only if **Mains >>V Protection**!= Disabled
Related applications	MINT, MPTM
Alarm ID	1084
Description	This alarm is activated by **Mains >>V Protection**. This alarm is activated when **Mains/Bus Voltage L3-N** rises over preset value. **Application Mode** / **Behavior** MPTM: Alarm is activated by **Mains >>V Protection** MINT: Protection is always active. Alarm is activated when relative value of **Mains/Bus Voltage L3-N** related to **Mains/Bus Nominal Voltage Ph-N** rises over **BESS >>V** for period longer than **BESS >>V**. This alarm has FPS - **Fixed Protections States 4**This alarm has FPS - **Fixed Protections States 2**.

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Mains/Bus >>V L1-L2

Alarm Type	<table><tr><th>Application Mode</th><th>Alarm Type</th></tr><tr><td>MPTM</td><td>**Mains Protection**</td></tr><tr><td>MINT</td><td>**History Record Only**</td></tr></table> **Warning**
Alarmlist message	AC Mains/BusConverter >>V L1-L2
Alarm evaluated	<table><tr><th>Application Mode</th><th>Evaluated</th></tr><tr><td>MPTM</td><td>Only if **Mains >>V Protection** != Disabled</td></tr><tr><td>MINT</td><td>All the time</td></tr></table> Only if **Mains >>V Protection** != Disabled
Related applications	MINT, MPTM
Alarm ID	1086
Description	This alarm is activated by **Mains >>V Protection**. This alarm is activated when **Mains/Bus Voltage L1-L2** rises over preset value. <table><tr><th>Application Mode</th><th>Behavior</th></tr><tr><td>MPTM</td><td>Alarm is activated by **Mains >>V Protection**</td></tr><tr><td>MINT</td><td>Protection is always active. Alarm is activated when relative value of **Mains/Bus Voltage L1-L2** related to **Mains/Bus Nominal Voltage Ph-Ph** rises over **BESS >>V** for period longer than **BESS >>V Delay**.</td></tr></table> This alarm has FPS - **Fixed Protections States 4**This alarm has FPS - **Fixed Protections States 2**.

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Mains/Bus >>V L2-L3

Alarm Type	<table><tr><th>Application Mode</th><th>Alarm Type</th></tr><tr><td>MPTM</td><td>**Mains Protection**</td></tr><tr><td>MINT</td><td>**History Record Only**</td></tr></table> **Warning**
Alarmlist message	AC Mains/BusConverter >>V L2-L3
Alarm evaluated	<table><tr><th>Application Mode</th><th>Evaluated</th></tr><tr><td>MPTM</td><td>Only if **Mains >>V Protection**!= Disabled</td></tr><tr><td>MINT</td><td>All the time</td></tr></table> Only if **Mains >>V Protection**!= Disabled
Related applications	MINT, MPTM

Alarm ID	1088
Description	This alarm is activated by **Mains >>V Protection**. This alarm is activated when **Mains/Bus Voltage L2-L3** rises over preset value. **Application Mode** / **Behavior** MPTM: Alarm is activated by **Mains >V Protection** MINT: Protection is always active. Alarm is activated when relative value of **Mains/Bus Voltage L2-L3** related to **Mains/Bus Nominal Voltage Ph-Ph** rises over **BESS >>V** for period longer than **BESS >>V Delay**. This alarm has FPS - **Fixed Protections States 4**This alarm has FPS - **Fixed Protections States 2**.

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Mains/Bus >>V L3-L1

Alarm Type	**Application Mode** / **Alarm Type** MPTM: **Mains Protection** MINT: **History Record Only** **Warning**
Alarmlist message	AC Mains/BusConverter >>V L3-L1
Alarm evaluated	**Application Mode** / **Evaluated** MPTM: Only if **Mains >>V Protection**!= Disabled MINT: All the time Only if **Mains >>V Protection**!= Disabled
Related applications	MINT, MPTM
Alarm ID	1090
Description	This alarm is activated by **Mains >>V Protection**. This alarm is activated when **Mains/Bus Voltage L3-L1** rises over preset value. **Application Mode** / **Behavior** MPTM: Alarm is activated by **Mains >>V Protection** MINT: Protection is always active. Alarm is activated when relative value of **Mains/Bus Voltage L3-L1** related to **Mains/Bus Nominal Voltage Ph-Ph** rises over **BESS >>V** for period longer than **BESS >>V Delay**. This alarm has FPS - **Fixed Protections States 4**This alarm has FPS - **Fixed Protections States 2**.

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Mains/Bus <V L1-N

Alarm Type	<table><tr><th>Application Mode</th><th>Alarm Type</th></tr><tr><td>MPTM</td><td>**Mains Protection**</td></tr><tr><td>MINT</td><td>**History Record Only**</td></tr></table> **Warning**
Alarmlist message	Mains/Bus <V L1-N
Alarm evaluated	<table><tr><th>Application Mode</th><th>Evaluated</th></tr><tr><td>MPTM</td><td>Only if **Mains <V Protection** != Disabled</td></tr><tr><td>MINT</td><td>All the time</td></tr></table> Only if **Mains >V Protection** != Disabled
Related applications	MINT, MPTM
Alarm ID	122
Description	This alarm is activated by **Mains <V Protection**. This alarm is activated when **Mains/Bus Voltage L1-N** drops below preset value. <table><tr><th>Application Mode</th><th>Behavior</th></tr><tr><td>MPTM</td><td>Alarm is activated by **Mains <V Protection**</td></tr><tr><td>MINT</td><td>Protection is always active. Alarm is activated when relative value of **Mains/Bus Voltage L1-N** related to **Mains/Bus Nominal Voltage Ph-N** drops below **BESS <V** for period longer than **BESS <V Delay**.</td></tr></table> This alarm has FPS - **Fixed Protections States 4**This alarm has FPS - **Fixed Protections States 2**.

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Mains/Bus <V L2-N

Alarm Type	<table><tr><th>Application Mode</th><th>Alarm Type</th></tr><tr><td>MPTM</td><td>**Mains Protection**</td></tr><tr><td>MINT</td><td>**History Record Only**</td></tr></table> **Warning**
Alarmlist message	Mains/Bus <V L2-N
Alarm evaluated	<table><tr><th>Application Mode</th><th>Evaluated</th></tr><tr><td>MPTM</td><td>Only if **Mains <V Protection** != Disabled</td></tr><tr><td>MINT</td><td>All the time</td></tr></table> Only if **Mains >V Protection** != Disabled
Related applications	MINT, MPTM

Alarm ID	123
Description	This alarm is activated by **Mains <V Protection**. This alarm is activated when **Mains/Bus Voltage L2-N** drops below preset value. **Application Mode** / **Behavior** MPTM: Alarm is activated by **Mains <V Protection** MINT: Protection is always active. Alarm is activated when relative value of **Mains/Bus Voltage L2-N** related to **Mains/Bus Nominal Voltage Ph-N** drops below **BESS <V** for period longer than **BESS <V Delay**. This alarm has FPS - **Fixed Protections States 4**This alarm has FPS - **Fixed Protections States 2**.

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Mains/Bus <V L3-N

Alarm Type	**Application Mode** / **Alarm Type** MPTM: **Mains Protection** MINT: **History Record Only** **Warning**
Alarmlist message	Mains/Bus <V L3-N
Alarm evaluated	**Application Mode** / **Evaluated** MPTM: Only if **Mains <V Protection** != Disabled MINT: All the time Only if **Mains >V Protection** != Disabled
Related applications	MINT, MPTM
Alarm ID	124
Description	This alarm is activated by **Mains <V Protection**. This alarm is activated when **Mains/Bus Voltage L3-N** drops below preset value. **Application Mode** / **Behavior** MPTM: Alarm is activated by **Mains <V Protection** MINT: Protection is always active. Alarm is activated when relative value of **Mains/Bus Voltage L3-N** related to **Mains/Bus Nominal Voltage Ph-N** drops below **BESS <V** for period longer than **BESS <V Delay**. This alarm has FPS - **Fixed Protections States 4**This alarm has FPS - **Fixed Protections States 2**.

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Mains/Bus <V L1-L2

Alarm Type	<table><tr><th>Application Mode</th><th>Alarm Type</th></tr><tr><td>MPTM</td><td>**Mains Protection**</td></tr><tr><td>MINT</td><td>**History Record Only**</td></tr></table> **Warning**
Alarmlist message	Mains/Bus <V L1-L2
Alarm evaluated	<table><tr><th>Application Mode</th><th>Evaluated</th></tr><tr><td>MPTM</td><td>Only if **Mains <V Protection** != Disabled</td></tr><tr><td>MINT</td><td>All the time</td></tr></table> Only if **Mains >V Protection** is not Disabled
Related applications	MINT, MPTM
Alarm ID	128
Description	This alarm is activated by **Mains <V Protection**. This alarm is activated when **Mains/Bus Voltage L1-L2** drops below preset value. <table><tr><th>Application Mode</th><th>Behavior</th></tr><tr><td>MPTM</td><td>Alarm is activated by **Mains <V Protection**</td></tr><tr><td>MINT</td><td>Protection is always active. Alarm is activated when relative value of **Mains/Bus Voltage L1-L2** related to **Mains/Bus Nominal Voltage Ph-Ph** drops below **BESS <V** for period longer than **BESS <V Delay**.</td></tr></table> This alarm has FPS - **Fixed Protections States 4**This alarm has FPS - **Fixed Protections States 2**.

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Mains/Bus <V L2-L3

Alarm Type	<table><tr><th>Application Mode</th><th>Alarm Type</th></tr><tr><td>MPTM</td><td>**Mains Protection**</td></tr><tr><td>MINT</td><td>**History Record Only**</td></tr></table> **Warning**
Alarmlist message	Mains/Bus <V L2-L3
Alarm evaluated	<table><tr><th>Application Mode</th><th>Evaluated</th></tr><tr><td>MPTM</td><td>Only if **Mains <V Protection** != Disabled</td></tr><tr><td>MINT</td><td>All the time</td></tr></table> Only if **Mains >V Protection** is not Disabled
Related applications	MINT, MPTM

Alarm ID	129
Description	This alarm is activated by **Mains <V Protection**. This alarm is activated when **Mains/Bus Voltage L2-L3** drops below preset value. <table><tr><th>Application Mode</th><th>Behavior</th></tr><tr><td>MPTM</td><td>Alarm is activated by **Mains <V Protection**</td></tr><tr><td>MINT</td><td>Protection is always active. Alarm is activated when relative value of **Mains/Bus Voltage L2-L3** related to **Mains/Bus Nominal Voltage Ph-Ph** drops below **BESS <V** for period longer than **BESS <V Delay**.</td></tr></table>This alarm has FPS - **FIXED PROTECTIONS STATES 4**This alarm has FPS - **FIXED PROTECTIONS STATES 2**.

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Mains/Bus <V L3-L1

Alarm Type	<table><tr><th>Application Mode</th><th>Alarm Type</th></tr><tr><td>MPTM</td><td>**Mains Protection**</td></tr><tr><td>MINT</td><td>**History Record Only**</td></tr></table>**Warning**
Alarmlist message	Mains/Bus <V L3-L1
Alarm evaluated	<table><tr><th>Application Mode</th><th>Evaluated</th></tr><tr><td>MPTM</td><td>Only if **Mains <V Protection** != Disabled</td></tr><tr><td>MINT</td><td>All the time</td></tr></table>Only if **Mains >V Protection** is not Disabled
Related applications	MINT, MPTM
Alarm ID	130
Description	This alarm is activated by **Mains <V Protection**. This alarm is activated when **Mains/Bus Voltage L3-L1** drops below preset value. <table><tr><th>Application Mode</th><th>Behavior</th></tr><tr><td>MPTM</td><td>Alarm is activated by **Mains <V Protection**</td></tr><tr><td>MINT</td><td>Protection is always active. Alarm is activated when relative value of **Mains/Bus Voltage L3-L1** related to **Mains/Bus Nominal Voltage Ph-Ph** drops below **BESS <V** for period longer than **BESS <V Delay**.</td></tr></table>This alarm has FPS - **FIXED PROTECTIONS STATES 4**This alarm has FPS - **FIXED PROTECTIONS STATES 2**.

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Mains/Bus <<V L1-N

Alarm Type	<table><tr><th>Application Mode</th><th>Alarm Type</th></tr><tr><td>MPTM</td><td>**Mains Protection**</td></tr><tr><td>MINT</td><td>**History Record Only**</td></tr></table> **Warning**
Alarmlist message	Mains/Bus <<V L1-N
Alarm evaluated	<table><tr><th>Application Mode</th><th>Evaluated</th></tr><tr><td>MPTM</td><td>Only if **Mains <V Protection** != Disabled</td></tr><tr><td>MINT</td><td>All the time</td></tr></table> Only if **Mains <V Protection** != Disabled
Related applications	MINT, MPTM
Alarm ID	1081
Description	This alarm is activated by **Mains <V Protection**. This alarm is activated when **Mains/Bus Voltage L1-N** drops below preset value. <table><tr><th>Application Mode</th><th>Behavior</th></tr><tr><td>MPTM</td><td>Alarm is activated by **Mains <V Protection**</td></tr><tr><td>MINT</td><td>Protection is always active. Alarm is activated when relative value of **Mains/Bus Voltage L1-N** related to **Mains/Bus Nominal Voltage Ph-N** drops below **BESS <V** for period longer than **BESS <V Delay**.</td></tr></table> This alarm has FPS - **Fixed Protections States 4**This alarm has FPS - **Fixed Protections States 2**.

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Mains/Bus <<V L2-N

Alarm Type	<table><tr><th>Application Mode</th><th>Alarm Type</th></tr><tr><td>MPTM</td><td>**Mains Protection**</td></tr><tr><td>MINT</td><td>**History Record Only**</td></tr></table> **Warning**
Alarmlist message	Mains/Bus <<V L2-N
Alarm evaluated	<table><tr><th>Application Mode</th><th>Evaluated</th></tr><tr><td>MPTM</td><td>Only if **Mains <V Protection** != Disabled</td></tr><tr><td>MINT</td><td>All the time</td></tr></table> Only if **Mains <V Protection** != Disabled
Related applications	MINT, MPTM

Alarm ID	1083
Description	This alarm is activated by **Mains <V Protection**. This alarm is activated when **Mains/Bus Voltage L2-N** drops below preset value. <table><tr><th>Application Mode</th><th>Behavior</th></tr><tr><td>MPTM</td><td>Alarm is activated by **Mains <V Protection**</td></tr><tr><td>MINT</td><td>Protection is always active. Alarm is activated when relative value of **Mains/Bus Voltage L2-N** related to **Mains/Bus Nominal Voltage Ph-N** drops below **BESS <V** for period longer than **BESS <V Delay**.</td></tr></table>This alarm has FPS - **Fixed Protections States 4**This alarm has FPS - **Fixed Protections States 2**.

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Mains/Bus <<V L3-N

Alarm Type	<table><tr><th>Application Mode</th><th>Alarm Type</th></tr><tr><td>MPTM</td><td>**Mains Protection**</td></tr><tr><td>MINT</td><td>**History Record Only**</td></tr></table>**Warning**
Alarmlist message	Mains/Bus <<V L3-N
Alarm evaluated	<table><tr><th>Application Mode</th><th>Evaluated</th></tr><tr><td>MPTM</td><td>Only if **Mains <V Protection** != Disabled</td></tr><tr><td>MINT</td><td>All the time</td></tr></table>Only if **Mains <V Protection** != Disabled
Related applications	MINT, MPTM
Alarm ID	1085
Description	This alarm is activated by **Mains <V Protection**. This alarm is activated when **Mains/Bus Voltage L3-N** drops below preset value. <table><tr><th>Application Mode</th><th>Behavior</th></tr><tr><td>MPTM</td><td>Alarm is activated by **Mains <V Protection**</td></tr><tr><td>MINT</td><td>Protection is always active. Alarm is activated when relative value of **Mains/Bus Voltage L3-N** related to **Mains/Bus Nominal Voltage Ph-N** drops below **BESS <V** for period longer than **BESS <V Delay**.</td></tr></table>This alarm has FPS - **Fixed Protections States 4**This alarm has FPS - **Fixed Protections States 2**.

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Mains/Bus <<V L1-L2

Alarm Type	<table><tr><th>Application Mode</th><th>Alarm Type</th></tr><tr><td>MPTM</td><td>**Mains Protection**</td></tr><tr><td>MINT</td><td>**History Record Only**</td></tr></table> **Warning**
Alarmlist message	Mains/Bus <<V L1-L2
Alarm evaluated	<table><tr><th>Application Mode</th><th>Evaluated</th></tr><tr><td>MPTM</td><td>Only if **Mains <V Protection** != Disabled</td></tr><tr><td>MINT</td><td>All the time</td></tr></table> Only if **Mains <V Protection** != Disabled
Related applications	MINT, MPTM
Alarm ID	1087
Description	This alarm is activated by **Mains <V Protection**. This alarm is activated when **Mains/Bus Voltage L1-L2** drops below preset value. <table><tr><th>Application Mode</th><th>Behavior</th></tr><tr><td>MPTM</td><td>Alarm is activated by **Mains <V Protection**</td></tr><tr><td>MINT</td><td>Protection is always active. Alarm is activated when relative value of **Mains/Bus Voltage L1-L2** related to **Mains/Bus Nominal Voltage Ph-Ph** drops below **BESS <V** for period longer than **BESS <V Delay**.</td></tr></table> This alarm has FPS - **Fixed Protections States 4**This alarm has FPS - **Fixed Protections States 2**.

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Mains/Bus <<V L2-L3

Alarm Type	<table><tr><th>Application Mode</th><th>Alarm Type</th></tr><tr><td>MPTM</td><td>**Mains Protection**</td></tr><tr><td>MINT</td><td>**History Record Only**</td></tr></table> **Warning**
Alarmlist message	Mains/Bus <<V L2-L3
Alarm evaluated	<table><tr><th>Application Mode</th><th>Evaluated</th></tr><tr><td>MPTM</td><td>Only if **Mains <V Protection** != Disabled</td></tr><tr><td>MINT</td><td>All the time</td></tr></table> Only if **Mains <V Protection** != Disabled
Related applications	MINT, MPTM

Alarm ID	1089
Description	This alarm is activated by **Mains <V Protection**. This alarm is activated when **Mains/Bus Voltage L2-L3** drops below preset value. <table><tr><th>Application Mode</th><th>Behavior</th></tr><tr><td>MPTM</td><td>Alarm is activated by **Mains <V Protection**</td></tr><tr><td>MINT</td><td>Protection is always active. Alarm is activated when relative value of **Mains/Bus Voltage L2-L3** related to **Mains/Bus Nominal Voltage Ph-Ph** drops below **BESS <V** for period longer than **BESS <V Delay**.</td></tr></table>This alarm has FPS - **Fixed Protections States 4**This alarm has FPS - **Fixed Protections States 2**.

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Mains/Bus <<V L3-L1

Alarm Type	<table><tr><th>Application Mode</th><th>Alarm Type</th></tr><tr><td>MPTM</td><td>**Mains Protection**</td></tr><tr><td>MINT</td><td>**History Record Only**</td></tr></table>**Warning**
Alarmlist message	Mains/Bus <<V L3-L1
Alarm evaluated	<table><tr><th>Application Mode</th><th>Evaluated</th></tr><tr><td>MPTM</td><td>Only if **Mains <V Protection** != Disabled</td></tr><tr><td>MINT</td><td>All the time</td></tr></table>Only if **Mains <V Protection** != Disabled
Related applications	MINT, MPTM
Alarm ID	1091
Description	This alarm is activated by **Mains <V Protection**. This alarm is activated when **Mains/Bus Voltage L3-L1** drops below preset value. <table><tr><th>Application Mode</th><th>Behavior</th></tr><tr><td>MPTM</td><td>Alarm is activated by **Mains <V Protection**</td></tr><tr><td>MINT</td><td>Protection is always active. Alarm is activated when relative value of **Mains/Bus Voltage L3-L1** related to **Mains/Bus Nominal Voltage Ph-Ph** drops below **BESS <V** for period longer than **BESS <V Delay**.</td></tr></table>This alarm has FPS - **Fixed Protections States 4**This alarm has FPS - **Fixed Protections States 2**.

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Mains/Bus >f

Alarm Type	<table><tr><th>Application Mode</th><th>Alarm Type</th></tr><tr><td>MPTM</td><td>**Mains Protection**</td></tr><tr><td>MINT</td><td>**History Record Only**</td></tr></table> **Warning**
Alarmlist message	Mains/Bus >V L1-N >f
Alarm evaluated	<table><tr><th>Application Mode</th><th>Evaluated</th></tr><tr><td>MPTM</td><td>Only if **Mains >f Protection** != Disabled</td></tr><tr><td>MINT</td><td>All the time</td></tr></table> Only if **Mains >f Protection**!= Disabled
Related applications	MINT, MPTM
Alarm ID	135
Description	This alarm is activated by **Mains >f Protection**. This alarm is activated when **Mains/Bus Frequency**, rises over preset value. <table><tr><th>Application Mode</th><th>Behavior</th></tr><tr><td>MPTM</td><td>Alarm is activated by **Mains >f Protection**</td></tr><tr><td>MINT</td><td>Protection is always active. Alarm is activated when **Mains/Bus Frequency** rises over **BESS >f** for period longer than **BESS >f Delay**.</td></tr></table> This alarm has FPS - **Fixed Protections States 5**This alarm has FPS - **Fixed Protections States 3**.

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Mains/Bus >>f

Alarm Type	
Alarmlist message	Mains/Bus >>f
Alarm evaluated	Only if **Mains >>f Protection** != Disabled
Related applications	MPTM
Alarm ID	1092
Description	This alarm is activated by **Mains >>f Protection**. This alarm is activated when **Mains/Bus Frequency**, rises over preset value. This alarm has FPS - **Fixed Protections States 5**This alarm has FPS - **Fixed Protections States 3**.

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Mains/Bus <f

Alarm Type	<table><tr><th>Application Mode</th><th>Alarm Type</th></tr><tr><td>MPTM</td><td>**Mains Protection**</td></tr><tr><td>MINT</td><td>**History Record Only**</td></tr></table> **Warning**
Alarmlist message	Mains/Bus <f
Alarm evaluated	<table><tr><th>Application Mode</th><th>Evaluated</th></tr><tr><td>MPTM</td><td>Only if **Mains <f Protection** != Disabled</td></tr><tr><td>MINT</td><td>All the time</td></tr></table>Only if **Mains <f Protection** != Disabled
Related applications	MINT, MPTM
Alarm ID	134
Description	This alarm is activated by **Mains >f Protection**. This alarm is activated when **Mains/Bus Frequency**, drops below preset value. <table><tr><th>Application Mode</th><th>Behavior</th></tr><tr><td>MPTM</td><td>Alarm is activated by **Mains <f Protection**</td></tr><tr><td>MINT</td><td>Protection is always active. Alarm is activated when **Mains/Bus Frequency** drops below **BESS <f** for period longer than **BESS <f Delay**.</td></tr></table>This alarm has FPS - **Fixed Protections States 5**This alarm has FPS - **Fixed Protections States 3**.

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Mains/Bus <<f

Alarm Type	**Warning**
Alarmlist message	Mains/Bus <<f
Alarm evaluated	Only if **Mains <<f Protection** != Disabled
Related applications	MINT, MPTM
Alarm ID	1093
Description	This alarm is activated by **Mains <<f Protection**. This alarm is activated when **Mains/Bus Frequency**, drops below preset value. This alarm has FPS - **Fixed Protections States 5**This alarm has FPS - **Fixed Protections States 3**.

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Mains/Bus V Unbalance Ph-N

Alarm Type	<table><tr><th>Application Mode</th><th>Alarm Type</th></tr><tr><td>MPTM</td><td>**Mains Protection**</td></tr><tr><td>MINT</td><td>**History Record Only**</td></tr></table> **History Record Only** **Warning**
Alarmlist message	Mains/Bus V Unbalance Ph-N
Alarm evaluated	<table><tr><th>Application Mode</th><th>Evaluated</th></tr><tr><td>MPTM</td><td>Only if **Mains V Unbalance Protection** != Disabled</td></tr><tr><td>MINT</td><td>All the time</td></tr></table>Only if **Mains V Unbalance Protection** != Disabled All the time
Related applications	MINT, MPTM
Alarm ID	593
Description	This alarm is activated by **Mains V Unbalance Protection** This alarm is activated when relative difference between **Mains/Bus Voltage L1-N**, **Mains/Bus Voltage L2-N** or **Mains/Bus Voltage L3-N** rises over preset value. <table><tr><th>Application Mode</th><th>Behavior</th></tr><tr><td>MPTM</td><td>Alarm is activated by **Mains V Unbalance Protection**</td></tr><tr><td>MINT</td><td>Protection is always active. Alarm is activated when relative difference between bus voltages rises over **BESS V Unbalance** for period longer than **BESS V Unbalance Delay**.</td></tr></table>This alarm has FPS - **Fixed Protections States 4**Fixed Protections States **2**This alarm has FPS - **Fixed Protections States 2**.

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Mains/BusV Unbalance Ph-Ph

Alarm Type	<table><tr><th>Application Mode</th><th>Alarm Type</th></tr><tr><td>MPTM</td><td>**Mains Protection**</td></tr><tr><td>MINT</td><td>**History Record Only**</td></tr></table> **History Record Only** **Warning**
Alarmlist message	BOR ACMains/BusConverter V Unbalance Ph-Ph

Alarm evaluated	<table><tr><th>Application Mode</th><th>Evaluated</th></tr><tr><td>MPTM</td><td>Only if **Mains V Unbalance Protection** != Disabled</td></tr><tr><td>MINT</td><td>All the time</td></tr></table> Only if **Mains V Unbalance Protection** != Disabled All the time
Related applications	MINT, MPTM
Alarm ID	592
Description	This alarm is activated by **Mains V Unbalance Protection** This alarm is activated when relative difference between **Mains/Bus Voltage L1-L2**, **Mains/Bus Voltage L2-L3** or **Mains/Bus Voltage L3-L1** rises over preset value. <table><tr><th>Application Mode</th><th>Behavior</th></tr><tr><td>MPTM</td><td>Alarm is activated by **Mains V Unbalance Protection**</td></tr><tr><td>MINT</td><td>Protection is always active. Alarm is activated when relative difference between bus voltages rises over **BESS V Unbalance** for period longer than **BESS V Unbalance Delay**.</td></tr></table> This alarm has FPS - **Fixed Protections States 4Fixed Protections States 2**This alarm has FPS - **Fixed Protections States 2**.

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Maintenance 1 Interval

Alarm Type	Based on configuration (**Warning/Slow Stop**)
Alarmlist message	Wrn/Stp Maintenance 1 Interval
Alarm evaluated	Only if **Maintenance Timer 1 Interval** != Disabled
Related applications	MINT, MPTM
Alarm ID	1072
Description	This alarm is activated when setpoint **Maintenance Timer 1 Interval** elapses i.e. the value **Maintenance Timer 1 Interval** = 0 and lasts until the setpoint is set to value > 0 or "Disabled". This alarm has FPS - **Fixed Protections States 7Fixed Protections States 4**.

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Maintenance Timer 1 RunHours

Alarm Type	Based on configuration (**Warning/Slow Stop**)
Alarmlist message	Wrn/Stp Maintenance 1 Protection
Alarm evaluated	Only if **Maintenance Timer 1 RunHours** != Disabled
Related applications	MINT, MPTM
Alarm ID	585

Description	This alarm is activated when setpoint **Maintenance Timer 1 RunHours** elapses i.e. the value **Maintenance Timer 1 RunHours** = 0 and lasts until the setpoint is set to value > 0 or "Disabled". This alarm has FPS - **Fixed Protections States 7Fixed Protections States 4**.

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Maintenance 2 Interval

Alarm Type	Based on configuration (**Warning/Slow Stop**)
Alarmlist message	Wrn/Stp Maintenance 1 Interval
Alarm evaluated	Only if **Maintenance Timer 2 Interval** != Disabled
Related applications	MINT, MPTM
Alarm ID	1073
Description	This alarm is activated when setpoint **Maintenance Timer 2 Interval** elapses i.e. the value **Maintenance Timer 2 Interval** = 0 and lasts until the setpoint is set to value > 0 or "Disabled". This alarm has FPS - **Fixed Protections States 7Fixed Protections States 4**.

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Maintenance 2 RunHours

Alarm Type	Based on configuration (**Warning/Slow Stop**)
Alarmlist message	Wrn/Stp Maintenance 2 Protection
Alarm evaluated	Only if **Maintenance Timer 2 RunHours** != Disabled
Related applications	MINT, MPTM
Alarm ID	586
Description	This warning is activated when setpoint **Maintenance Timer 2 RunHours** elapses i.e. the value **Maintenance Timer 2 RunHours** = 0 and lasts until the setpoint is set to value > 0 or "Disabled". This alarm has FPS - **Fixed Protections States 7Fixed Protections States 4**.

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Maintenance 3 Interval

Alarm Type	Based on configuration (**Warning/Slow Stop**)
Alarmlist message	Wrn/Stp Maintenance 1 Interval
Alarm evaluated	Only if **Maintenance Timer 3 Interval** != Disabled
Related applications	MINT, MPTM
Alarm ID	1074
Description	This alarm is activated when setpoint **Maintenance Timer 3 Interval** elapses i.e. the value **Maintenance Timer 3 Interval** = 0 and lasts until the setpoint is set to value > 0 or "Disabled".

	This alarm has FPS - **Fixed Protections States 7Fixed Protections States 4**.

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Maintenance 3 RunHours

Alarm Type	Based on configuration (**Warning/Slow Stop**)
Alarmlist message	Wrn/Stp Maintenance 3 Protection
Alarm evaluated	Only if **Maintenance Timer 3 RunHours** != Disabled
Related applications	MINT, MPTM
Alarm ID	587
Description	This warning is activated when setpoint **Maintenance Timer 3 RunHours** elapses i.e. the value **Maintenance Timer 3 RunHours** = 0 and lasts until the setpoint is set to value > 0 or "Disabled". This alarm has FPS - **Fixed Protections States 7Fixed Protections States 4**.

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Maintenance 4 Interval

Alarm Type	Based on configuration (**Warning/Slow Stop**)
Alarmlist message	Wrn/Stp Maintenance 1 Interval
Alarm evaluated	Only if **Maintenance Timer 4 Interval** != Disabled
Related applications	MINT, MPTM
Alarm ID	1519
Description	This alarm is activated when setpoint **Maintenance Timer 4 Interval** elapses i.e. the value **Maintenance Timer 4 Interval** = 0 and lasts until the setpoint is set to value > 0 or "Disabled". This alarm has FPS - **Fixed Protections States 7Fixed Protections States 4**.

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Maintenance 4 RunHours

Alarm Type	Based on configuration (**Warning/Slow Stop**)
Alarmlist message	Wrn/Stp Maintenance 4 Protection
Alarm evaluated	Only if **Maintenance Timer 4 RunHours** or != Disabled
Related applications	MINT, MPTM
Alarm ID	1518
Description	This warning is activated when setpoint **Maintenance Timer 4 RunHours** elapses i.e. the value **Maintenance Timer 4 RunHours** = 0 and lasts until the setpoint is set to value > 0 or "Disabled". This alarm has FPS - **Fixed Protections States 7Fixed Protections States 4**.

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Wrn DISTIN 01

Alarm Type	Based on configuration **Warning**
Alarmlist message	Wrn/SdGPR DISTIN 01
Alarm evaluated	Only if DIST-IN 01 is configured
Related applications	MINT, MPTM
Alarm ID	1156
Description	This alarm is activated when DIST-IN data are not received from controller with **CAN Controller Address** = 1.

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Wrn DISTIN 02

Alarm Type	Based on configuration **Warning**
Alarmlist message	Wrn/SdGPR DISTIN 02
Alarm evaluated	Only if DIST-IN 02 is configured
Related applications	MINT, MPTM
Alarm ID	1157
Description	This alarm is activated when DIST-IN data are not received from controller with **CAN Controller Address** = 2.

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Wrn DISTIN 03

Alarm Type	Based on configuration **Warning**
Alarmlist message	Wrn/SdGPR DISTIN 03
Alarm evaluated	Only if DIST-IN 03 is configured
Related applications	MINT, MPTM
Alarm ID	1158
Description	This alarm is activated when DIST-IN data are not received from controller with **CAN Controller Address** = 3.

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Wrn DISTIN 04

Alarm Type	Based on configuration **Warning**
Alarmlist message	Wrn/SdGPR DISTIN 04
Alarm evaluated	Only if DIST-IN 04 is configured
Related applications	MINT, MPTM
Alarm ID	1159
Description	This alarm is activated when DIST-IN data are not received from controller with **CAN Controller Address** = 4.

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Wrn DISTIN 05

Alarm Type	Based on configuration **Warning**
Alarmlist message	Wrn/SdGPR DISTIN 05
Alarm evaluated	Only if DIST-IN 05 is configured
Related applications	MINT, MPTM
Alarm ID	1160
Description	This alarm is activated when DIST-IN data are not received from controller with **CAN Controller Address** = 5.

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Wrn DISTIN 06

Alarm Type	Based on configuration **Warning**
Alarmlist message	Wrn/SdGPR DISTIN 06
Alarm evaluated	Only if DIST-IN 06 is configured
Related applications	MINT, MPTM
Alarm ID	1161
Description	This alarm is activated when DIST-IN data are not received from controller with **CAN Controller Address** = 6.

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Wrn DISTIN 07

Alarm Type	Based on configuration **Warning**
Alarmlist message	Wrn/SdGPR DISTIN 07
Alarm evaluated	Only if DIST-IN 07 is configured
Related applications	MINT, MPTM
Alarm ID	1162
Description	This alarm is activated when DIST-IN data are not received from controller with **CAN Controller Address** = 7.

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Wrn DISTIN 08

Alarm Type	Based on configuration **Warning**
Alarmlist message	Wrn/SdGPR DISTIN 08
Alarm evaluated	Only if DIST-IN 08 is configured
Related applications	MINT, MPTM
Alarm ID	1163
Description	This alarm is activated when DIST-IN data are not received from controller with **CAN Controller Address** = 8.

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Wrn DISTIN 09

Alarm Type	Based on configuration **Warning**
Alarmlist message	Wrn/SdGPR DISTIN 09
Alarm evaluated	Only if DIST-IN 09 is configured
Related applications	MINT, MPTM
Alarm ID	1164
Description	This alarm is activated when DIST-IN data are not received from controller with **CAN Controller Address** = 9.

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Wrn DISTIN 10

Alarm Type	Based on configuration **Warning**
Alarmlist message	Wrn/SdGPR DISTIN 10
Alarm evaluated	Only if DIST-IN 10 is configured
Related applications	MINT, MPTM
Alarm ID	1165
Description	This alarm is activated when DIST-IN data are not received from controller with **CAN Controller Address** = 10.

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Wrn DISTIN 11

Alarm Type	Based on configuration **Warning**
Alarmlist message	Wrn/SdGPR DISTIN 11
Alarm evaluated	Only if DIST-IN 11 is configured
Related applications	MINT, MPTM
Alarm ID	1166
Description	This alarm is activated when DIST-IN data are not received from controller with **CAN Controller Address** = 11.

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Wrn DISTIN 12

Alarm Type	Based on configuration **Warning**
Alarmlist message	Wrn/SdGPR DISTIN 12
Alarm evaluated	Only if DIST-IN 12 is configured
Related applications	MINT, MPTM
Alarm ID	1167
Description	This alarm is activated when DIST-IN data are not received from controller with **CAN Controller Address** = 12.

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Wrn DISTIN 13

Alarm Type	Based on configuration **Warning**
Alarmlist message	Wrn/SdGPR DISTIN 13
Alarm evaluated	Only if DIST-IN 13 is configured
Related applications	MINT, MPTM
Alarm ID	1168
Description	This alarm is activated when DIST-IN data are not received from controller with **CAN Controller Address** = 13.

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Wrn DISTIN 14

Alarm Type	Based on configuration **Warning**
Alarmlist message	Wrn/SdGPR DISTIN 14
Alarm evaluated	Only if DIST-IN 14 is configured
Related applications	MINT, MPTM
Alarm ID	1169
Description	This alarm is activated when DIST-IN data are not received from controller with **CAN Controller Address** = 14.

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Wrn DISTIN 15

Alarm Type	Based on configuration **Warning**
Alarmlist message	Wrn/SdGPR DISTIN 15
Alarm evaluated	Only if DIST-IN 15 is configured
Related applications	MINT, MPTM
Alarm ID	1170
Description	This alarm is activated when DIST-IN data are not received from controller with **CAN Controller Address** = 15.

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Wrn DISTIN 16

Alarm Type	Based on configuration **Warning**
Alarmlist message	Wrn/SdGPR DISTIN 16
Alarm evaluated	Only if DIST-IN 16 is configured
Related applications	MINT, MPTM
Alarm ID	1171
Description	This alarm is activated when DIST-IN data are not received from controller with **CAN Controller Address** = 16.

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Wrn DISTIN 17

Alarm Type	Based on configuration **Warning**
Alarmlist message	Wrn/SdGPR DISTIN 17
Alarm evaluated	Only if DIST-IN 17 is configured
Related applications	MINT, MPTM
Alarm ID	1172
Description	This alarm is activated when DIST-IN data are not received from controller with **CAN Controller Address** = 17.

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Wrn DISTIN 18

Alarm Type	Based on configuration **Warning**
Alarmlist message	Wrn/SdGPR DISTIN 18
Alarm evaluated	Only if DIST-IN 18 is configured
Related applications	MINT, MPTM
Alarm ID	1173
Description	This alarm is activated when DIST-IN data are not received from controller with **CAN Controller Address** = 18.

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Wrn DISTIN 19

Alarm Type	Based on configuration **Warning**
Alarmlist message	Wrn/SdGPR DISTIN 19
Alarm evaluated	Only if DIST-IN 19 is configured
Related applications	MINT, MPTM
Alarm ID	1174
Description	This alarm is activated when DIST-IN data are not received from controller with **CAN Controller Address** = 19.

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Wrn DISTIN 20

Alarm Type	Based on configuration **Warning**
Alarmlist message	Wrn/SdGPR DISTIN 20
Alarm evaluated	Only if DIST-IN 20 is configured
Related applications	MINT, MPTM
Alarm ID	1175
Description	This alarm is activated when DIST-IN data are not received from controller with **CAN Controller Address** = 20.

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Wrn DISTIN 21

Alarm Type	Based on configuration **Warning**
Alarmlist message	Wrn/SdGPR DISTIN 21
Alarm evaluated	Only if DIST-IN 21 is configured
Related applications	MINT, MPTM
Alarm ID	1176
Description	This alarm is activated when DIST-IN data are not received from controller with **CAN Controller Address** = 21.

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Wrn DISTIN 22

Alarm Type	Based on configuration **Warning**
Alarmlist message	Wrn/SdGPR DISTIN 22
Alarm evaluated	Only if DIST-IN 22 is configured
Related applications	MINT, MPTM
Alarm ID	1177
Description	This alarm is activated when DIST-IN data are not received from controller with **CAN Controller Address** = 22.

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Wrn DISTIN 23

Alarm Type	Based on configuration **Warning**
Alarmlist message	Wrn/SdGPR DISTIN 23
Alarm evaluated	Only if DIST-IN 23 is configured
Related applications	MINT, MPTM
Alarm ID	1178
Description	This alarm is activated when DIST-IN data are not received from controller with **CAN Controller Address** = 23.

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Wrn DISTIN 24

Alarm Type	Based on configuration **Warning**
Alarmlist message	Wrn/SdGPR DISTIN 24
Alarm evaluated	Only if DIST-IN 24 is configured
Related applications	MINT, MPTM
Alarm ID	1179
Description	This alarm is activated when DIST-IN data are not received from controller with **CAN Controller Address** = 24.

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Wrn DISTIN 25

Alarm Type	Based on configuration **Warning**
Alarmlist message	Wrn/SdGPR DISTIN 25
Alarm evaluated	Only if DIST-IN 25 is configured
Related applications	MINT, MPTM
Alarm ID	1180
Description	This alarm is activated when DIST-IN data are not received from controller with **CAN Controller Address** = 25.

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Wrn DISTIN 26

Alarm Type	Based on configuration **Warning**
Alarmlist message	Wrn/SdGPR DISTIN 26
Alarm evaluated	Only if DIST-IN 26 is configured
Related applications	MINT, MPTM
Alarm ID	1181
Description	This alarm is activated when DIST-IN data are not received from controller with **CAN Controller Address** = 26.

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Wrn DISTIN 27

Alarm Type	Based on configuration **Warning**
Alarmlist message	Wrn/SdGPR DISTIN 27
Alarm evaluated	Only if DIST-IN 27 is configured
Related applications	MINT, MPTM
Alarm ID	1182
Description	This alarm is activated when DIST-IN data are not received from controller with **CAN Controller Address** = 27.

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Wrn DISTIN 28

Alarm Type	Based on configuration **Warning**
Alarmlist message	Wrn/SdGPR DISTIN 28
Alarm evaluated	Only if DIST-IN 28 is configured
Related applications	MINT, MPTM
Alarm ID	1183
Description	This alarm is activated when DIST-IN data are not received from controller with **CAN Controller Address** = 28.

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Wrn DISTIN 29

Alarm Type	Based on configuration **Warning**
Alarmlist message	Wrn/SdGPR DISTIN 29
Alarm evaluated	Only if DIST-IN 29 is configured
Related applications	MINT, MPTM
Alarm ID	1184
Description	This alarm is activated when DIST-IN data are not received from controller with **CAN Controller Address** = 29.

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Wrn DISTIN 30

Alarm Type	Based on configuration **Warning**
Alarmlist message	Wrn/SdGPR DISTIN 30
Alarm evaluated	Only if DIST-IN 30 is configured
Related applications	MINT, MPTM
Alarm ID	1185
Description	This alarm is activated when DIST-IN data are not received from controller with **CAN Controller Address** = 30.

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Wrn DISTIN 31

Alarm Type	Based on configuration **Warning**
Alarmlist message	Wrn/SdGPR DISTIN 31
Alarm evaluated	Only if DIST-IN 31 is configured
Related applications	MINT, MPTM
Alarm ID	1186
Description	This alarm is activated when DIST-IN data are not received from controller with **CAN Controller Address** = 31.

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Wrn DISTIN 32

Alarm Type	Based on configuration **Warning**
Alarmlist message	Wrn/SdGPR DISTIN 32
Alarm evaluated	Only if DIST-IN 32 is configured
Related applications	MINT, MPTM
Alarm ID	1187
Description	This alarm is activated when DIST-IN data are not received from controller with **CAN Controller Address** = 32.

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Wrn DISTIN 33

Alarm Type	Based on configuration **Warning**
Alarmlist message	Wrn/SdGPR DISTIN 33
Alarm evaluated	Only if DIST-IN 33 is configured
Related applications	MINT, MPTM
Alarm ID	1344
Description	This alarm is activated when DIST-IN data are not received from controller with **CAN Controller Address** = 33.

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Wrn DISTIN 34

Alarm Type	Based on configuration **Warning**
Alarmlist message	Wrn/SdGPR DISTIN 34
Alarm evaluated	Only if DIST-IN 34 is configured
Related applications	MINT, MPTM
Alarm ID	1345
Description	This alarm is activated when DIST-IN data are not received from controller with **CAN Controller Address** = 34.

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Wrn DISTIN 35

Alarm Type	Based on configuration **Warning**
Alarmlist message	Wrn/SdGPR DISTIN 35
Alarm evaluated	Only if DIST-IN 35 is configured
Related applications	MINT, MPTM
Alarm ID	1346
Description	This alarm is activated when DIST-IN data are not received from controller with **CAN Controller Address** = 35.

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Wrn DISTIN 36

Alarm Type	Based on configuration **Warning**
Alarmlist message	Wrn/SdGPR DISTIN 36
Alarm evaluated	Only if DIST-IN 36 is configured
Related applications	MINT, MPTM
Alarm ID	1347
Description	This alarm is activated when DIST-IN data are not received from controller with **CAN Controller Address** = 36.

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Wrn DISTIN 37

Alarm Type	Based on configuration **Warning**
Alarmlist message	Wrn/SdGPR DISTIN 37
Alarm evaluated	Only if DIST-IN 37 is configured
Related applications	MINT, MPTM
Alarm ID	1348
Description	This alarm is activated when DIST-IN data are not received from controller with **CAN Controller Address** = 37.

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Wrn DISTIN 38

Alarm Type	Based on configuration **Warning**
Alarmlist message	Wrn/SdGPR DISTIN 38
Alarm evaluated	Only if DIST-IN 38 is configured
Related applications	MINT, MPTM
Alarm ID	1349
Description	This alarm is activated when DIST-IN data are not received from controller with **CAN Controller Address** = 38.

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Wrn DISTIN 39

Alarm Type	Based on configuration **Warning**
Alarmlist message	Wrn/SdGPR DISTIN 39
Alarm evaluated	Only if DIST-IN 39 is configured
Related applications	MINT, MPTM
Alarm ID	1350
Description	This alarm is activated when DIST-IN data are not received from controller with **CAN Controller Address** = 39.

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Wrn DISTIN 40

Alarm Type	Based on configuration **Warning**
Alarmlist message	Wrn/SdGPR DISTIN 40
Alarm evaluated	Only if DIST-IN 40 is configured
Related applications	MINT, MPTM
Alarm ID	1351
Description	This alarm is activated when DIST-IN data are not received from controller with **CAN Controller Address** = 40.

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Wrn DISTIN 41

Alarm Type	Based on configuration **Warning**
Alarmlist message	Wrn/SdGPR DISTIN 41
Alarm evaluated	Only if DIST-IN 41 is configured
Related applications	MINT, MPTM
Alarm ID	1352
Description	This alarm is activated when DIST-IN data are not received from controller with **CAN Controller Address** = 41.

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Wrn DISTIN 42

Alarm Type	Based on configuration **Warning**
Alarmlist message	Wrn/SdGPR DISTIN 42
Alarm evaluated	Only if DIST-IN 42 is configured
Related applications	MINT, MPTM
Alarm ID	1353
Description	This alarm is activated when DIST-IN data are not received from controller with **CAN Controller Address** = 42.

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Wrn DISTIN 43

Alarm Type	Based on configuration **Warning**
Alarmlist message	Wrn/SdGPR DISTIN 43
Alarm evaluated	Only if DIST-IN 43 is configured
Related applications	MINT, MPTM
Alarm ID	1354
Description	This alarm is activated when DIST-IN data are not received from controller with **CAN Controller Address** = 43.

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Wrn DISTIN 44

Alarm Type	Based on configuration **Warning**
Alarmlist message	Wrn/SdGPR DISTIN 44
Alarm evaluated	Only if DIST-IN 44 is configured
Related applications	MINT, MPTM
Alarm ID	1355
Description	This alarm is activated when DIST-IN data are not received from controller with **CAN Controller Address** = 44.

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Wrn DISTIN 45

Alarm Type	Based on configuration **Warning**
Alarmlist message	Wrn/SdGPR DISTIN 45
Alarm evaluated	Only if DIST-IN 45 is configured
Related applications	MINT, MPTM
Alarm ID	1356
Description	This alarm is activated when DIST-IN data are not received from controller with **CAN Controller Address** = 45.

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Wrn DISTIN 46

Alarm Type	Based on configuration **Warning**
Alarmlist message	Wrn/SdGPR DISTIN 46
Alarm evaluated	Only if DIST-IN 46 is configured
Related applications	MINT, MPTM
Alarm ID	1357
Description	This alarm is activated when DIST-IN data are not received from controller with **CAN Controller Address** = 46.

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Wrn DISTIN 47

Alarm Type	Based on configuration **Warning**
Alarmlist message	Wrn/SdGPR DISTIN 47
Alarm evaluated	Only if DIST-IN 47 is configured
Related applications	MINT, MPTM
Alarm ID	1358
Description	This alarm is activated when DIST-IN data are not received from controller with **CAN Controller Address** = 47.

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Wrn DISTIN 48

Alarm Type	Based on configuration **Warning**
Alarmlist message	Wrn/SdGPR DISTIN 48
Alarm evaluated	Only if DIST-IN 48 is configured
Related applications	MINT, MPTM
Alarm ID	1359
Description	This alarm is activated when DIST-IN data are not received from controller with **CAN Controller Address** = 48.

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Wrn DISTIN 49

Alarm Type	Based on configuration **Warning**
Alarmlist message	Wrn/SdGPR DISTIN 49
Alarm evaluated	Only if DIST-IN 49 is configured
Related applications	MINT, MPTM
Alarm ID	1360
Description	This alarm is activated when DIST-IN data are not received from controller with **CAN Controller Address** = 49.

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Wrn DISTIN 50

Alarm Type	Based on configuration **Warning**
Alarmlist message	Wrn/SdGPR DISTIN 50
Alarm evaluated	Only if DIST-IN 50 is configured
Related applications	MINT, MPTM
Alarm ID	1361
Description	This alarm is activated when DIST-IN data are not received from controller with **CAN Controller Address** = 50.

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Wrn DISTIN 51

Alarm Type	Based on configuration **Warning**
Alarmlist message	Wrn/SdGPR DISTIN 51
Alarm evaluated	Only if DIST-IN 51 is configured
Related applications	MINT, MPTM
Alarm ID	1362
Description	This alarm is activated when DIST-IN data are not received from controller with **CAN Controller Address** = 51.

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Wrn DISTIN 52

Alarm Type	Based on configuration **Warning**
Alarmlist message	Wrn/SdGPR DISTIN 52
Alarm evaluated	Only if DIST-IN 52 is configured
Related applications	MINT, MPTM
Alarm ID	1363
Description	This alarm is activated when DIST-IN data are not received from controller with **CAN Controller Address** = 52.

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Wrn DISTIN 53

Alarm Type	Based on configuration **Warning**
Alarmlist message	Wrn/SdGPR DISTIN 53
Alarm evaluated	Only if DIST-IN 53 is configured
Related applications	MINT, MPTM
Alarm ID	1364
Description	This alarm is activated when DIST-IN data are not received from controller with **CAN Controller Address** = 53.

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Wrn DISTIN 54

Alarm Type	Based on configuration **Warning**
Alarmlist message	Wrn/SdGPR DISTIN 54
Alarm evaluated	Only if DIST-IN 54 is configured
Related applications	MINT, MPTM
Alarm ID	1365
Description	This alarm is activated when DIST-IN data are not received from controller with **CAN Controller Address** = 54.

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Wrn DISTIN 55

Alarm Type	Based on configuration **Warning**
Alarmlist message	Wrn/SdGPR DISTIN 55
Alarm evaluated	Only if DIST-IN 55 is configured
Related applications	MINT, MPTM
Alarm ID	1366
Description	This alarm is activated when DIST-IN data are not received from controller with **CAN Controller Address** = 55.

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Wrn DISTIN 56

Alarm Type	Based on configuration **Warning**
Alarmlist message	Wrn/SdGPR DISTIN 56
Alarm evaluated	Only if DIST-IN 56 is configured
Related applications	MINT, MPTM
Alarm ID	1367
Description	This alarm is activated when DIST-IN data are not received from controller with **CAN Controller Address** = 56.

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Wrn DISTIN 57

Alarm Type	Based on configuration **Warning**
Alarmlist message	Wrn/SdGPR DISTIN 57
Alarm evaluated	Only if DIST-IN 57 is configured
Related applications	MINT, MPTM
Alarm ID	1368
Description	This alarm is activated when DIST-IN data are not received from controller with **CAN Controller Address** = 57.

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Wrn DISTIN 58

Alarm Type	Based on configuration **Warning**
Alarmlist message	Wrn/SdGPR DISTIN 58
Alarm evaluated	Only if DIST-IN 58 is configured
Related applications	MINT, MPTM
Alarm ID	1369
Description	This alarm is activated when DIST-IN data are not received from controller with **CAN Controller Address** = 58.

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Wrn DISTIN 59

Alarm Type	Based on configuration **Warning**
Alarmlist message	Wrn/SdGPR DISTIN 59
Alarm evaluated	Only if DIST-IN 59 is configured
Related applications	MINT, MPTM
Alarm ID	1370
Description	This alarm is activated when DIST-IN data are not received from controller with **CAN Controller Address** = 59.

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Wrn DISTIN 60

Alarm Type	Based on configuration **Warning**
Alarmlist message	Wrn/SdGPR DISTIN 60
Alarm evaluated	Only if DIST-IN 60 is configured
Related applications	MINT, MPTM
Alarm ID	1371
Description	This alarm is activated when DIST-IN data are not received from controller with **CAN Controller Address** = 60.

back to List of other alarms

Wrn DISTIN 61

Alarm Type	Based on configuration **Warning**
Alarmlist message	Wrn/SdGPR DISTIN 61
Alarm evaluated	Only if DIST-IN 61 is configured
Related applications	MINT, MPTM
Alarm ID	1372
Description	This alarm is activated when DIST-IN data are not received from controller with **CAN Controller Address** = 61.

back to List of other alarms

Wrn DISTIN 62

Alarm Type	Based on configuration **Warning**
Alarmlist message	Wrn/SdGPR DISTIN 62
Alarm evaluated	Only if DIST-IN 62 is configured
Related applications	MINT, MPTM
Alarm ID	1373
Description	This alarm is activated when DIST-IN data are not received from controller with **CAN Controller Address** = 62.

back to List of other alarms

Wrn DISTIN 63

Alarm Type	Based on configuration **Warning**
Alarmlist message	Wrn/SdGPR DISTIN 63
Alarm evaluated	Only if DIST-IN 63 is configured
Related applications	MINT, MPTM
Alarm ID	1374
Description	This alarm is activated when DIST-IN data are not received from controller with **CAN Controller Address** = 63.

back to List of other alarms

Wrn DISTIN 64

Alarm Type	Based on configuration **Warning**
Alarmlist message	Wrn/SdGPR DISTIN 64
Alarm evaluated	Only if DIST-IN 64 is configured
Related applications	MINT, MPTM
Alarm ID	1375
Description	This alarm is activated when DIST-IN data are not received from controller with **CAN Controller Address** = 64.

back to List of other alarms

Wrn DISTOUT

Alarm Type	Based on configuration **Warning**
Alarmlist message	Wrn/SdGPR DISTOUT
Alarm evaluated	Only if DIST-OUT is configured
Related applications	MINT, MPTM
Description	This alarm is activated when failure of virtual module DIST-OUT is detected.

back to List of other alarms

Wrn ECU 1 Comm Fail

Alarm Type	Based on configuration **Warning**
Alarmlist message	Name of ECU in ECU slot 1
Alarm evaluated	1. ECU with protection configured in ECU slot 1 2. LBI **ECU Communication Fail Block** and **ECU Communication Fail Block 1** not activated 3. LBO **ECU Power Relay** is closed or all the time when is not configured
Related applications	MINT, MPTM
Alarm ID	945
Description	This alarm is activated when there is no communication received from ECU configured in ECU slot 1. This alarm has FPS - **Fixed Protections States 3**.

back to List of other alarms

Wrn ECU 2 Comm Fail

Alarm Type	Based on configuration **Warning**
Alarmlist message	Name of ECU in ECU slot 2
Alarm evaluated	1. ECU with protection configured in ECU slot 2 2. LBI **ECU Communication Fail Block** and **ECU Communication Fail Block 2** not activated 3. LBO **ECU Power Relay** is closed or all the time when is not configured
Related applications	MINT, MPTM
Alarm ID	946
Description	This alarm is activated when there is no communication received from ECU configured in ECU slot 2. This alarm has FPS - **Fixed Protections States 3**.

back to List of other alarms

Wrn ECU 3 Comm Fail

Alarm Type	Based on configuration **Warning**
Alarmlist message	Name of ECU in ECU slot 3
Alarm evaluated	1. ECU with protection configured in ECU slot 3

	2. LBI **ECU Communication Fail Block** and **ECU Communication Fail Block 3** not activated 3. LBO **ECU Power Relay** is closed or all the time when is not configured
Related applications	MINT, MPTM
Alarm ID	947
Description	This alarm is activated when there is no communication received from ECU configured in ECU slot 3. This alarm has FPS - **Fixed Protections States 3**.

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Wrn ECU 4 Comm Fail

Alarm Type	Based on configuration **Warning**
Alarmlist message	Name of ECU in ECU slot 4
Alarm evaluated	1. ECU with protection configured in ECU slot 4 2. LBI **ECU Communication Fail Block** and **ECU Communication Fail Block 4** not activated 3. LBO **ECU Power Relay** is closed or all the time when is not configured
Related applications	MINT, MPTM
Alarm ID	948
Description	This alarm is activated when there is no communication received from ECU configured in ECU slot 4. This alarm has FPS - **Fixed Protections States 3**.

back to List of other alarms

Wrn ECU 5 Comm Fail

Alarm Type	Based on configuration **Warning**
Alarmlist message	Name of ECU in ECU slot 5
Alarm evaluated	1. ECU with protection configured in ECU slot 5 2. LBI **ECU Communication Fail Block** and **ECU Communication Fail Block 5** not activated 3. LBO **ECU Power Relay** is closed or all the time when is not configured
Related applications	MINT, MPTM
Alarm ID	949
Description	This alarm is activated when there is no communication received from ECU configured in ECU slot 5. This alarm has FPS - **Fixed Protections States 3**.

back to List of other alarms

Wrn ECU 6 Comm Fail

Alarm Type	Based on configuration **Warning**

Alarmlist message	Name of ECU in ECU slot 6
Alarm evaluated	1. ECU with protection configured in ECU slot 6 2. LBI **ECU Communication Fail Block** and **ECU Communication Fail Block 6** not activated 3. LBO **ECU Power Relay** is closed or all the time when is not configured
Related applications	MINT, MPTM
Alarm ID	950
Description	This alarm is activated when there is no communication received from ECU configured in ECU slot 6. This alarm has FPS - **Fixed Protections States 3**.

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Wrn ECU 7 Comm Fail

Alarm Type	Based on configuration **Warning**
Alarmlist message	Name of ECU in ECU slot 7
Alarm evaluated	1. ECU with protection configured in ECU slot 7 2. LBI **ECU Communication Fail Block** and **ECU Communication Fail Block 7** not activated 3. LBO **ECU Power Relay** is closed or all the time when is not configured
Related applications	MINT, MPTM
Alarm ID	951
Description	This alarm is activated when there is no communication received from ECU configured in ECU slot 7. This alarm has FPS - **Fixed Protections States 3**.

back to List of other alarms

Wrn ECU 8 Comm Fail

Alarm Type	Based on configuration **Warning**
Alarmlist message	Name of ECU in ECU slot 8
Alarm evaluated	1. ECU with protection configured in ECU slot 8 2. LBI **ECU Communication Fail Block** and **ECU Communication Fail Block 8** not activated 3. LBO **ECU Power Relay** is closed or all the time when is not configured
Related applications	MINT, MPTM
Alarm ID	952
Description	This alarm is activated when there is no communication received from ECU configured in ECU slot 8. This alarm has FPS - **Fixed Protections States 3**.

back to List of other alarms

Wrn ECU 9 Comm Fail

Alarm Type	Based on configuration **Warning**
Alarmlist message	Name of ECU in ECU slot 9
Alarm evaluated	1. ECU with protection configured in ECU slot 9 2. LBI **ECU Communication Fail Block** and **ECU Communication Fail Block 9** not activated 3. LBO **ECU Power Relay** is closed or all the time when is not configured
Related applications	MINT, MPTM
Alarm ID	953
Description	This alarm is activated when there is no communication received from ECU configured in ECU slot 9. This alarm has FPS - **Fixed Protections States 3**.

back to List of other alarms

Wrn ECU 10 Comm Fail

Alarm Type	Based on configuration **Warning**
Alarmlist message	Name of ECU in ECU slot 10
Alarm evaluated	1. ECU with protection configured in ECU slot 10 2. LBI **ECU Communication Fail Block** and **ECU Communication Fail Block 10** not activated 3. LBO **ECU Power Relay** is closed or all the time when is not configured
Related applications	MINT, MPTM
Alarm ID	954
Description	This alarm is activated when there is no communication received from ECU configured in ECU slot 10. This alarm has FPS - **Fixed Protections States 3**.

back to List of other alarms

Wrn ECU 11 Comm Fail

Alarm Type	Based on configuration **Warning**
Alarmlist message	Name of ECU in ECU slot 11
Alarm evaluated	1. ECU with protection configured in ECU slot 11 2. LBI **ECU Communication Fail Block** and **ECU Communication Fail Block 11** not activated 3. LBO **ECU Power Relay** is closed or all the time when is not configured
Related applications	MINT, MPTM
Alarm ID	955
Description	This alarm is activated when there is no communication received from ECU configured in ECU slot 11. This alarm has FPS - **Fixed Protections States 3**.

back to List of other alarms

Wrn ECU 12 Comm Fail

Alarm Type	Based on configuration **Warning**
Alarmlist message	Name of ECU in ECU slot 12
Alarm evaluated	1. ECU with protection configured in ECU slot 12 2. LBI **ECU Communication Fail Block** and **ECU Communication Fail Block 12** not activated 3. LBO **ECU Power Relay** is closed or all the time when is not configured
Related applications	MINT, MPTM
Alarm ID	956
Description	This alarm is activated when there is no communication received from ECU configured in ECU slot 12. This alarm has FPS - **Fixed Protections States 3**.

back to List of other alarms

Wrn ECU 13 Comm Fail

Alarm Type	Based on configuration **Warning**
Alarmlist message	Name of ECU in ECU slot 13
Alarm evaluated	1. ECU with protection configured in ECU slot 13 2. LBI **ECU Communication Fail Block** and **ECU Communication Fail Block 13** not activated 3. LBO **ECU Power Relay** is closed or all the time when is not configured
Related applications	MINT, MPTM
Alarm ID	957
Description	This alarm is activated when there is no communication received from ECU configured in ECU slot 13. This alarm has FPS - **Fixed Protections States 3**.

back to List of other alarms

Wrn ECU 14 Comm Fail

Alarm Type	Based on configuration **Warning**
Alarmlist message	Name of ECU in ECU slot 14
Alarm evaluated	1. ECU with protection configured in ECU slot 14 2. LBI **ECU Communication Fail Block** and **ECU Communication Fail Block 14** not activated 3. LBO **ECU Power Relay** is closed or all the time when is not configured
Related applications	MINT, MPTM
Alarm ID	958
Description	This alarm is activated when there is no communication received from ECU configured in ECU slot 14. This alarm has FPS - **Fixed Protections States 3**.

back to List of other alarms

Wrn ECU 15 Comm Fail

Alarm Type	Based on configuration **Warning**
Alarmlist message	Name of ECU in ECU slot 15
Alarm evaluated	1. ECU with protection configured in ECU slot 15 2. LBI **ECU Communication Fail Block** and **ECU Communication Fail Block 15** not activated 3. LBO **ECU Power Relay** is closed or all the time when is not configured
Related applications	MINT, MPTM
Alarm ID	959
Description	This alarm is activated when there is no communication received from ECU configured in ECU slot 15. This alarm has FPS - **Fixed Protections States 3**.

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Wrn ECU 16 Comm Fail

Alarm Type	Based on configuration **Warning**
Alarmlist message	Name of ECU in ECU slot 16
Alarm evaluated	1. ECU with protection configured in ECU slot 16 2. LBI **ECU Communication Fail Block** and **ECU Communication Fail Block 16** not activated 3. LBO **ECU Power Relay** is closed or all the time when is not configured
Related applications	MINT, MPTM
Alarm ID	960
Description	This alarm is activated when there is no communication received from ECU configured in ECU slot 16. This alarm has FPS - **Fixed Protections States 3**.

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Wrn SHAIN 1

Alarm Type	**Warning** Based on configuration
Alarmlist message	Wrn/SdGPR SHAIN 1
Alarm evaluated	Only if SHAIN 1 is configured
Related applications	MINT, MPTM
Alarm ID	36
Description	This alarm is activated when shared analog inputs are not received from SHAIN module 1.

back to List of alarms level 1

Wrn SHAIN 2

Alarm Type	**Warning** Based on configuration

Alarmlist message	Wrn/SdGPR SHAIN 2
Alarm evaluated	Only if SHAIN 2 is configured
Related applications	MINT, MPTM
Alarm ID	233
Description	This alarm is activated when shared analog inputs are not received from SHAIN module 2.

back to List of alarms level 1

Wrn SHAIN Collision

Alarm Type	**Warning**
Alarmlist message	Wrn SHAIN Collision
Alarm evaluated	Only if SHIN 1 or SHAIN 2 module is configured
Related applications	MINT, MPTM
Alarm ID	38
Description	This alarm is activated when controller receives shared analog inputs of any SHAIN module from more than just one controller. This alarm has FPS - **FIXED PROTECTIONS STATES 1**

back to List of alarms level 1

Wrn SHBIN 1

Alarm Type	**Warning** Based on configuration
Alarmlist message	Wrn/SdGPR SHBIN 1
Alarm evaluated	Only if SHBIN 1 is configured
Related applications	MINT, MPTM
Alarm ID	32
Description	This alarm is activated when shared binary inputs are not received from SHBIN module 1.

back to List of alarms level 1

Wrn SHBIN 2

Alarm Type	**Warning** Based on configuration
Alarmlist message	Wrn/SdGPR SHBIN 2
Alarm evaluated	Only if SHBIN 2 is configured
Related applications	MINT, MPTM
Alarm ID	33
Description	This alarm is activated when shared binary inputs are not received from SHBIN module 2.

back to List of alarms level 1

Wrn SHBIN 3

Alarm Type	**Warning** Based on configuration

Alarmlist message	Wrn/SdGPR SHBIN 3
Alarm evaluated	Only if SHBIN 3 is configured
Related applications	MINT, MPTM
Alarm ID	34
Description	This alarm is activated when shared binary inputs are not received from SHBIN module 3.

back to List of alarms level 1

Wrn SHBIN 4

Alarm Type	**Warning** Based on configuration
Alarmlist message	Wrn/SdGPR SHBIN 4
Alarm evaluated	Only if SHBIN 4 is configured
Related applications	MINT, MPTM
Alarm ID	35
Description	This alarm is activated when shared binary inputs are not received from SHBIN module 4.

back to List of alarms level 1

Wrn SHBIN 5

Alarm Type	**Warning** Based on configuration
Alarmlist message	Wrn/SdGPR SHBIN 5
Alarm evaluated	Only if SHBIN 5 is configured
Related applications	MINT, MPTM
Alarm ID	216
Description	This alarm is activated when shared binary inputs are not received from SHBIN module 5.

back to List of alarms level 1

Wrn SHBIN 6

Alarm Type	**Warning** Based on configuration
Alarmlist message	Wrn/SdGPR SHBIN 6
Alarm evaluated	Only if SHBIN 6 is configured
Related applications	MINT, MPTM
Alarm ID	217
Description	This alarm is activated when shared binary inputs are not received from SHBIN module 6.

back to List of alarms level 1

Wrn SHBIN Collision

Alarm Type	**Warning**

Alarmlist message	Wrn SHBIN Collision
Alarm evaluated	Only if at least one of SHBIN 1 to SHBIN 6 modules is configured
Related applications	MINT, MPTM
Alarm ID	37
Description	This alarm is activated when controller receives shared binary inputs of any SHBIN module from more than just one controller. This alarm has FPS - **FIXED PROTECTIONS STATES 1**

back to List of alarms level 1

MP VRT Protection Trip

Alarm Type	Based on **Dynamic Support Protection Type**
Alarmlist message	Wrn/MP VRT Protection Trip
Alarm evaluated	Only when **Dynamic Support** = Enabled and and **Breaker state** = ParalOper
Related applications	MINT, MPTM
Alarm ID	1043
Description	This alarm indicates active **Dynamic Support** protection. This alarm has FPS - **FIXED PROTECTIONS STATES 5**This alarm has FPS - **FIXED PROTECTIONS STATES 1**

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12 Modules

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12.1 Plug-in modules

CM2-4G-GPS 1608

IMPORTANT: Plug-in modules are supported on controller HW version 01.01.xx and higher.

The available communication plug-in modules are:

- CM-RS232-485 – communication module for connection via RS232 or RS485 line
- CM2-4G-GPS – communication module for connection via 4G
- CM3-Ethernet – communication module for internet connection via Ethernet

The available extension plug-in modules are:

- EM-BIO8-EFCP – extension module with 8 binary inputs/outputs and with earth fault current protection

Note: *Controller has 2 plug-in module slots.*

Supported combinations of plug-in modules

Module	CM-Ethernet	CM-4G-GPS	CM-RS232-485	EM-BIO8-EFCP
CM-Ethernet	✗	✓	✓	✓
CM-4G-GPS	✓	✗	✓	✓
CM-RS232-485	✓	✓	✗	✓
EM-BIO8-EFCP	✓	✓	✓	✓

12.1.1 Communication modules

CM2-4G-GPS

CM2-4G-GPS plug-in module containing a GPS receiver and GSM/WCDMA/LTE modem which can work in two modes of operation.

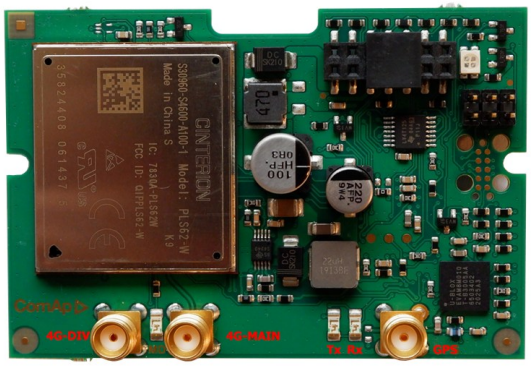


Image 22.97 CM2-4G-GPS module

IMPORTANT: Any manipulation with plug-in module shall be done with disconnected power supply to controller.

IMPORTANT: Operating temperature of module is from -30 °C to +75 °C.

Note: *Cellular data service must be enabled in your SIM card by your mobile operator for successful operation.*

CM2-4G-GPS module works with:

- WebSupervisor – internet-based remote monitoring solution
- AirGate – powerful connection technology to make internet access as simple as possible

CM2-4G-GPS module also works like GPS locator. Geo-fencing function can be used with this module.

4G module types

- If the anthenna is CELLULAR only and has 1 cable (OT1A4GXXMCX), it is connected to the 4G-MAIN connector.
- If the anthenna is CELLULAR only and has 2 cables, cables are connected to the 4G-MAIN or 4G-DIV connectors (does not matter which cable to which connector).
- If the anthenna is a combination of CELLULAR/GPS and has 2 cables (OT1A4GGPSCX), then cable "4G/LTE" needs to be connected to the 4G-MAIN connector and "GPS" cable to the GPS connector.
- If the anthenna is a combination of CELLULAR/GPS and has 3 cables (OT2A4GGPSCX), then cables "4G/LTE" need to be connected to the 4G-MAIN and 4G-DIV connectors (does not matter which cable to which connector) and "GPS" cable to the GPS connector.

Note: *Type of the cable is labeled on its side.*

Technical data

General

Width × Height × Depth	73.8 × 50.3 × 15
Weight	~35 g
Power supply	8-36 V DC
Power consumption	1.7 W
Peak power consumption	10 W
Operating temperature	-30 ˚C to +70 ˚C
Storage temperature	-40 ˚C to +80 ˚C

GNSS

Antenna interface	SMA female, 2.8 V / 20 mA
Antenna type	Active

Cellular

Supported networks and frequency bands	> 2G (GSM/GPRS/EDGE) Quad band, 850/900/1800/1900 MHz > 3G (UMTS/HSPA+) Seven band, 800 (BdXIX) / 850 (BdV) / 900 (BdVIII) / AWS (BdIV) / 1800 (BdIX) / 1900 (BdII) / 2100MHz (BdI) > 4G (LTE) Twelve band, 700 (Bd12 <MFBI Bd17>, Bd28) 800 (Bd18, Bd19, Bd20) 850 (Bd5) / 900 (Bd8) / AWS (Bd4) / 1800 (Bd3) / 1900 (Bd2) / 2100 (Bd1) / 2600MHz (Bd7)
Antenna interface	2x SMA female (Main and Diversity)

SIM card settings

SIM card must be adjusted as follows:

- SMS service enabled
- Packet data (Internet access) enabled (when required for the selected mode of operation)
- PIN code security disabled

How to start using CM2-4G-GPS module

- You will need a controller, CM2-4G-GPS module, antenna and SIM card with SMS and packet data service.

Note: *Make sure that your SIM supports the packet data network type you want to use. – i.e. if you want to use the module in LTE (4G) network you have to confirm with the operator that the particular SIM card supports 4G network.*

- Contact your mobile operator for getting packet data APN (APN = Access Point Name), username and password.

Example: APN Name = "internet", UserName = [blank], Password = [blank].

- Make sure SIM card does not require PIN code. Use any mobile phone to switch the SIM PIN security off.
- Place the SIM card into slot on CM2-4G-GPS card
- Connect the antenna to Cellular module antenna connector.
- If you want to use the built-in GPS receiver, also connect an **active** GPS antenna to the GPS antenna connector.
- Switch off the controller.
- Insert CM2-4G-GPS module into controller
- Power up the controller.
- Enter correct APN Name, APN User Name and APN User Password in controller's setpoint group CM-4G-GPS which is accessible by PAGE button from any measurement screen on controller. Setpoints can be set on controller's front panel keyboard or by InteliConfig.
- Enter correct **Access Point Name** (this information is provided by Mobile Operator). Setpoint can be set on controller's front panel or by InteliConfig.
- Switch the controller off and on.
- Wait for approx 2 – 4 minutes for first connection of the system to AirGate. AirGate will automatically generate the AirGate ID value. Then navigate to measurement screens where you will find signal strength bar and AirGate ID identifier.

Firmware upgrade

- Download the newest FW of module from ComAp website (in form of PSI file or installation package)
- Install package to computer or open PSI to install it into InteliConfig
- Plug the module into the controller and power the controller on.
- Open a connection with controller via InteliConfig
- Go the menu Tools -> Firmware upgrade, select the Plug-in modules tab and select the appropriate firmware you want to program into the module (in InteliConfig).
- Press the OK button to start upgrade of firmware.

The firmware update process may be performed via any kind of connection including connection via the same module in which the firmware is to be updated. The connection is re-established again automatically when the update process is finished.

12.1.2 Extension modules

EM-BIO8-EFCP

EM-BIO8-EFCP is optional plug-in card. Through this card, the controller can accommodate one AC current (CT) measuring input (1A or 5A input) and up to 8 binary inputs or outputs. In InteliConfig PC configuration tool it is possible to easily choose whether particular I/O will be binary input or output.

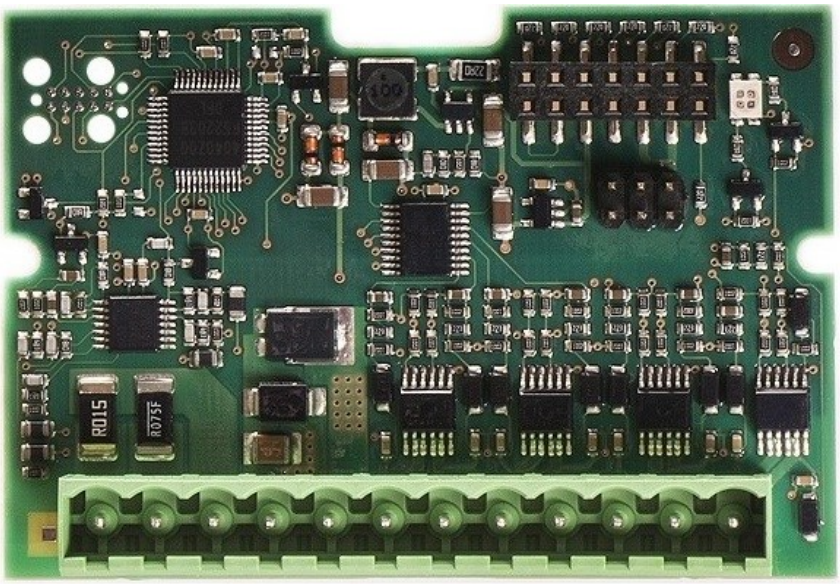


Image 22.98 EM-BIO8-EFCP interface

Note: *This protection is active ONLY when Engine is running.*

IMPORTANT: Any manipulation with plug-in module shall be done with disconnected power supply to controller.

IMPORTANT: Earth fault current measurement is supported by controller only in slot A.

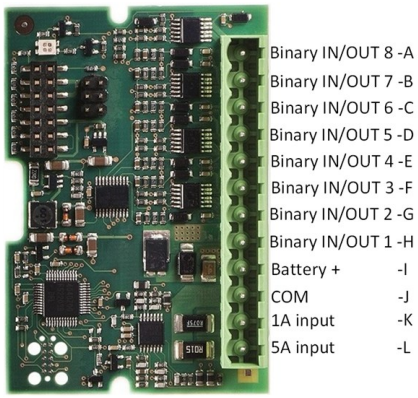


Image 22.99 Overview of EM-BIO8-EFCP

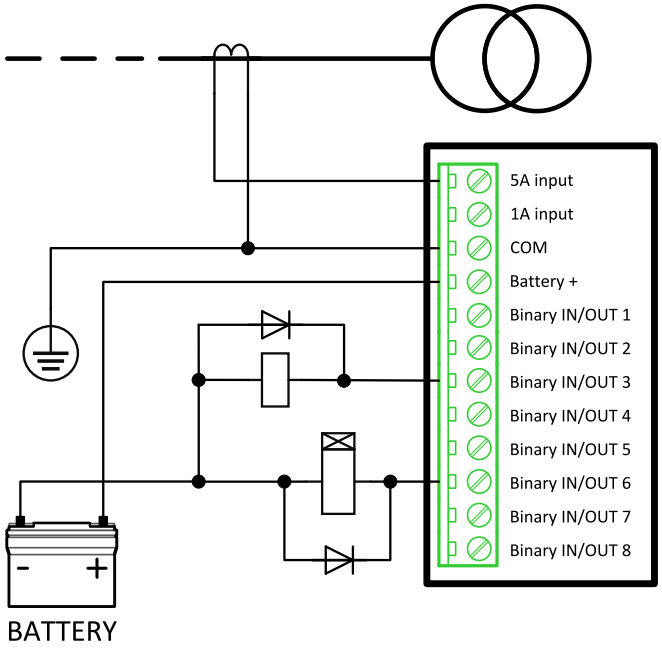


Image 22.100 EM-BIO8-EFCP wiring

EM-BIO8-EFCP technical data

Power supply

Power supply range	8-36 VDC
Power consumption	40 mA / 8 VDC 27 mA / 12 VDC 22 mA / 24 VDC 19 mA / 36 VDC

Binary inputs

Number	Up to 8, non-isolated
Close/Open indication	0-2 VDC close contact >6 VDC open contact

Binary outputs

Number	Up to 8 , non-isolated
Max. current	0,5A
Switching to	positive supply terminal

Current measuring input

Number of inputs	2
Nominal input current	1A/5A
Load (CT output impedance)	< 0,1
Max measured current from CT	10 A

Current measurement tolerance	2% from Nominal current
Max peak current from CT	150 A / 1 s
Max continuous current	10 A

Firmware upgrade

- Download the newest FW of module from ComAp website (in form of PSI file or installation package)
- Install package to computer or open PSI to install it into InteliConfig
- Plug the module into the controller and power the controller on.
- Open a connection with controller via InteliConfig
- Go the menu Tools -> Firmware upgrade, select the Plug-in modules tab and select the appropriate firmware you want to program into the module (in InteliConfig).
- Press the OK button to start upgrade of firmware.

The firmware update process may be performed via any kind of connection including connection via the same module in which the firmware is to be updated. The connection is re-established again automatically when the update process is finished.

12.2 CAN modules

12.2.1 Supported combinations of modules

The maximal number of CAN modules is limited by the number of the controller's generic modules. Once the physical module is configured, it allocates necessary generic modules. So, it is possible to configure as many CAN modules as many generic modules are available. The maximum number of CAN modules is also limited by the number of addresses (indexes) that can be configured for each type of the generic module. CAN modules and generic modules share indexes.

> **Example:** If you configure Inteli IO8/8 module which is using 1x BI, BO, and AO generic module with index (address) 1, any other module using same generic modules will not be able to be configured with index (address) 1 (IGS-PTM, Inteli AIO9/1).

Each generic module has 8 "terminals" (inputs/outputs) and the InteliNeo 6000 has the following amount of the generic modules:

- AI generic: 10
- AO generic: 8
- BI generic: 16
- BO generic: 12

In the table below, you can see how many generic modules are necessary for each CAN module and how many indexes are available for each type of CAN module in the InteliNeo 6000.

CAN Module	Max number of indexes	AI generic	AO generic	BI generic	BO generic
Inteli AIN8	10	1	0	0	0
Inteli IO 8/8	12	0	1	1	1
Inteli IO 16/0	8	0	1	2	0

IGL-RA15	**4**	0	0	0	2
IGS-PTM	**4**	1	1	1	1
Inteli AIO9/1	**5**	2	1	0	0
Inteli AIN8TC	10	1	0	0	0
I-AOUT8	**4**	0	1	0	0
IS-AIN8	10	1	0	0	0
IS-AIN8TC	10	1	0	0	0
IS-BIN16/8	7	0	0	2	1

Note: *When configuring modules do not forget to let first 4 indexes free for modules which can't use high addresses such as IGL-RA15, IGS-PTM, AIO9/1, I-AOUT8.*

Note: *Module Inteli IO8/8 has available AOUT only if it is configured with index number below 9 and Inteli AIO9/1 has available AOUT only if it is configured with index number below 5.*

Note: *Module Inteli IO8/8 with older FW than 1.3.1.2 has available AOUT only if it is configured with index number below 5.*

12.2.2 Module's protections

Each configured CAN module can has it's own protection and protection state. For setup: connect the controller via InteliConfig → Control → Controller Configuration → Modules → Module Settings.

- **Protection Upon Module Failure**
  - None - No alarm will be activated if module fails. It is not possible to use the User Protection State.
  - Warning - Wrn alarm is activated if module fails.
  - Shutdown - Sd alarm is activated if module fails.

Note: *The name and color of the alarm is automatically generated according to the options* ***Protection Upon Module Failure****,* ***Module Name****, and* ***Module Index****. The module name is automatically generated or renamed by the user.*

- **Protection State** - If you check the check box the new User Protection State will be displayed in the User Protection States group in the Values after the configuration is imported to the CU.

Note: *The name of the User Protection State is automatically generated according to the options* ***Protection Upon Module Failure****,* ***Module Name****, and* ***Module Index****. The module name is automatically generated or renamed by the user.*

Example: Wrn Inteli AIN8 10 = Warning upon module failure of the Inteli AIN8 module with index 10.

12.2.3 Theory of binary inputs and outputs

Binary inputs 1615
Pull Down 1615
Pull Up 1616
Binary outputs 1617
High side switch - HSS 1617
Low side switch - LSS 1618

Type of the binary inputs/outputs of some configured modules using BINs or BOUTs can be changed via Inteli Config. For setup: connect the controller via InteliConfig → Control → Controller Configuration → Modules → Module Settings → **Binary Inputs Type** / **Binary Outputs Type**.

See the fallowing chapters for more details.

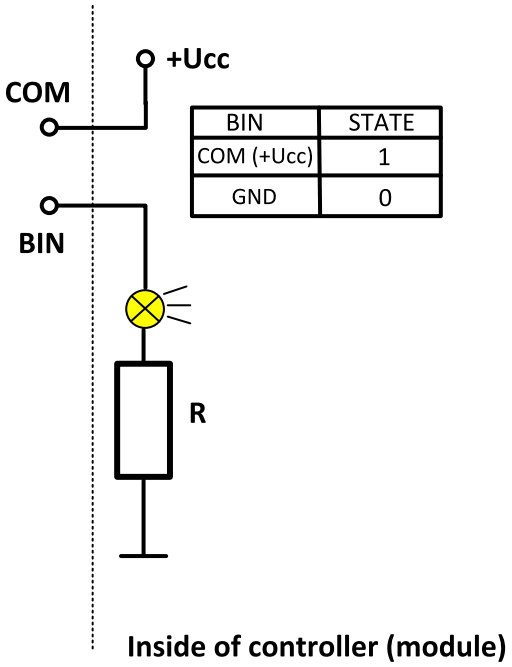
Binary inputs

Pull Down

The pull-down logic is used when it is required to ensure that the logical value of inputs settles at the expected logical level whenever external devices are turned off, or they are at a high impedance state. It ensures that input is at a defined low logic level when the connection with external devices is lost. In the controller (module), the pull-down resistor is used to connect the input to the -BAT (0 V), so the log 0 (open state) is represented by 0 V. This connection is used as prevention against fluctuations and an undefined state at the input.

- The principle of internal connection is shown in the picture below.
- The bulb represents internal state of binary input.
- In case the “COM” (+Ucc) is not connected to the input terminal “BIN” then the internal state is logical 0.
- In case the “COM” (+Ucc) is connected to the input terminal “BIN” then the internal state is logical 1.

Binary input : Pull Down



BIN	STATE
COM (+Ucc)	1
GND	0

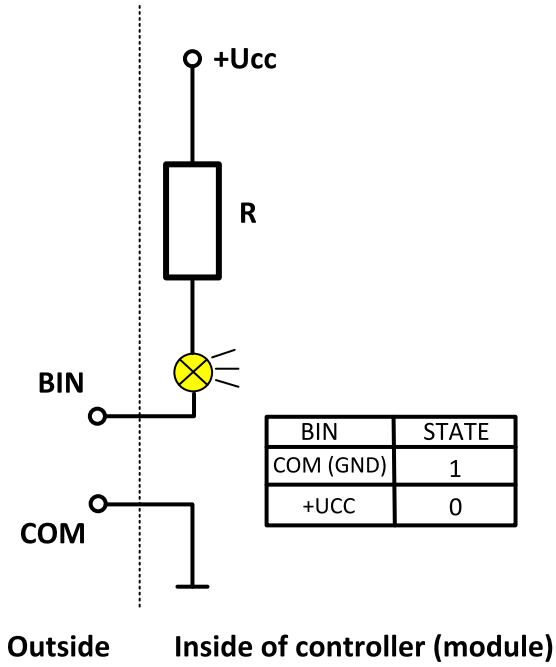
Note: *There is not any COM terminal on the controller, the wire is directly connected to the input terminal "BIN", so if input signal is log 1 the +Ucc is directly connected to the "BIN".*

Pull Up

The pull-up logic is used when it is required to establish an additional loop over the critical components while making sure that the voltage is well-defined even when the switch is open. It ensures that input and wiring is at a defined high logical level in the absence of an input signal. In the controller (module), the pull-up resistor is used to connect the input to the +BAT (+Ucc), so the log 0 (open state) is represented by +Ucc. This connection is used as prevention against fluctuations and an undefined state at the input.

- The principle of internal connection is shown in the picture below.
- The bulb represents internal state of binary input.
- In case the input terminal “BIN” (+Ucc) is not connected to the “COM” (GND) then the internal state is logical 0.
- In case the input terminal “BIN” (+Ucc) is connected to the “COM” (GND) then the internal state is logical 1.

Binary input : Pull Up



BIN	STATE
COM (GND)	1
+UCC	0

Note: *There is not any COM terminal on the controller, the wire is directly connected to the input terminal "BIN", so if input signal is log 1 the GND is directly connected to the "BIN".*

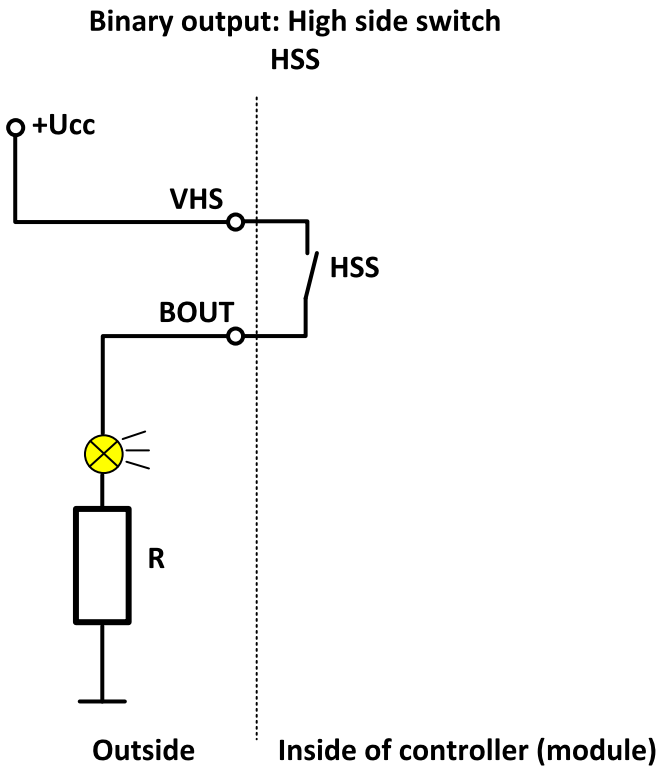
back to Theory of binary inputs and outputs

Binary outputs

High side switch - HSS

The high side logic is used when load is permanently connected to the ground (GND) and when it is required to ensure that the logical value of outputs settles at the expected logical level whenever the controller (module) is turned off, or at a high impedance state. It ensures that external devices will not be randomly activated when the connection is lost.

- The principle of internal connection is shown in the picture below.
- The bulb represents internal state of binary output.
- By activating of binary output terminal (BOUT), the switch is closed, which causes connection of the load to the VHS (Voltage High side) and +Ucc, so the external state of the load is logical 1.

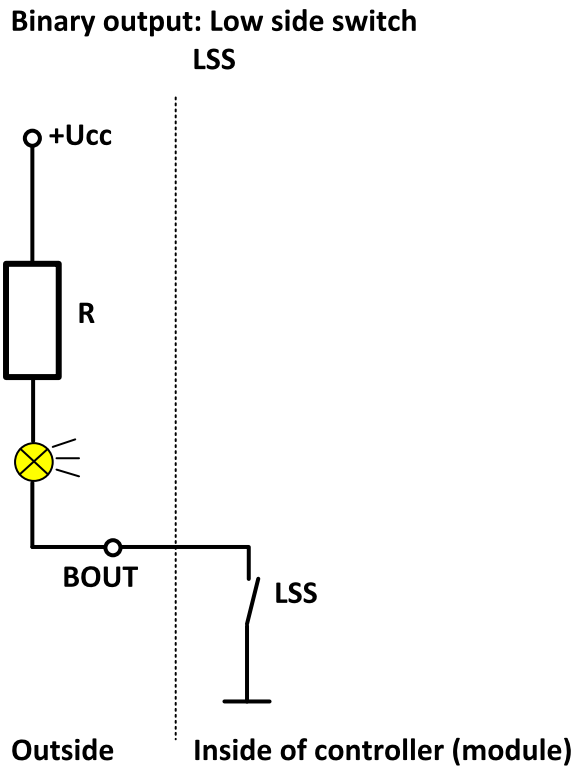


Low side switch - LSS

The low side logic is used when load is permanently connected to the voltage (+Ucc). In case module will be turned off or the connection will be lost the external devices will be activated. It can be used as inverse logic for the detection of the lost connection.

- The principle of internal connection is shown in the picture below.
- The bulb represents internal state of binary output.
- By activating of binary output terminal (BOUT), the switch is closed, which causes connection of the load to the ground (GND), so the external state of the load is logical 1.

Note: *Because of safety reasons, the Low side switch is not supported in the InteliNeo 6000 controller. In case you need BOUT to BIN logical communication between controllers using Pull Up BIN logic, you must use an external module with LSS BOUT logic or any converter which converts the HSS controller's BOUT to LSS. The solution above is not recommended! Try to reconsider your options and use the Pull Down BIN logic.*



back to Theory of binary inputs and outputs

12.2.4 Extension modules

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Inteli AIN8

Inteli AIN8 module is extension module equipped with analog inputs and Impulse/RPM input. The module is connected to controller by **CAN1A** bus. It is possible to connect up to 10 Inteli AIN8 external units to one controller.

The detection of communication speed is indicated by fast flashing of status LED. Once the speed is detected the module remains set for the speed even when the communication is lost. Renewal of communication speed detection is done by reset of the module.

Image 22.101 Inteli AIN8

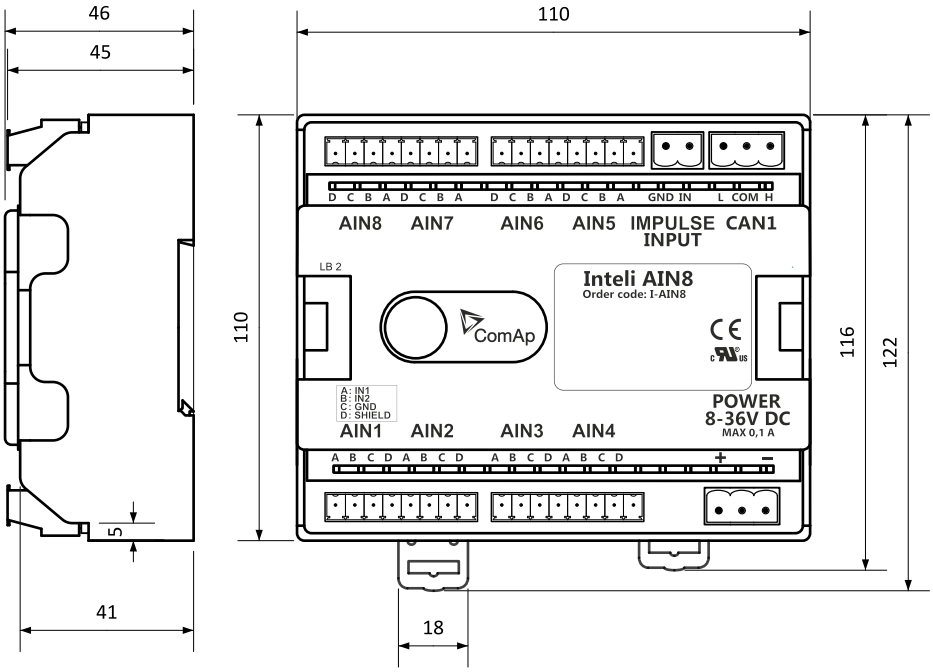
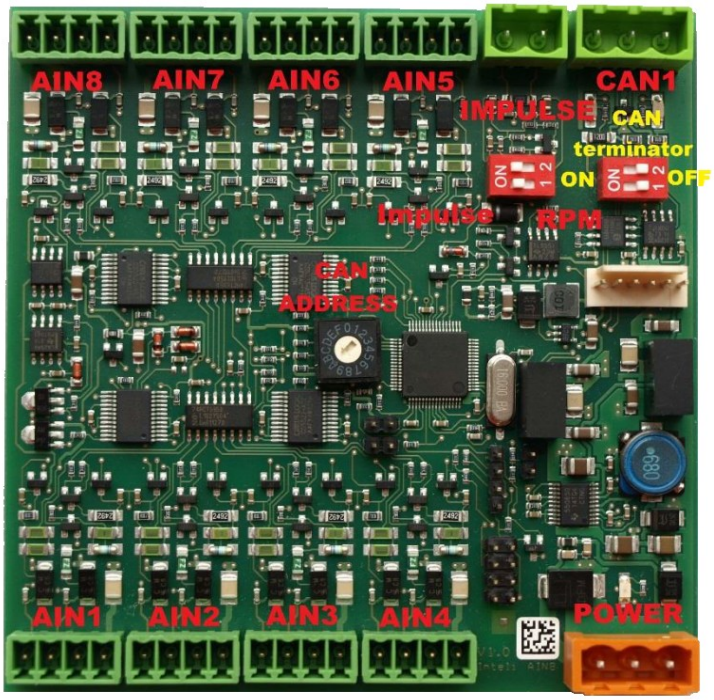


Image 22.102 Inteli AIN8 dimensions

Note: *All dimensions are in mm.*

Terminals



Analog input	8 analog Inputs
CAN1	**CAN1A** line
Power	Power supply
CAN LED Tx, Rx	Indication transmitted or received data
Status LED	LED indication of correct function
CAN terminator	Terminating CAN resistor (active in position “ON” - switch both switches)

IMPORTANT: Impulse input is not supported by the controller.

Analog inputs

- 8 channels
- can be configured as:
  - resistor three wire input
  - current input
  - voltage input

All inputs can be configured to any logical function or protection.

Supported sensors

Sensors				
PT100 [°C] (fix)	PT100 [°F] (fix)	+-1V	4-20mA passive	0-250 ohm
PT1000 [°C] (fix)	PT1000 [°F] (fix)	0-2.4V	4-20mA active	0-2400 ohm
NI100 [°C] (fix)	NI100 [°F] (fix)	0-5V	0-20mA passive	0-10k ohm
NI1000 [°C] (fix)	NI1000 [°F] (fix)	0-10V	+-20mA active	

Note: *It is also possible to use User Curves as sensor.*

CAN address

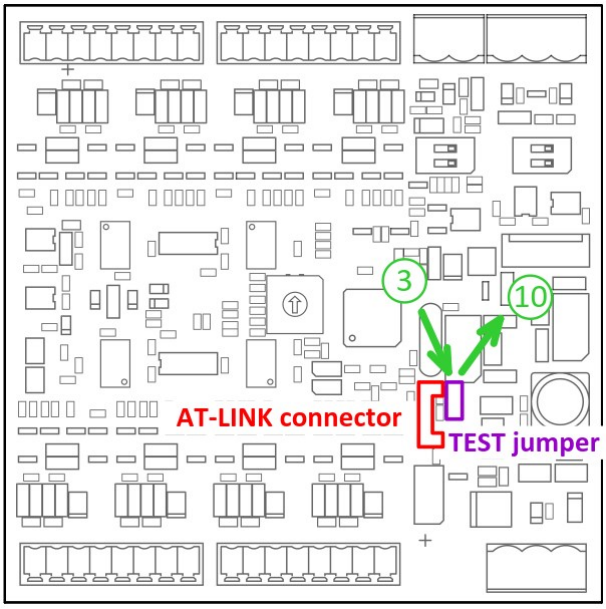
DIP switch determinates CAN address for analog inputs.

Note: *In case of setting the CAN address to zero, the appropriate group of signals is deactivated.*

Programming firmware

Firmware upgrade process:

1. Disconnect all terminals from the unit.
2. Separate the top cover of module
3. Put the TEST jumper on a pins
4. Connect the unit with PC via RS232-null modem cable and AT-Link conv



5. Connect power supply of the module (status LED lights continuously)
6. Launch FlashPgr.exe PC software (version 4.2 or higher)
7. In FlashPrg program choose card Inteli AIN8 and load FW for the module
8. Set the proper COM port (connected with the unit) and press Start button
9. Wait till process is done (If the process doesn't start – after 60 second the "Timeout" will be evaluated. In this case please check:
   - You have proper connection with the unit
   - COM port selection is correct
   - Module has power supply, (no CAN bus connection, status LED lights continuously)

10. After successful programming disconnect AT-Link conv , remove TEST jumper and disconnect power supply
11. Connect power supply again (status LED should blinking)
12. Module FW is upgraded

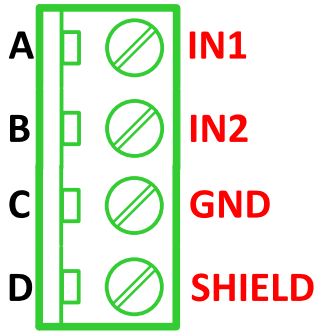
LED indication

LED status	Description
Dark	Fw in module does not work correctly.
Flashing	Module does not communicate with controller (in case non-zero CAN address).
Lights	Power supply is in the range and the communication between Inteli AIN8 and controller works properly. Or power supply is in range and zero CAN address is set. (in case zero CAN address module doesn't communicate with the controller).

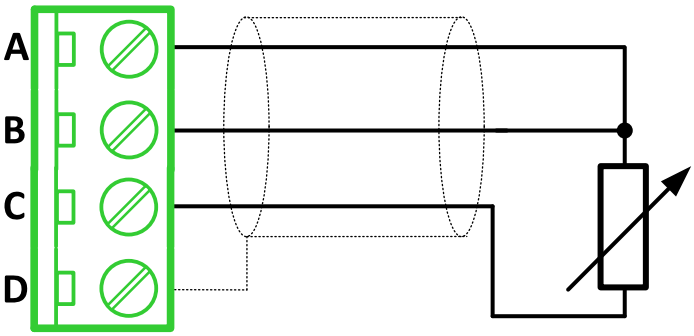
Wiring

The following diagrams show the correct connection of sensors.

Terminator

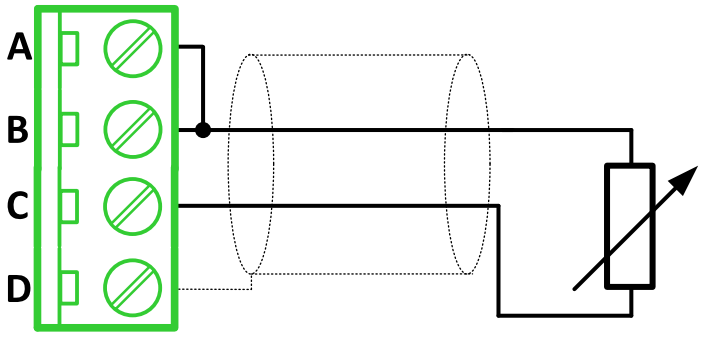


Resistance sensor - 3 wires



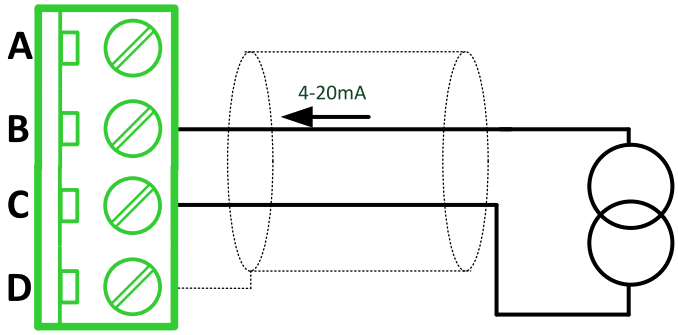
Note: *Ranges: Pt100, Pt1000, Ni100, Ni1000, 0 – 2400 Ω, 0 – 10 kΩ*

Resistance sensor - 2 wires



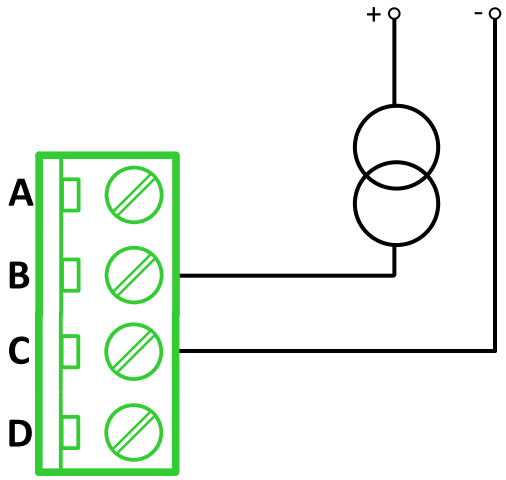
Note: *Ranges: Pt100, Pt1000, Ni100, Ni1000, 0 – 2400 Ω, 0 – 10 kΩ*

Current sensor - active



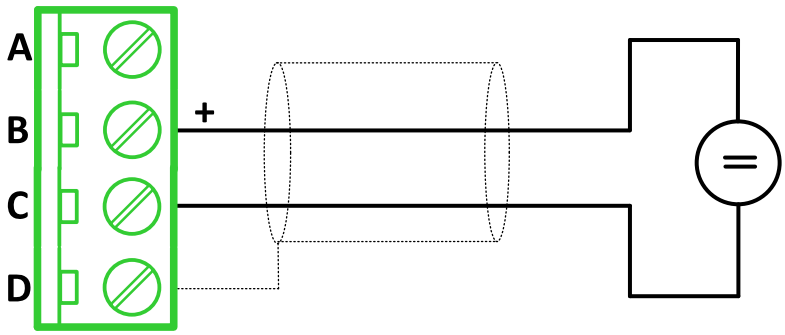
Note: *Ranges: ±20 mA, 4 – 20 mA*

Current sensor - passive



Note: *Ranges: 0 – 20 mA, 4 – 20 mA*

Voltage sensor



Note: *Ranges: ±1 V, 0 – 2,5 V, 0 – 5 V, 0 – 10 V*

Technical data

General data

Power supply	8 to 36 V DC
Current consumption	35 mA at 24 V ÷ 100 mA at 8 V
Interface to controller	**CAN1A**
Protection	IP20
Storage temperature	- 40 °C to + 80 °C
Operating temperature	- 30 °C to + 70 °C
Dimensions (WxHxD)	110x110x46 mm (4,3”x4,3”x1,8”)
Weight	221,5 grams

Analog inputs

Number of channels	8
Voltage	Range 0-10 V Accuracy: ± 0,25 % of actual value + ± 25 mV
Current	Range: ±20 mA Accuracy: ± 0,25 % of actual value + ± 50 µA
Resistive	Range: 0- 10 kΩ Accuracy: ± 0,5 % of actual value + ± 2 Ω

back to Extension modules

Inteli IO8/8

Inteli IO8/8 module is an extension module equipped with binary inputs, binary outputs and analog outputs. The module is connected to controller by **CAN1A** bus.

Inteli IO8/8 is the name of the module, but it is possible to configure the module (by internal switch) to two configurations:

- Inteli IO8/8 - 8 binary inputs, 8 binary outputs and 2 analog outputs
- Inteli IO16/0 - 16 binary inputs, 0 binary outputs and 2 analog outputs

It is possible to connect up to 12 Inteli IO8/8 or 8 Inteli IO 16/0 external units to one controller.

The detection of communication speed is indicated by fast flashing of status LED. Once the speed is detected the module remains set for the speed even when the communication is lost. Renewal of communication speed detection is done by reset of the module.

Image 22.103 Inteli IO8/8

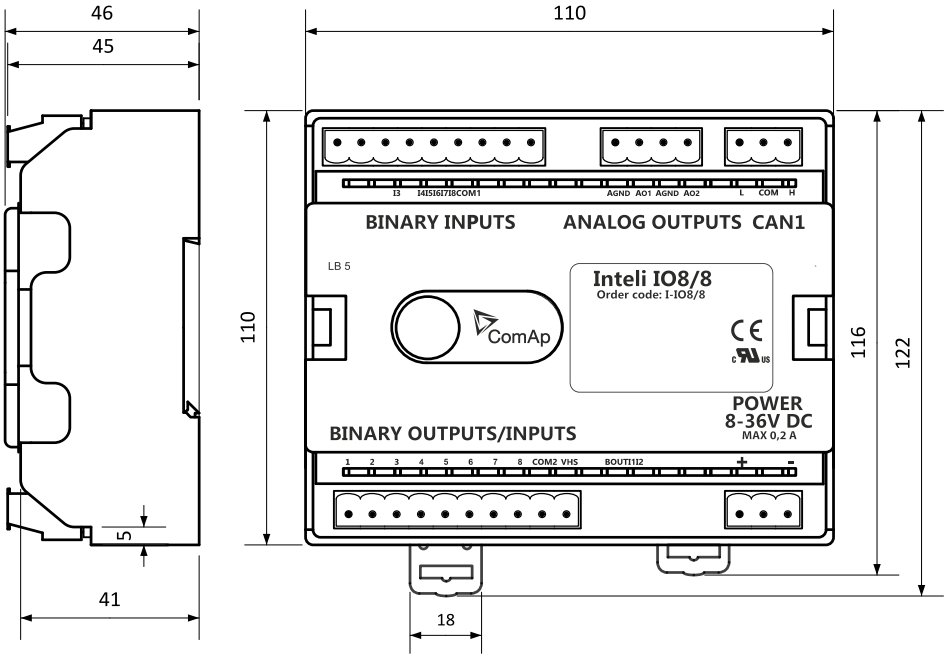
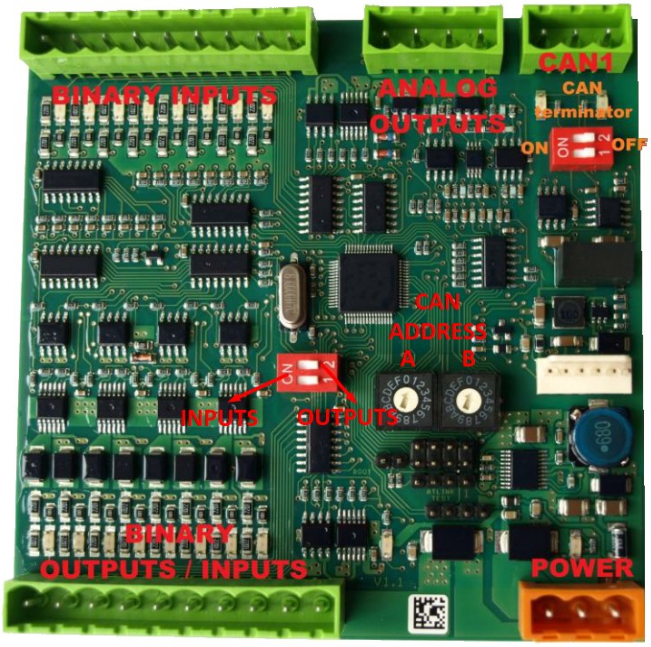


Image 22.104 Inteli IO8/8 dimensions

Note: *All dimensions are in mm.*

Terminals



Binary inputs	8 binary inputs
Binary outputs	8 binary outputs (8 binary inputs)
Analog outputs	2 analog outputs
CAN1	**CAN1A** line
Power	Power supply
Binary inputs LEDs	8 LEDs for binary input indication
Binary outputs LEDs	8 LEDs for binary output indication
CAN LED	Indication transmitted or received data
Status	LED indication of correct function
CAN terminator	Terminating CAN resistor (active in position “ON” - switch both switches)

Inputs and outputs

Binary inputs

- 8 channels
- can be configured as:
  - pull up
  - pull down

All 8 inputs are configured to one type together.

All inputs can be configured to any logical function or protection.

Binary outputs

- 8 channels
- can be configured as:
  - High side switch
  - Low side switch

Always all 8 inputs are configured to one type (HSS/LSS) together. All 8 outputs can be modified to inputs by switch on the PCB (Inteli IO8/8 to Inteli IO16/0).

Analog outputs

- 2 channels
- can be configured as:
  - voltage 0-10V
  - current 0-20mA
  - PWM (level 5V, with adjustable frequency from 200Hz to 2400Hz, with step 1Hz)

All inputs/outputs can be configured to any logical function or protection.

Output state check

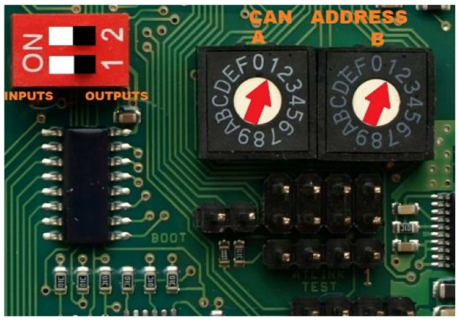
Output state check function evaluates in real time the state of binary outputs and adjusted (required) state. In case of failure (different state of required state and real state) history record and alarm are issued (type of the alarm is set by “Protection upon module failure” - (No protection / Warning / Shutdown)).

This function is designed for short-circuit or other failure, which causes change of set state of binary output.

CAN address

In Inteli IO8/8 mode CAN address for binary inputs is determined by DIP switch A, CAN address for binary output and analog outputs is determined by DIP switch B.

In Inteli IO16/0 mode CAN address for binary inputs is determined by DIP switch A, first group of 8 input has address A, second group of 8 inputs has address A+1. CAN address of analog outputs is set by DIP switch B.



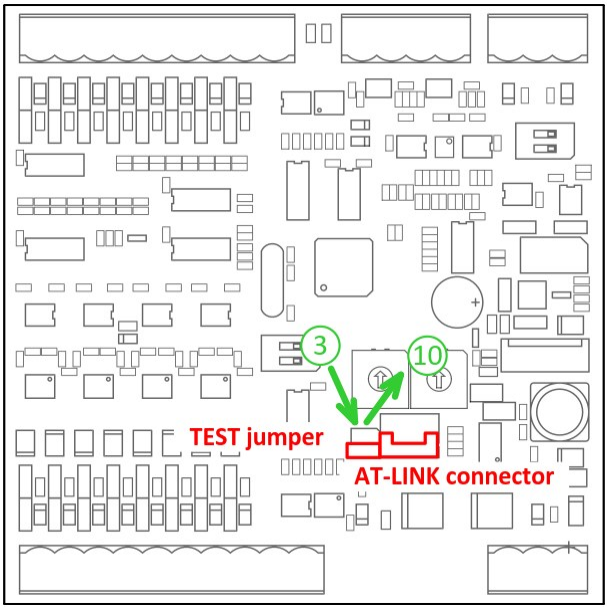
Note: *In case of setting the CAN address to zero, the appropriate group of signals is deactivated.*

Programming firmware

Firmware upgrade process:

1. Disconnect all terminals from the unit.
2. Separate the top cover of module
3. Put the TEST jumper on a pins

4. Connect the unit with PC via RS232-null modem cable and AT-Link conv



5. Connect power supply of the module (status LED lights continuously)
6. Launch FlashPgr.exe PC software (version 4.2 or higher)
7. In FlashPrg program choose card Inteli IO8/8 and load FW for the module
8. Set the proper COM port (connected with the unit) and press Start button
9. Wait till process is done (If the process doesn't start – after 60 second the "Timeout" will be evaluated. In this case please check:
   - You have proper connection with the unit
   - COM port selection is correct
   - Module has power supply, (no CAN bus connection, status LED lights continuously)
10. After successful programming disconnect AT-Link conv , remove TEST jumper and disconnect power supply
11. Connect power supply again (status LED should blinking)
12. Module FW is upgraded

LED indication

Binary input

Each binary input has LED which indicates input signal. LED is shining when input signal is set, and LED is dark while input signal has other state.

Binary output

Each binary output has LED which indicates output signal. Binary output LED is shining when binary output is set. When this LED is shining, then module is configured as 8 binary inputs and 8 binary outputs. When this LED is dark, then the module is configured as 16 binary inputs.

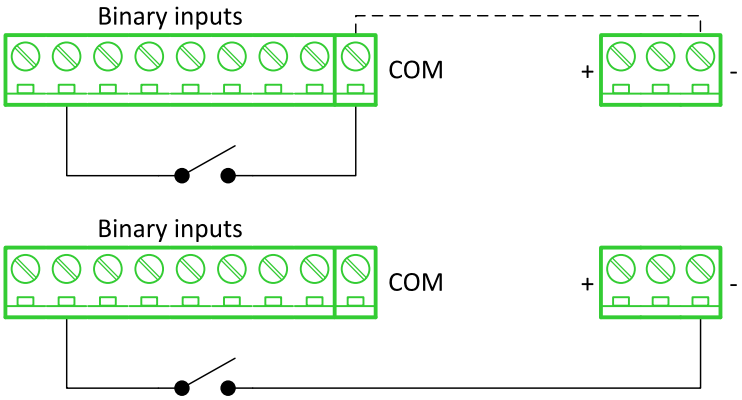
LED at power connector - status LED

LED status	Description
Dark	Fw in module does not work correctly.
Flashing	Module does not communicate with controller (in case non-zero CAN address).
Lights	Power supply is in the range and the communication between Inteli IO8/8 and controller works properly. Or power supply is in range and zero CAN address is set. (in case zero CAN address module doesn't communicate with the controller).

Wiring

The following diagrams show the correct connection of inputs and outputs.

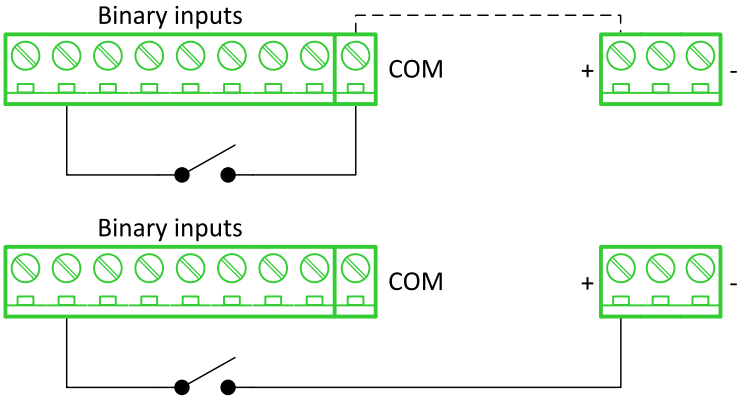
Binary inputs - pull up



There are two options of wiring. On upper picture you can see case when binary input is connected between BIN2 and COM (COM is connected internally to the GND (-) - dashed line).

On lower picture is case of wiring between BIN2 and GND (-). Both ways are correct.

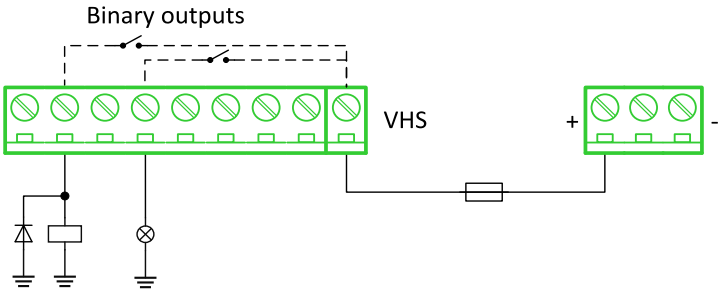
Binary inputs - pull down



There are two options of wiring. On upper picture you can see case when binary input is connected between BIN2 and COM (COM is connected internally to the Ucc (+) - dashed line).

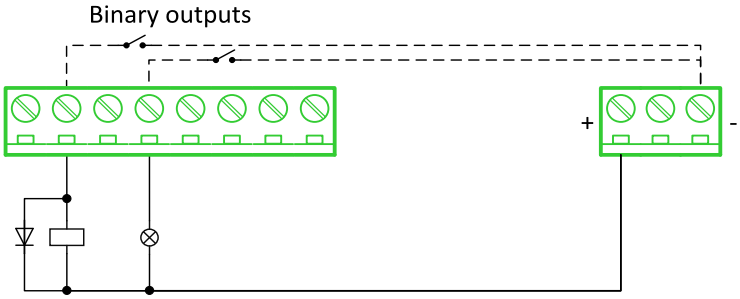
On lower picture is case of wiring between BIN2 and Ucc (+). Both ways are correct.

Binary outputs - high side



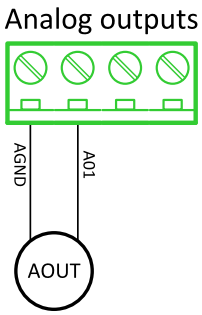
When high side setting of outputs is chosen - binary output must be connected to the minus potential directly Terminal VHS (voltage High side) has to be connected to positive potential directly. Maximal current of each binary output is 500 mA. Size of fuse depends on load.

Binary outputs - low side



When low side setting of outputs is chosen - binary output must be connected to the plus potential of power supply directly. Minus potential is connected internally - dashed line.

Analog outputs



Note: *Limit of analog ground (AGND) is 100mA.*

> **IMPORTANT: Terminator for analog output has special analog ground (AGND), which must not be connected to the GND.**

Technical data

General data

Power supply	8 to 36 V DC
Current consumption	35 mA at 24 V ÷ 100 mA at 8 V
Interface to controller	**CAN1A**
Protection	IP20
Storage temperature	- 40 °C to + 80 °C

Operating temperature	- 30 °C to + 70 °C
Dimensions (WxHxD)	110x110x46 mm (4,3”x4,3”x1,8”)
Weight	240 grams

Analog outputs

Number of channels	2
Voltage	Range 0-10 V Accuracy: ± 20 mV + ±0,5 % of actual value Imax 5 mA
Current	Range: 0-20 mA Accuracy: ± 100 µA + ±0,5 % of actual value Rmax 500 Ω
PWM	Level 5 V Frequency - adjustable 200÷2400 Hz Imax 20 mA

Binary inputs

Number of channels	8 for Inteli IO8/8, 16 for Inteli IO16/0
Input resistance	4400 Ω
Input range	0 to 36 V DC
Switching voltage level for open contact indication	0 to 2 V DC
Max voltage level for close contact indication	6 to 36 V DC

Binary outputs

Number of channels	8 for Inteli IO8/8, 0 for Inteli IO16/0
Max current	500 mA
Max switching voltage	36 V DC

back to Extension modules

IGL-RA15

Remote annunciator (IGL-RA15) is designed as an extension signaling unit. The module is connected to controller by **CAN1A** bus. It is possible to connect up to 4 IGL-RA15 external units to one controller.

The unit is equipped with a fully configurable tri-color (red, orange, green) LED for intuitive operation together with high functionality.

Image 22.105 IGL-RA15

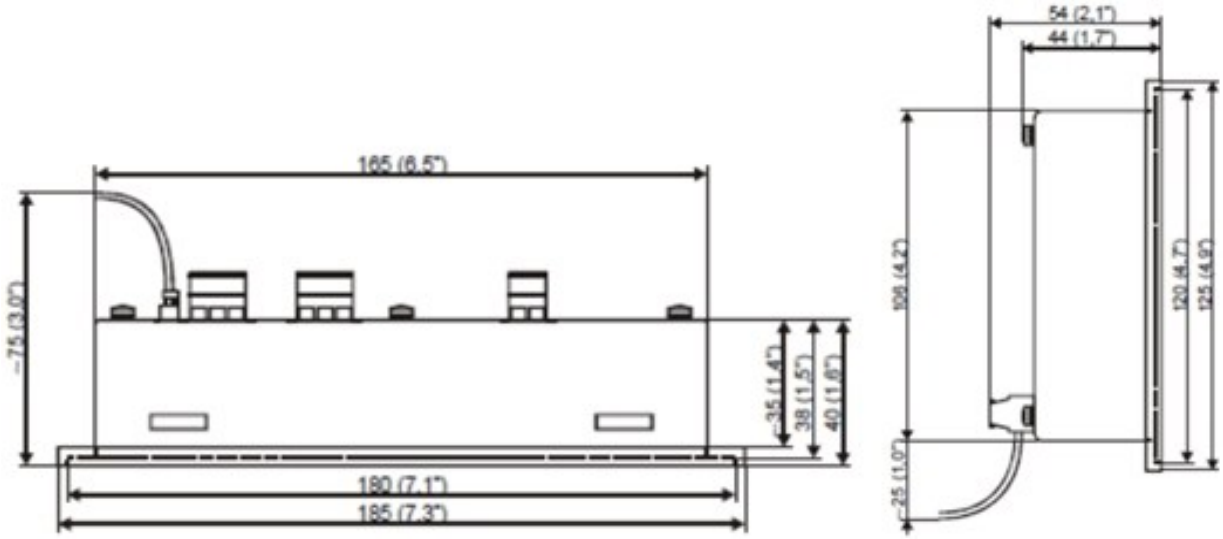


Image 22.106 IGL-RA15 dimensions

Terminals

Horn	Horn
CAN	**CAN1A** line
Power	Power supply

CAN address

Address	Jumper A	Jumper B
1	OPEN	OPEN
5+6	CLOSED	OPEN
Customer defined	CLOSED	CLOSED

SW changing of **CAN1A** address is enabled only when both jumpers are closed. Any one of these addresses (1+2 or 3+4 or 5+6 or 7+8) can be set by following steps:

- Switch to programming mode (Hold the Horn reset and Lamp test when unit is powering on). Status led is yellow

- Press Lamp test sixteen times
- Set the address up by pressing Horn reset.
  - The number of red luminous LEDs means the **CAN1A** addresses (two for addresses 1+2, four for addresses 3+4, six for addresses 5+6 and eight for addresses 7+8)
- Press Lamp test

LED indication

Each LED color is adjusted independently of controller output settings. If controller output 1 is set as “Common Shutdown” it doesn’t mean red LED1 color for iGL-RA15. The LEDs color can by adjust by following steps:

- Switch to programming mode (Hold the Horn reset and Lamp test when unit is powering on). Status led is yellow
- Press Horn reset to change the LED1 color (green, yellow, red)
- Press Lamp test to switch to the next LED color adjusting
- Continue to adjust all LEDs color
- After LED15 color adjusting press three times Lamp test

Note: *If there is no operator action during address setting, color adjusting or timeout setting, the unit returns to normal operation without changes saving.*

Status LED

The signals LEDs are handled like binary outputs. It means all what can be configured to binary outputs can be also configured to the LEDs of IGL-RA15.

LED status	Description
Lights	Configured logical output is active on the controller
Dark green LED	Configured logical output is not active on the controller
Dark yellow or red LED	Configured logical output is not active on the controller and horn reset was pressed.
Yellow or red LED blinks	Configured logical output is not active on the controller and horn reset was still not pressed.

Power LED

LED status	Description
Blinking green	The unit is OK and the communication to the master controller is OK.
Blinking red	The unit is OK, but the communication to the master controller is not running.
Blinking yellow	EEPROM check not passed OK after power on
Yellow	Horn timeout or controller address adjustment

Horn setting

The horn output is activated if any of red or yellow LED is on. Output is on until pressing Horn reset or horn timeout counts down. The timeout can by set by following steps:

- Switch to programming mode (Hold the Horn reset and Lamp test when unit is powering on). Status led is yellow

- Press Lamp test fifteen times
- Set the horn timeout by pressing Horn reset.
  - The number of green luminous LEDs means timeout in 10 s (none for disabling horn output, 1 for 10s timeout, 2 for 10s timeout, 15 for disabling horn timeout).
  - Press Lamp test two times

Note: *If there is no operator action during address setting, color adjusting or timeout setting, the unit returns to normal operation without changes saving.*

The horn is activated if:

- Some of red or yellow LED lights up or
- At the end of the extended lamp test. See chapter **Lamp and horn test**

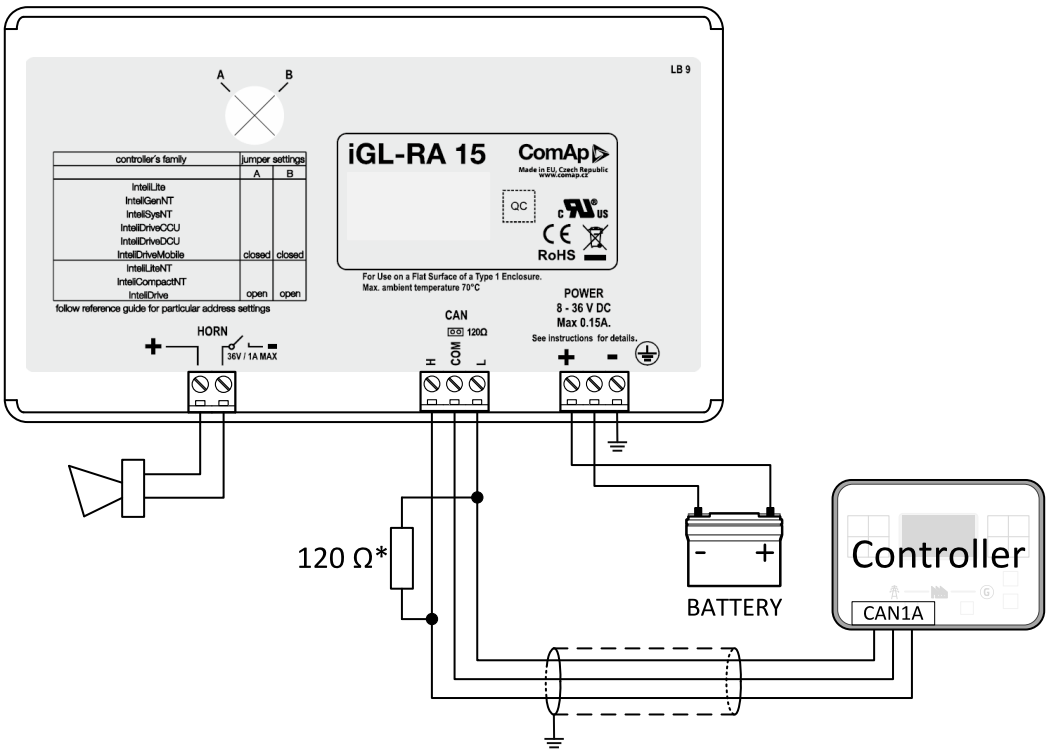
The horn can be silenced:

- By pressing horn reset button or
- It silences automatically after adjusted time

Lamp and horn test

Pressing and holding lamp test button for less than 2 s execute the basic lamp test. All LEDs light up with the configured colour. If the button is hold longer than 2 s, an extended test is started. Every LED is tested step-by-step in green colour and then in red colour. The horn is activated at the end of the test. After that the unit returns to normal operation. The horn can be silenced with horn reset.

Wiring



* use terminator resistor only when IGL-RA 15 is the last unit on the CAN1A bus.

Note: *The shielding of the CAN bus cable has to be grounded at one point only!*

Note: *See the section **Technical data** for recommended CAN bus cable type*

Technical data

General data

Power supply	8 to 36 V DC
Current consumption	0.35-0.1A (+1Amax horn output) depends on supply voltage
Protection	IP65
Interface to controller	**CAN1A**
Humidity	85%
Storage temperature	- 30 °C to + 80 °C
Operating temperature	- 20 °C to + 70 °C
Dimensions (WxHxD)	180x120x55 mm
Weight	950 g

Horn output

Maximum current	1.0 A
Maximum switching voltage	36 V DC

CAN bus interface

Galvanic separated	
Maximal CAN bus length	200 m
Speed	250 kbps
Nominal impedance	120 Ω
Cable type	twisted pair (shielded)
Following dynamic cable parameters are important especially for maximal 200 meters CAN bus length	
Nominal Velocity of Propagation	min. 75 % (max. 4,4 ns/m)
Wire crosscut	min.0,25 mm^2
Maximal attenuation (at 1 MHz)	2 dB/100m
Recommended Industrial Automation & Process Control Cables	
BELDEN (www.belden.com)	> 3082A DeviceBus for Allen-Bradley DeviceNet > 3083A DeviceBus for Allen-Bradley DeviceNet > 3086A DeviceBus for Honeywell SDS > 3087A DeviceBus for Honeywell SDS > 3084A DeviceBus for Allen-Bradley DeviceNet > 3085A DeviceBus for Allen-Bradley DeviceNet > 3105A Paired EIA Industrial RS485 cable
LAPP CABLE (www.lappcable.com)	> Unitronic BUS DeviceNet Trunk Cable > Unitronic BUS DeviceNet Drop Cable > Unitronic BUS CAN > Unitronic-FD BUS P CAN UL/CSA

IMPORTANT: This module is not compatible with different than 250 kbps communication speed. If the ECU module with 125 kbps communication speed is connected the whole system will automatically switch to the 125 kbps, and IGL-RA15 module will stop communicating.

back to Extension modules

IGS-PTM

IGS-PTM module is extension module equipped with binary inputs, binary outputs, analog inputs and analog output. The module is connected to controller by **CAN1A** bus. It is possible to connect up to 4 IGS-PTM external units to one controller.

Image 22.107 IGS-PTM

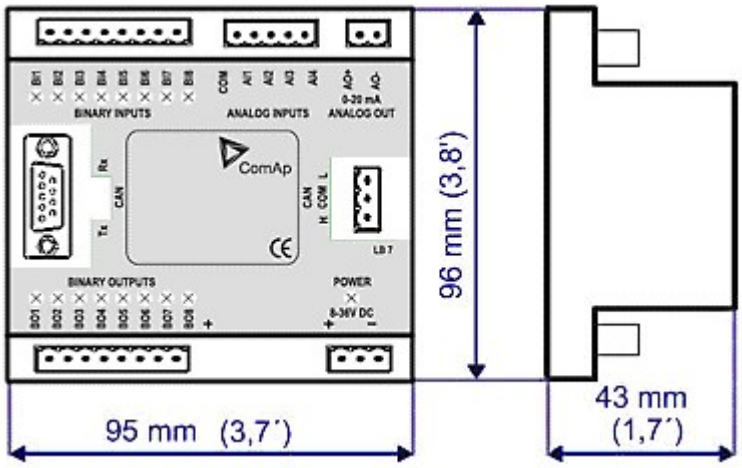
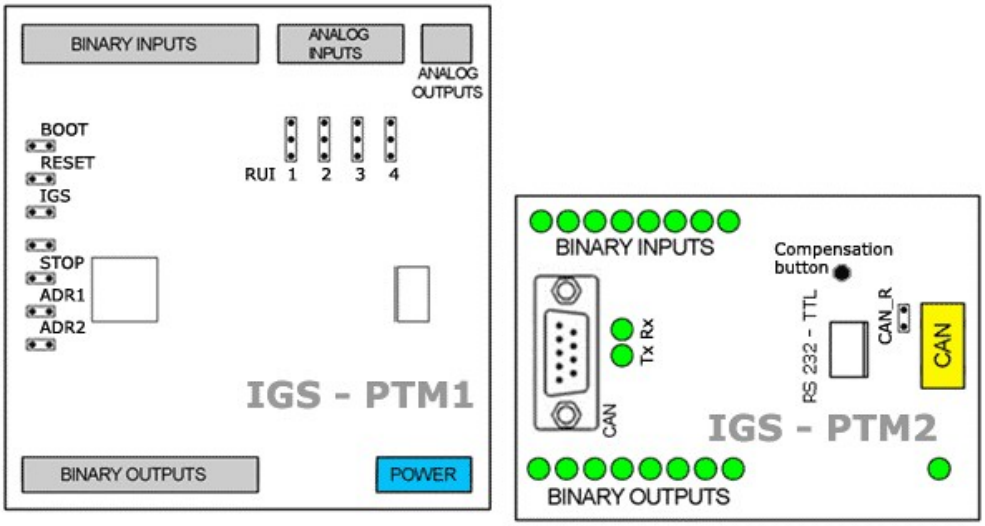


Image 22.108 IGS-PTM dimensions

Terminals



Binary inputs	8 binary inputs
Analog inputs	4 analog inputs
Analog outputs	1 analog output
Binary outputs	8 binary outputs
CAN	**CAN1A** line
RS232-TTL	Interface for programming
Power	Power supply

Analog inputs

Analog inputs can be configured for:

- Resistance measurement
- Current measurement
- Voltage measurement

The type of analog inputs is configured via jumpers RUI located on lower PCB.

RUI	Analog input configuration
1 - 2	Resistance measuring
2 - 3	Current measuring
no jumper	Voltage measuring

Supported sensors

Sensors	
PT100 [°C] (fix)	User curves
NI100 [°C] (fix)	0-100 mV
PT100 [°F] (fix)	0-2400 ohm
NI100 [°F] (fix)	±20 mA

CAN address

Controller type selection

The type of controller to be used with IGS-PTM must be selected via jumper labeled IGS accessible at the lower PCB.

IGS jumper	Controller type
OPEN	IL-NT, IC-NT
CLOSE	IG-NT, IS-NT, InteliLite

Address configuration

If InteliLite controller type is selected (by IGS jumper), address of IGS-PTM could be modified via jumpers labeled ADR1 and ADR2.

ADR1	ADR2	ADR offset	BIN module	BOUT module	AIN module
Open	Open	0 (default)	1	1	1
Close	Open	1	2	2	2
Open	Close	2	3	3	3
Close	Close	3	4	4	4

Programing firmware

Firmware upgrade is via AT-link (TTL). For programming is necessary to close jumper BOOT. RESET jumper is used to reset the device. Close jumper to reset the device. For programming is used FlashProg PC tool.

LED indication

Binary input

Each binary input has LED which indicates input signal. LED is shining when input signal is set, and LED is dark while input signal has other state.

Binary output

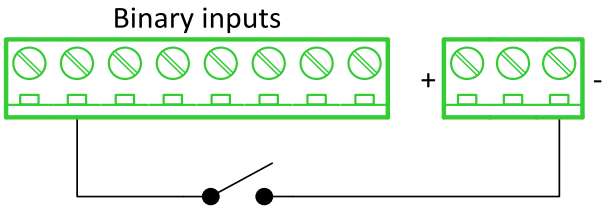
Each binary output has LED which indicates output signal. Binary output LED is shining when binary output is set.

LED at power connector - status LED

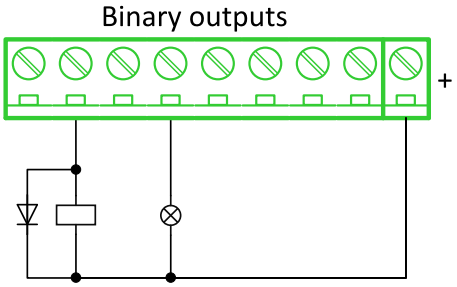
LED status	Description
Dark	No required power connected.
Quick flashing	Program check failure.
One flash and pause	Compensation fail.
Three flashes and pause	Compensation successful.
Flashes	There is no communication between IGS-PTM and the controller.
Lights	Power supply is in the range and communication between IGS-PTM and controller properly works.

Wiring

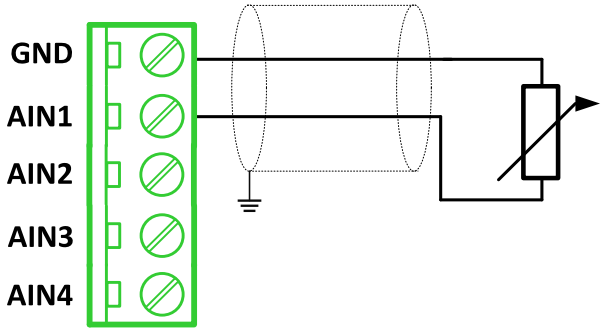
Binary inputs



Binary outputs



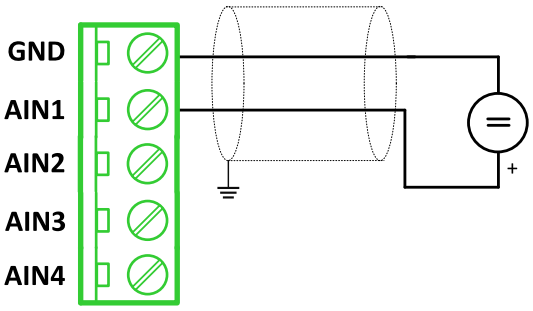
Resistance sensor



Note: *Range: 0- 2400 Ω*

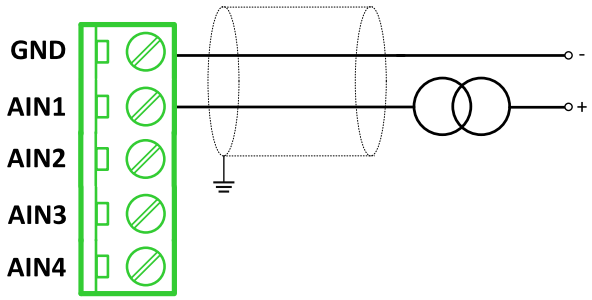
IMPORTANT: Physical analog input range is 0-250 Ω. In sensor configuration in PC tool it is necessary to chose 0-2400 Ω sensor HW type to ensure proper function of analog input.

Voltage sensor



Note: *Range 0-100 mV*

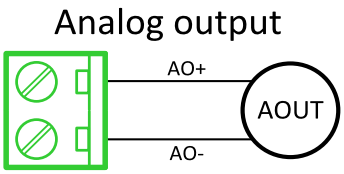
Current sensor - passive



Note: *Range: ± 0-20 mA*

IMPORTANT: Physical analog input range is 0-20mA. In sensor configuration in PC tool it is necessary to chose +- 20mA active sensor HW type to ensure proper function of analog input.

Analog outputs



Note: *Range: 0 to 20 mA ± 0,33 mA*

Technical data

General data

Power supply	8 to 36 V DC
Current consumption	100 mA at 24V ÷ 500 mA
Interface to controller	**CAN1A**
Protection	IP20
Storage temperature	- 40 °C to + 80 °C
Operating temperature	- 30 °C to + 70 °C
Dimensions (WxHxD)	95×96×43 mm (3.7’×3.8’×1.7’)

Analog inputs

Number of channels	4
Voltage	Range 0-100 mV Accuracy: 1,5 % ± 1 mV out of measured value
Current	Range: 0-20 mA Accuracy: 2.5 % ± 0,5 ohm out of measured value
Resistive	Range: 0- 250 Ω Accuracy: 1 % ± 2 ohm out of measured value

Analog outputs

Number of channels	1
Current	Range: 0 to 20 mA ± 0,33 mA Resolution 10 bit

Binary inputs

Number of channels	8
Input resistance	4700 Ω
Input range	0 to 36 V DC
Switching voltage level for open contact indication	0 to 2 V DC
Max voltage level for close contact indication	8 to 36 V DC

Binary outputs

Number of channels	8
Max current	500 mA
Max switching voltage	36 V DC
Number of channels	8
Voltage	Range 0-100 mV Accuracy: 1,5 % ± 1 mV out of measured value
Current	Range: 0-20 mA Accuracy: 2.5 % ± 0,5 ohm out of measured value
Resistive	Range: 0- 250 Ω Accuracy: 1 % ± 2 ohm out of measured value

back to Extension modules

Inteli AIO9/1

Inteli AIO9/1 module is an extension module equipped with analog inputs and outputs – designed for DC measurement. The module is connected to controller by **CAN1A** bus. It is possible to connect up to 5 Inteli AIO9/1 external units to one controller.

The detection of communication speed is indicated by rapid flashing of status LED. Once the speed is detected the module remains set for this speed even when the communication is lost. Renewal of communication speed detection is done by resetting of the module.

Image 22.109 Inteli AIO9/1

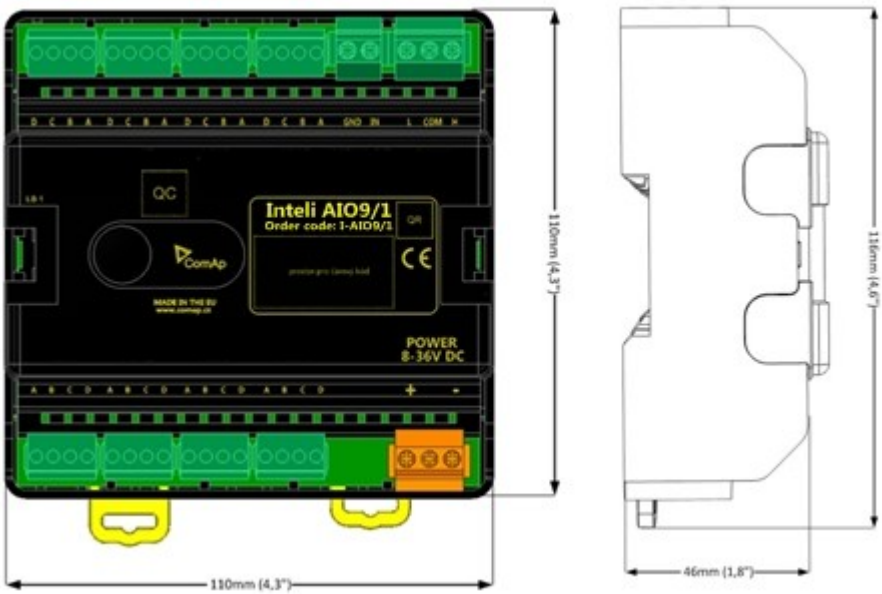
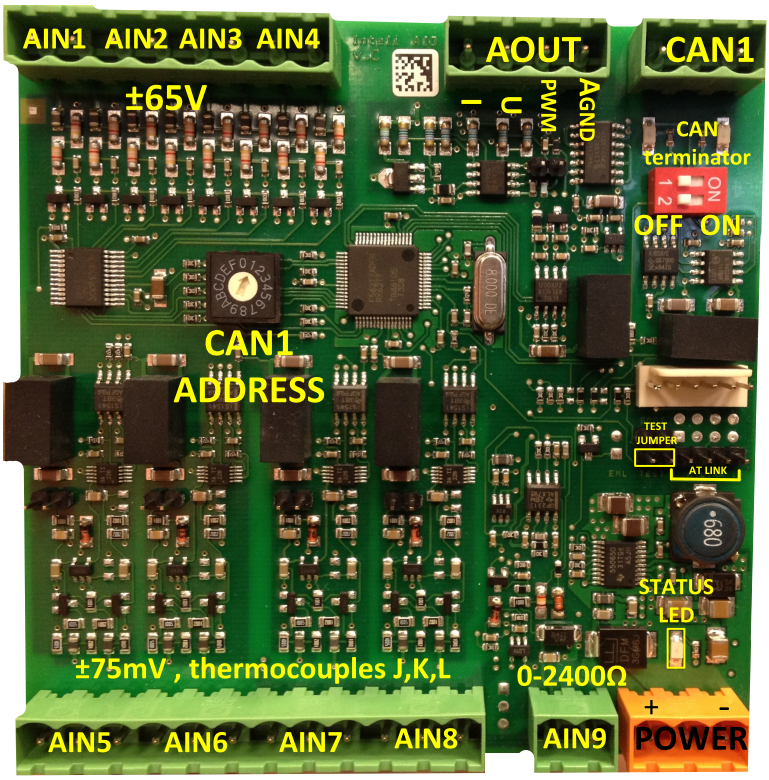


Image 22.110 Inteli AIO9/1 dimensions

Terminals



ANALOG INPUT	9 channels
ANALOG OUTPUTS	1 channel
CAN	CAN1 line
POWER	Power supply
CAN LED Tx, Rx	Indication transmitted or received data
Status LED	LED indication of correct function
CAN terminator	Terminating CAN resistor (active in position "ON")
TEST jumper	Upgrade of SW
AT-LINK	Connector for AT-LINK (Upgrade of SW)

Analog inputs

- 4 channels AIN1 – AIN4 can be configured as:
  - Sensor ±65V (determined for measurement of battery voltage)
- 4 channels AIN5 – AIN8 can be configured as:
  - Thermocouples – type J,K or L (in °C or °F)
  - Sensor ±75mV DC – (for connecting current shunts)
- 1 channel AIN9 can be configured as:
  - RTD (Pt1000, Ni1000)
  - Common resistance 0-2400Ω

Analog outputs

- 1 channel AOUT1. Type of output:
  - 0-10V DC
  - 0-20mA
  - PWM (5 V, freq 2.4 Hz ÷2.4 kHz)
- Analog output has 4-pins connector – GND and one pin for each type of output.

All analog inputs can be configured to any logical function or protection.

Supported sensors

Sensors		
User curves	±65 V DC (fix linear)	Thermocpl (nc) K [°C] (fix)
PT1000 [°C] (fix)	±75 mV (fix linear)	Thermocpl (nc) L [°C] (fix)
NI1000 [°C] (fix)	Thermocpl J [°C] (fix)	Thermocpl (nc) J [°F] (fix)
PT1000 [°F] (fix)	Thermocpl K [°C] (fix)	Thermocpl (nc) K [°F] (fix)
NI1000 [°F] (fix)	Thermocpl L [°C] (fix)	Thermocpl (nc) L [°F] (fix)
0-2400 Ω (fix linear)	Thermocpl (nc) J [°C] (fix)	

Address and DIP switch setting

Address configuration

DIP switch determinates CAN address for analog inputs and outputs.

Programming Firmware

Firmware upgrade is available via AT-link (TTL). For programming it is necessary to close jumper TEST and switch OFF and ON the power supply.

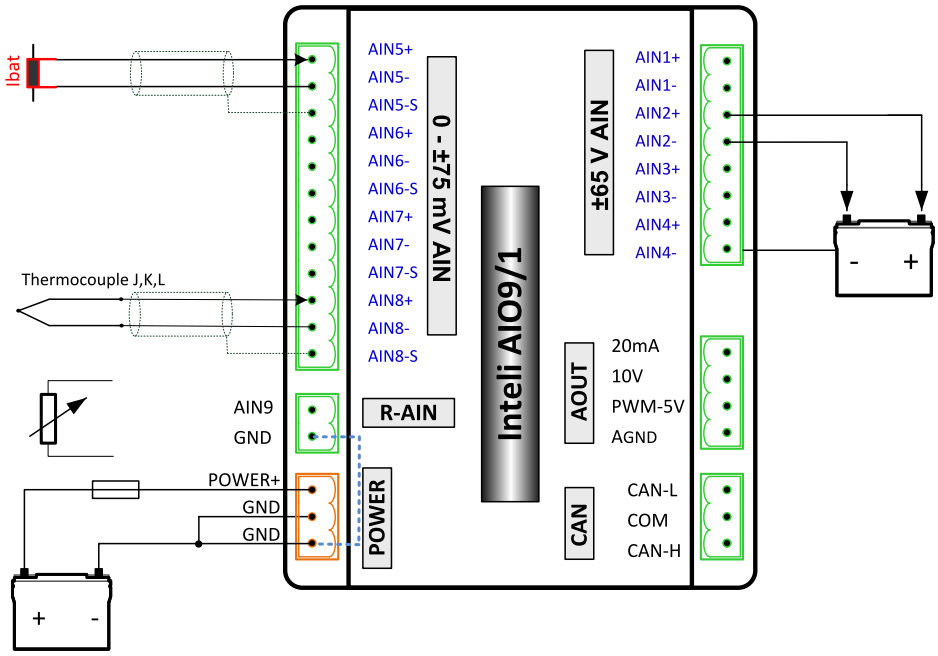
For programming use FlashProg PC tool version 4.4 or higher.

LED indication

LED status	Description
Dark	Fw in module does not work correctly.
Flashing	Module does not communicate with controller (in case non-zero CAN address)
Fast flashing	Detection of CAN communication speed
Lights	Power supply is in the range and the communication between Inteli AIN8TC and controller works properly. Or power supply is in range and zero CAN address is set. (in case zero CAN address module doesn't communicate with the controller)

Wiring

The following diagrams show the correct connection of sensors.



Measuring resistance – AIN9

- 2 – wire measurement

Ranges: Pt1000, Ni1000, 0 – 2400 Ω.

Analog input 9 is determined for measuring resistance only.

Technical data

General data

Dimension (W × H × D)	110 × 110 × 46 mm (4.3” × 4.3” × 1.8”)
Weight	248 grams
Interface to controller	CAN1 – galvanic separated from power supply and measurement,

Analog inputs (not electric separated)

9 channels		
AIN1-AIN4 – Voltage inputs	**Range**	0-65 V ± 0.25 % of actual value + ± 120 mV Measurement is not galvanic separated from power supply, but IN- is not interconnected with GND – there is floating measurement.
	Accuracy of	± 0,1 % of actual value + ± 100 µV (± 3 °C)

AIN5-AIN8 – Voltage inputs	**measurement**	
	Range	± 75 mV (nominal) (measurement up to ±80 mV)
	Accuracy of measurement	± 0.1 % of actual value + ± 75 µV Galvanic separated from power supply
AIN9 resistance input	**Range**	0- 2400 Ω
	Accuracy of measurement	± 0.5 % of actual value + ± 4 Ω Pt1000, Ni1000 ± 2,5 °C It is not galvanic separated from power supply.

Analog output

I 0-20mA /500Rmax. ± 1 % of actual value + ± 200 uA U 0-10V ± 0.5 % of actual value + ± 50 mV PWM – 5 V, 200 Hz-2.4kHz 15 mA max. Galvanic separated from power supply

Galvanic separation	CAN bus is galvanic separated from the measurement and power supply

Power supply	8 to 36 V DC
Protection	IP20
Current consumption	150 mA at 24 V ÷ 400 mA at 8 V
Storage temperature	- 40 °C to + 80 °C
Operating temperature	- 30 °C to + 80 °C

The product is fully supported in firmware IGS-NT 3.1.1 or higher.

For information about support of this module in IGS-NT fw branches and ID-DCU – please read New Feature Lists.

back to Extension modules

Inteli AIN8TC

Inteli AIN8TC module is extension module equipped with 8 analog inputs dedicated for thermocouple sensors only. The module is connected to controller by **CAN1A** bus. It is possible to connect up to 10 Inteli AIO9/1 external units to one controller.

The detection of communication speed is indicated by fast flashing of status LED. Once the speed is detected the module remains set for the speed even when the communication is lost. Renewal of communication speed detection is done by reset of the module.

Image 22.111 Inteli AIN8TC

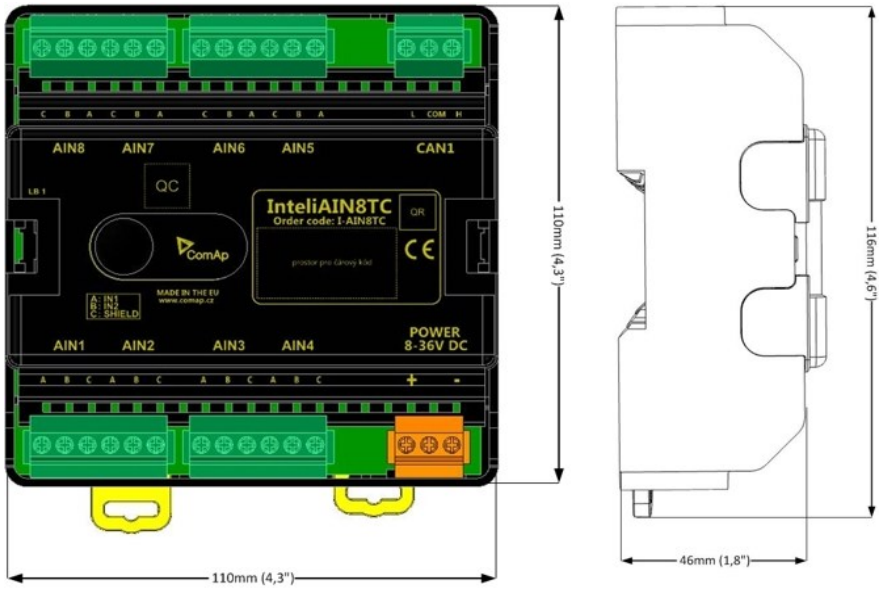
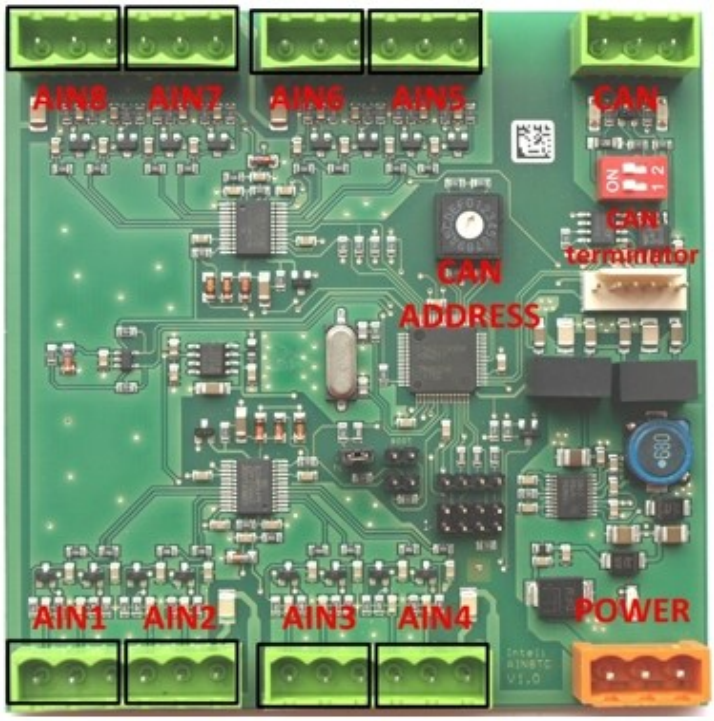


Image 22.112 Inteli AIN8TC dimensions

Terminals



Analog input	8 analog Inputs
CAN	**CAN1A** line
Power	Power supply
CAN LED Tx, Rx	Indication transmitted or received data
Status LED	LED indication of correct function
CAN terminator	Terminating CAN resistor (active in position “ON” - switch both switches)

Analog inputs

- 8 channels
- Can be configured as thermocouple sensors only

All inputs can be configured to any logical function or protection

Supported sensors

Sensors	
Thermocpl J [°C] (fix)	Thermocpl (nc) J [°C] (fix)
Thermocpl K [°C] (fix)	Thermocpl (nc) K [°C] (fix)
Thermocpl L [°C] (fix)	Thermocpl (nc) L [°C] (fix)
Thermocpl J [°F] (fix)	Thermocpl (nc) J [°F] (fix)
Thermocpl K [°F] (fix)	Thermocpl (nc) K [°F] (fix)
Thermocpl L [°F] (fix)	Thermocpl (nc) L [°F] (fix)

Note: *"nc" means" not cold junction compensation (by external sensor).In this case is used internal temperature sensor on the PCB*

CAN address

DIP switch determinates CAN address for analog inputs.

Note: *In case of setting the CAN address to zero, the appropriate group of signals is deactivated.*

Programming firmware

Firmware is upgraded via AT-link (TTL). For programming it is necessary to close jumper TEST.

For programming FlashProg PC tool version 4.2 or higher must be used.

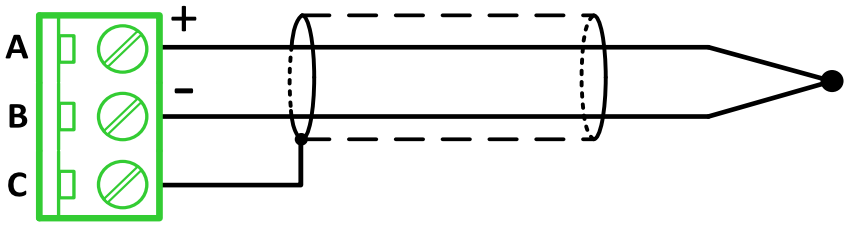
LED indication

LED status	Description
Dark	Fw in module does not work correctly.
Flashing	Module does not communicate with controller (in case non-zero CAN address)
Fast flashing	Detection of CAN communication speed
Lights	Power supply is in the range and the communication between Inteli AIN8TC and controller works properly. Or power supply is in range and zero CAN address is set. (in case zero CAN address module doesn't communicate with the controller)

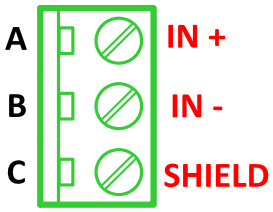
Wiring

The following diagrams show the correct connection of sensors.

Thermocouple



Terminator



Technical data

General data

Power supply	8 to 36 V DC
Current consumption	35 mA at 24 V ÷ 100 mA at 8 V
Interface to controller	**CAN1A**
Protection	IP20
Storage temperature	- 40 °C to + 80 °C
Operating temperature	- 30 °C to + 70 °C
Dimensions (WxHxD)	110 × 110 × 46 mm (4.3” × 4.3” × 1.8”)
Weight	237.5 grams

Analog inputs

Number of channels	8, no galvanic separated
Voltage	Range: ± 100 mV Accuracy: ± 0.1 % of actual value + ± 100 µV (± 3 °C)

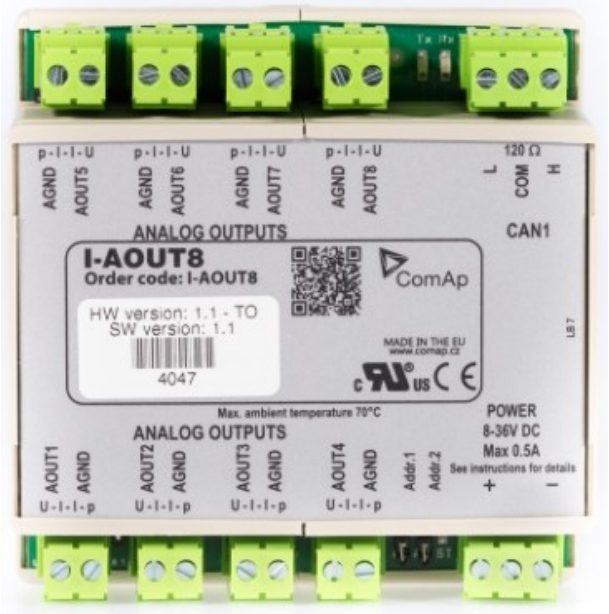
back to Extension modules

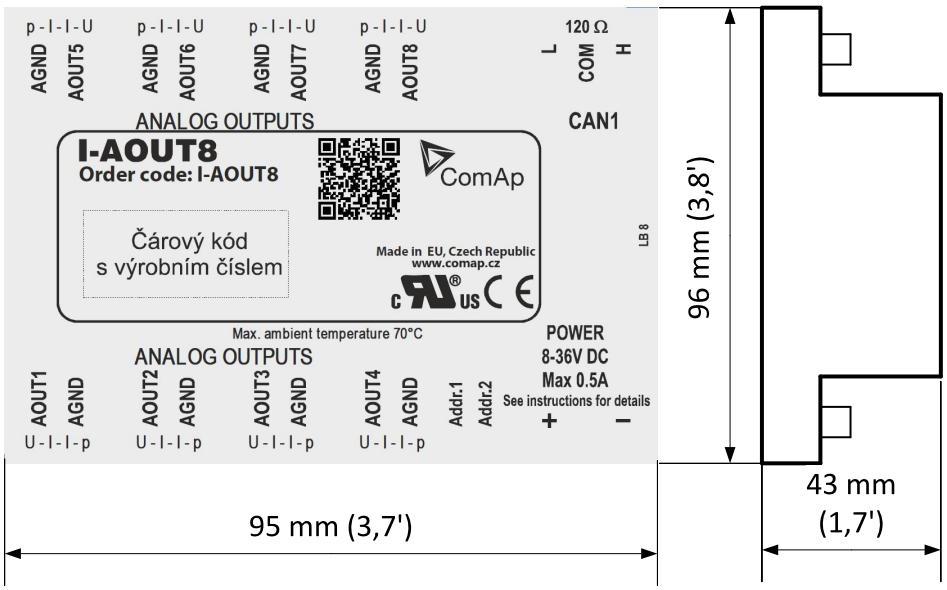
I-AOUT8

I-AOUT8 is an extension unit with 8 analog outputs. Each analog output can be switched to

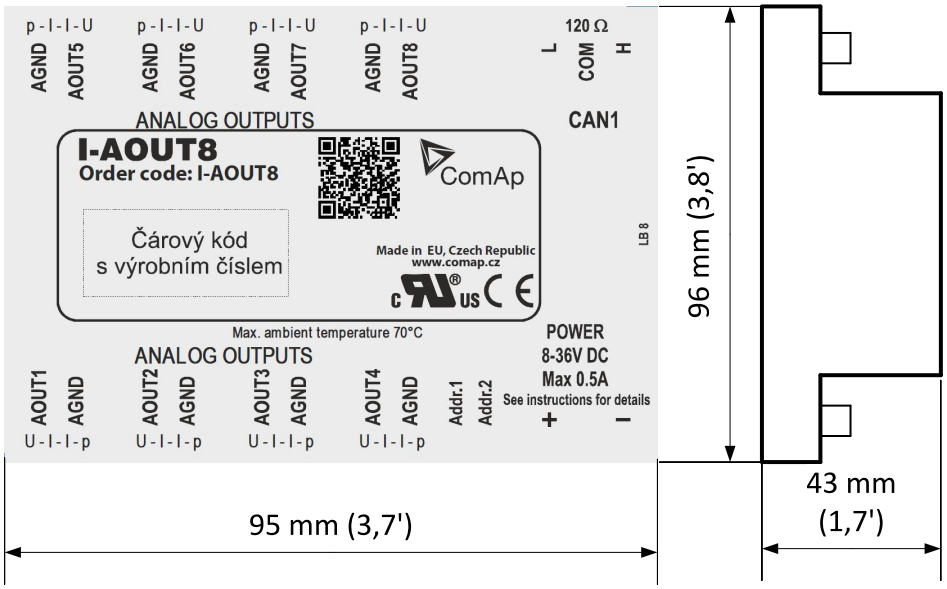
- 0 to 20 mA DC
- 0 to 10 V DC
- PWM (Pulse With Modulation on 1,2 kHz)

The module is connected to controller by **CAN1A** bus. It is possible to connect up to 4 I-AOUT8 external units to one controller. The corresponding module Address 1 to 4 (default 1) must be set on module (by Adr.1 and Adr.2 jumpers) and in controller configuration. CAN1 terminating 120 ohm resistor jumper is connected as default. AGND terminals are on the same potential.


p-I-I-U
AGND
AOUT5
AGND
AOUT6
AGND
AOUT7
AGND
AOUT8
120 Ω
L
COM
H
ANALOG OUTPUTS
CAN1
I-AOUT8
Order code: I-AOUT8
ComAp
HW version: 1.1 - TO
SW version: 1.1
4047
MADE IN THE EU
www.comap.cz
Max. ambient temperature 70°C
ANALOG OUTPUTS
POWER
8-36V DC
Max 0.5A
See instructions for details
AOUT1
AGND
AOUT2
AGND
AOUT3
AGND
AOUT4
AGND
Addr.1
Addr.2
U-I-I-p
+
-

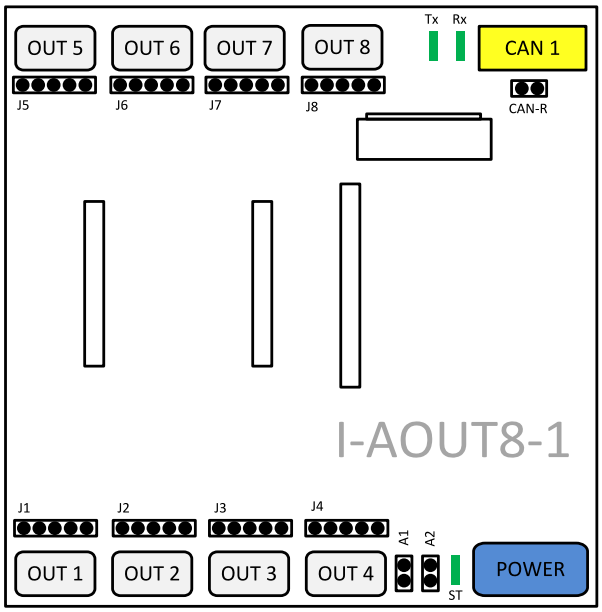

p-I-I-U
AGND
AOUT5
AGND
AOUT6
AGND
AOUT7
AGND
AOUT8
120 Ω
L
COM
H
ANALOG OUTPUTS
CAN1
I-AOUT8
Order code: I-AOUT8
ComAp
Čárový kód
s výrobním číslem
Made in EU, Czech Republic
www.comap.cz
Max. ambient temperature 70°C
ANALOG OUTPUTS
POWER
8-36V DC
Max 0.5A
See instructions for details
AOUT1
AGND
AOUT2
AGND
AOUT3
AGND
AOUT4
AGND
Addr.1
Addr.2
U-I-I-p
+
-
96 mm (3,8')
95 mm (3,7')
43 mm
(1,7')

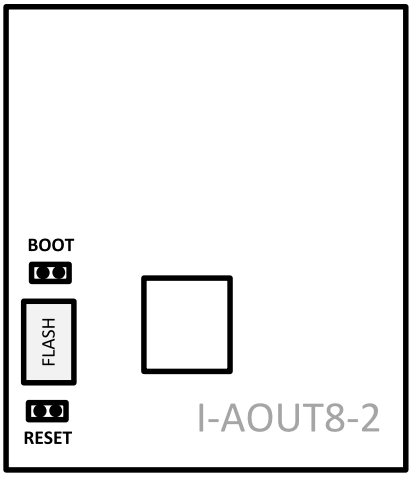
Dimensions



Unit is 35 mm DIN rail mounted.

Connectors





POWER	Power supply
CAN 1	CAN1 line
OUT1 - OUT8	Analog output
FLASH	AT-link
J1 – J8	Output mode
A1, A2	CAN 1 address

CAN-R	Terminating resistor
BOOT	Programming
RESET	Programming / reset
Tx, Rx	CAN 1data
ST	Power/module state

Address and jumpers setting

CAN Address

The module CAN address is set by jumpers A1 and A2. Set module CAN address correspondingly to configuration according table below.

CAN Address	A1	A2
1	Open	Open
2	Close	Open
3	Open	Close
4	Close	Close

Table 22.2 Setting CAN address

Output mode

Follow the p – I – I – U symbols on the module sticker. There are two equivalent positions for current output.

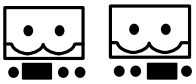
AOUT	Symbol	Function
	p	PWM Pulse-Width-Modulation
	I	0 to 20 mA DC
	U	0 to 10 V DC

Table 22.3 Setting output mode

Programming firmware

Firmware upgrade is via AT-link (TTL). For programming it is necessary to close jumper BOOT. RESET jumper is used to reset the device. Close jumper to reset the device. For programming is used FlashProg PC tool.

CAN1 termination

I-AOUT8 has own CAN terminating resistor (120 ohm). Close jumper CAN-R to connect terminating resistor to CAN bus, open jumper CAN-R disconnecting terminating resistor.

Wiring

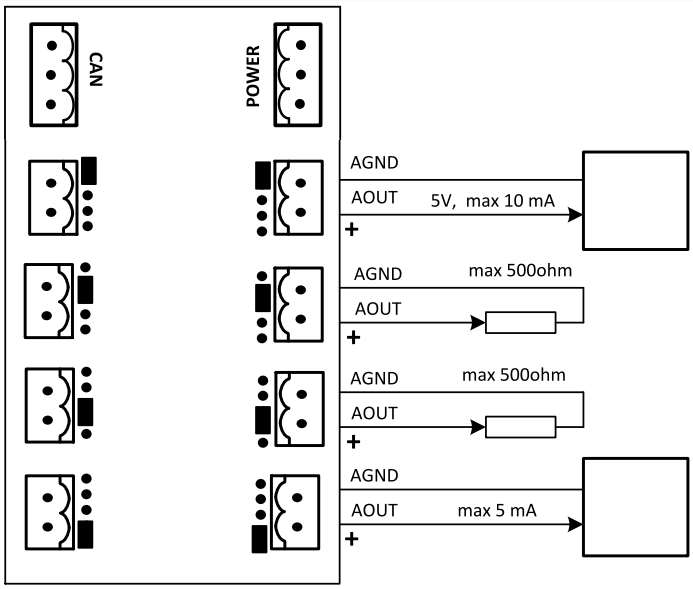
		
PWM output		PWM output 1200 Hz
Current output 0 to 20 mA DC		Current output 0 to 20 mA DC
Current output 0 to 20 mA DC		Current output 0 to 20 mA DC
Voltage output 0 to 10 V DC		Voltage output 0 to 10 V DC

Image 22.113 Possible output modes

Technical data

Dimension (W × H × D)	95 × 96 × 43 mm (3.7’ × 3.8’ × 1.7’)
Interface to controller	CAN
Output	8 analog, no galvanic separation

Type of analog output
0 to 10V DC ± 1 % , max 5 mA DC
0 to 20 mA DC ± 1 % , max 500 Ω
PWM 1200 Hz, 5V DC level, max 10 mA DC

Power supply	8 to 36 V DC
Analog output refreshment	320 ms
Current consumption	max 300 mA (100 mA at 24 V)
RS232 interface	TTL, firmware upgrade via AT-link.
Storage temperature	-40 °C to +80 °C
Operating temperature	- 30 °C to + 70 °C
Heat radiation	2.5 W

back to Extension modules

IS-AIN8

IS-AIN8 is input extension module equipped with 8 analog inputs which can be configured to:

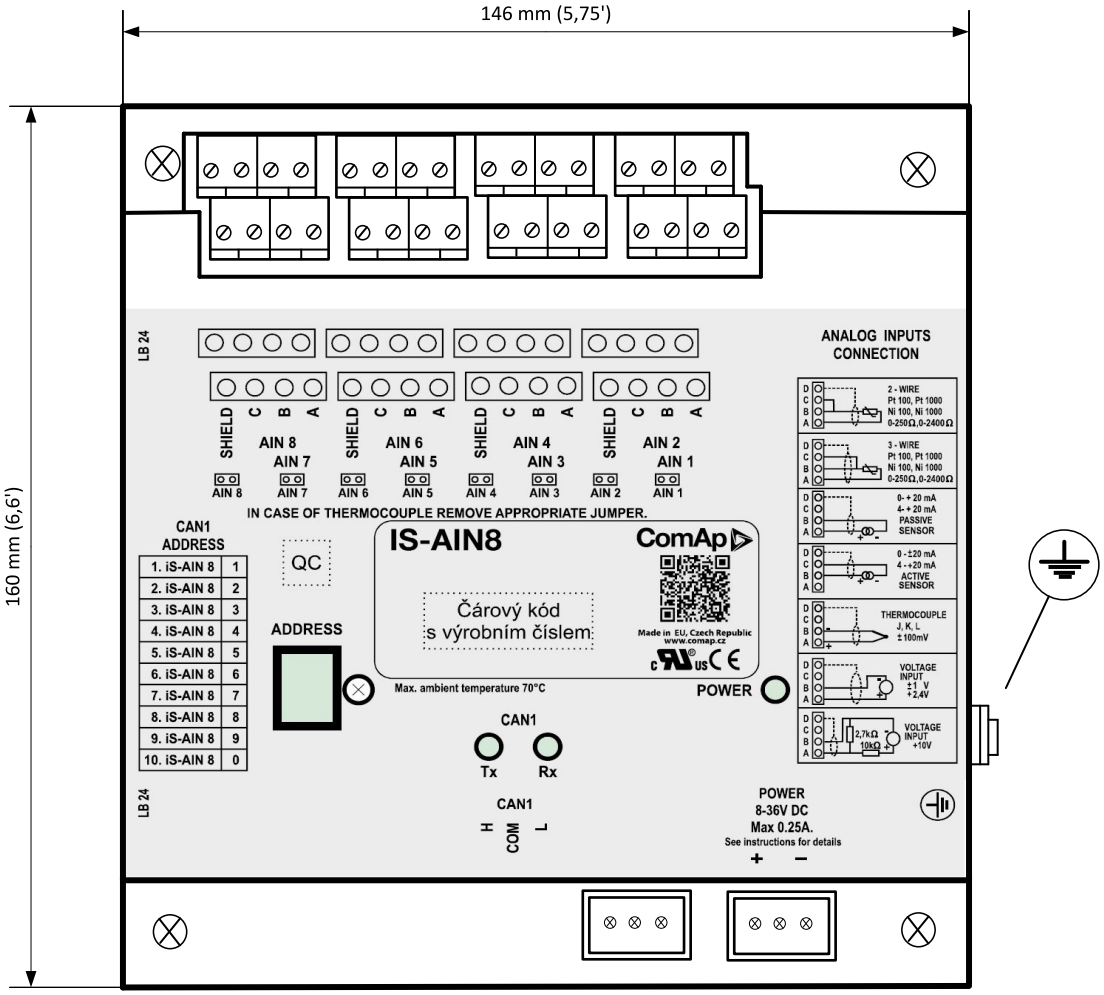
- Resistor two wire input
- Resistor three wire input

- Current input
- Thermocouple input
- Voltage input

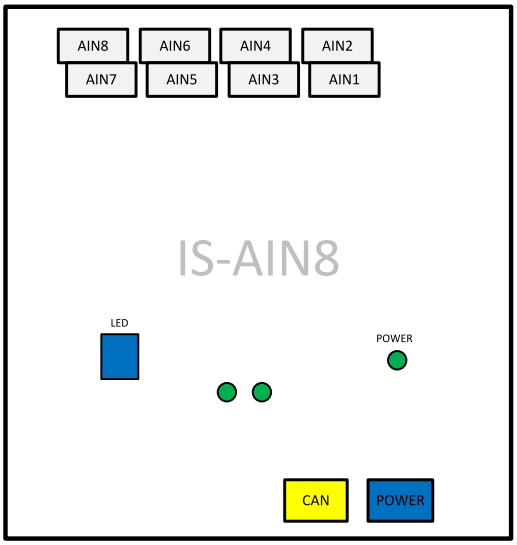
All inputs can be configured to any logical function or protection. It is possible to connect up to 10 IS-AIN external units to one controller. IS-AIN8 is connected to controller **CAN1A** bus.

This module is compatible with MTU ECU-7 at communication speed 125 kbps when uploaded with firmware 1.2.0 and higher.

The detection of communication speed is indicated by fast flashing of status LED. Once the speed is detected the module remains set for the speed even when the communication is lost. Renewal of communication speed detection is done by reset of the module.


146 mm (5,75')
160 mm (6,6')
LB 24
ANALOG INPUTS CONNECTION
SHIELD C B A
AIN 8 AIN 7
AIN 6 AIN 5
AIN 4 AIN 3
AIN 2 AIN 1
IN CASE OF THERMOCOUPLE REMOVE APPROPRIATE JUMPER.
CAN1 ADDRESS
1. iS-AIN 8 1
2. iS-AIN 8 2
3. iS-AIN 8 3
4. iS-AIN 8 4
5. iS-AIN 8 5
6. iS-AIN 8 6
7. iS-AIN 8 7
8. iS-AIN 8 8
9. iS-AIN 8 9
10. iS-AIN 8 0
QC
ADDRESS
IS-AIN8
ComAp
Čárový kód s výrobním číslem
Made in EU, Czech Republic
www.comap.cz
Max. ambient temperature 70°C
POWER
CAN1
Tx Rx
CAN1
H COM L
POWER
8-36V DC
Max 0.25A.
See instructions for details
+ –
2 - WIRE Pt 100, Pt 1000 Ni 100, Ni 1000 0-250Ω,0-2400Ω
3 - WIRE Pt 100, Pt 1000 Ni 100, Ni 1000 0-250Ω,0-2400Ω
0- + 20 mA 4- + 20 mA PASSIVE SENSOR
0 - ±20 mA 4 - +20 mA ACTIVE SENSOR
THERMOCOUPLE J, K, L ± 100mV
VOLTAGE INPUT ±1 V ±2.4V
VOLTAGE INPUT ±10V
2,7kΩ
10kΩ

Terminals


AIN8
AIN7
AIN6
AIN5
AIN4
AIN3
AIN2
AIN1
IS-AIN8
LED
POWER
CAN
POWER

AIN1 – AIN8	8 analog inputs
CAN	CAN1 line
POWER	Power supply
POWER	State indication
Rx, Tx	Data transmitted and received on CAN1 line
LDD	CAN1 adress

Supported sensors

Sensors				
PT100 [°C] (fix)	PT100 [°F] (fix)	+-1V	4-20mA passive	0-250 ohm
PT1000 [°C] (fix)	PT1000 [°F] (fix)	0-2.4V	4-20mA active	0-2400 ohm
NI100 [°C] (fix)	NI100 [°F] (fix)	0-5V	0-20mA passive	0-10k ohm
NI1000 [°C] (fix)	NI1000 [°F] (fix)	0-10V	+-20mA active	

Note: *It is also possible to use User Curves as sensor.*

TC Sensors	
Thermocpl J [°C] (fix)	Thermocpl (nc) J [°C] (fix)
Thermocpl K [°C] (fix)	Thermocpl (nc) K [°C] (fix)
Thermocpl L [°C] (fix)	Thermocpl (nc) L [°C] (fix)
Thermocpl J [°F] (fix)	Thermocpl (nc) J [°F] (fix)
Thermocpl K [°F] (fix)	Thermocpl (nc) K [°F] (fix)
Thermocpl L [°F] (fix)	Thermocpl (nc) L [°F] (fix)

Note: *"nc" means" not cold junction compensation (by external sensor).In this case is used internal temperature sensor on the PCB*

CAN Address

CAN 1 address is set by following procedure:

1. Press Address button during IS-AIN8 power supply on to switch to addressing mode.
2. Then repeatedly press or keep pressed address button to adjust required address according to controller configuration.
3. After setting requested address, release the buttons and wait until the digits blink – it indicates writing of the change address to EEPROM memory.

	CAN 1 Address
1. IS-AIN8	1
2. IS-AIN8	2
3. IS-AIN8	3
4. IS-AIN8	4
5. IS-AIN8	5

6. IS-AIN8	6
7. IS-AIN8	7
8. IS-AIN8	8
9. IS-AIN8	9
10. IS-AIN8	0

Table 22.4 Table of recommended CAN1 address setting

SW version check

Let suppose IS-AIN8 of SW version 1.4. Shortly press address button. Following sequence appears on the display: number “1”, one second pause, number “4”, two second pause, number “1”, one second pause, number “4”, two second pause and finally IS-AIN8 actual address. Error message (e.g. SD BOUT2) appears on Controller screen when Binary input or output Address x is configured but corresponding unit is not recognized (no message is received from CAN bus). Check IS configuration and corresponding external IS-AIN8, IS-BIN8/16 unit address setting.

LED indication

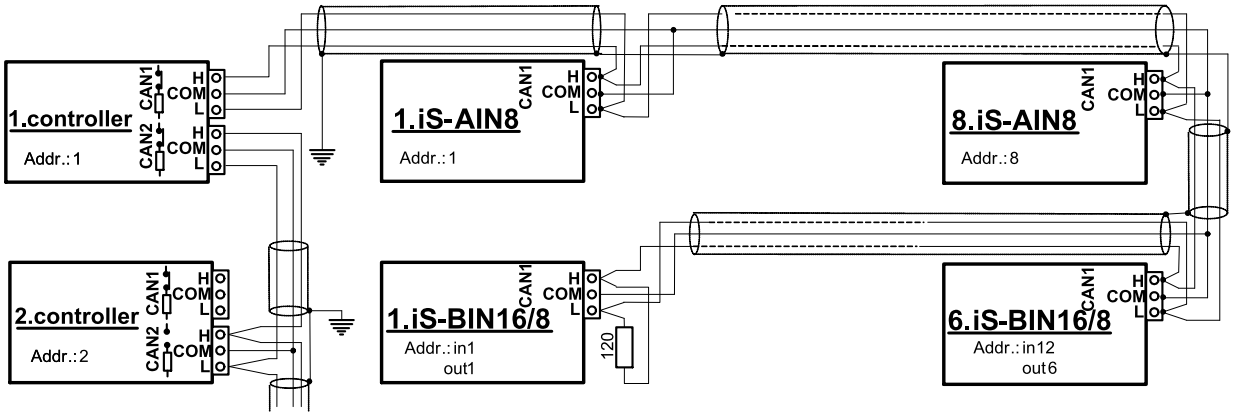
Power LED		Address LDD	
Lighting	Blink	Lighting	Blink
Power supply and CAN address are with no problems	CAN1 address is adjusted different in IS-AIN8 and in controller	Displaying current CAN1 address	Displaying current SW version

Table 22.5 LED / LDD status

Tx		Rx	
Lighting	Blink	Lighting	Blink
Any data are transmitted on the CAN1 line	Data are transmitted on the CAN1 line	Any data are received on the CAN1 line	Data are received on the CAN1 line

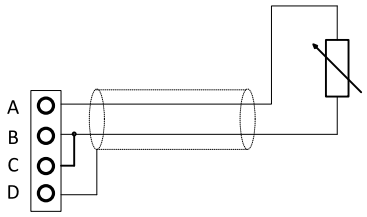
Table 22.6 Tx/Rx LED status

Wiring

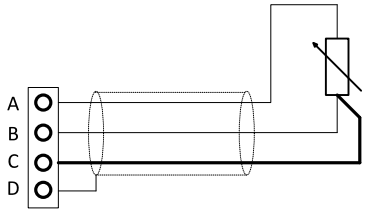


Note: *CAN bus line has to be terminated by 120 Ω resistors on the both ends.*
For longer distances is recommended to connect CAN COM terminals between all controllers and cable shielding to the ***ground in one point!****External units can be connected on the CAN bus line in any order, but line arrangement (no tails no star) is necessary.*
Recommended CAN bus data cables see in Chapter Technical data.
IG-MU and IG-IB units are connected to CONTROLLER CAN2 bus.

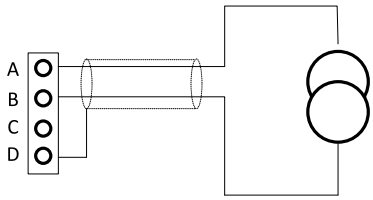
Select sensor characteristic from the list or define user sensor characteristic in PC configuration tool.



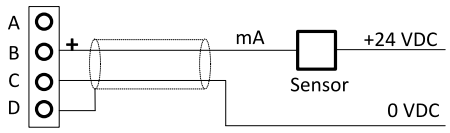
- Resistor sensor input – two wire connection.
- Range 0 to 2400 Ω.
- Pt100, Pt1000, Ni100, Ni1000
- D terminal is shielding



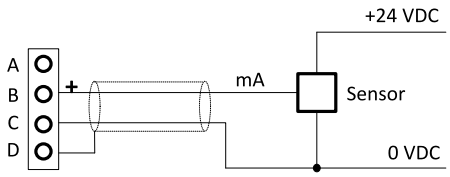
- Resistor sensor input – three wire connection.
- Range 0 to 2400 Ω.
- Pt100, Pt1000, Ni100, Ni1000 – recomended.
- D terminal is shielding



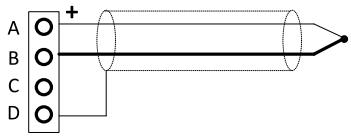
- Passive current sensor (current source is in IS-AIN8)
- Range 0 to +20 mA or 4 to + 0 mA
- D terminal is shielding



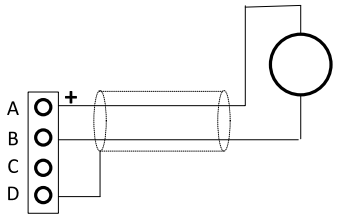
- Active current sensor (current source is in sensor)
- Range –20mA to +20 mA or 4 to +20 mA



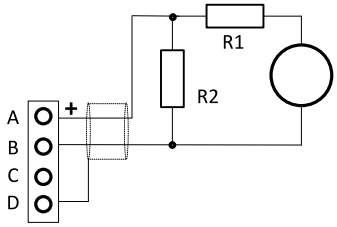
- D terminal is shielding



- Thermocouple J, K, L D terminal is shielding
- From IS-AIN8 hardware version 5.1 can be B terminal grounded to frame

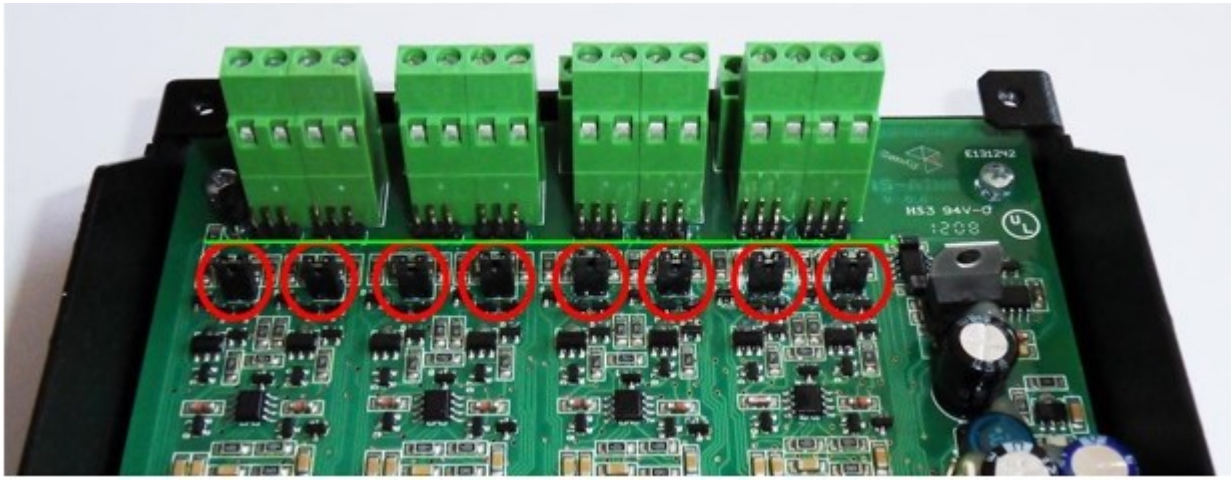


- Voltage input
- Range 0 to + 2500 mV.
- Voltage range is 0 to ±1000 mV.
- D terminal is shielding



- For 10 V input voltage range connects external resistors R1, R2 and select sensor characteristic 10 V
- R1=10 kΩ, R2=2.7 kΩ.
- D terminal is shielding

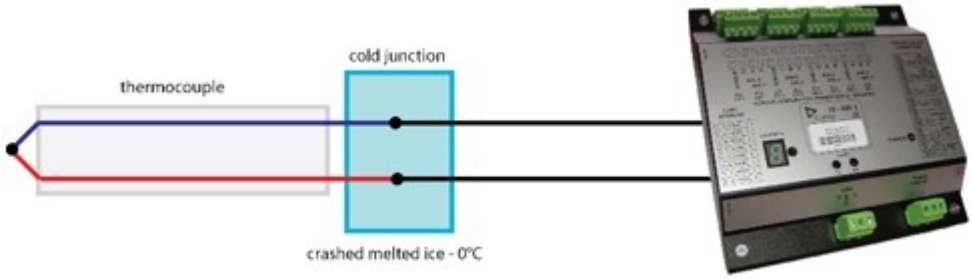
Note: *If the thermocouples are connected to IS-AIN8, appropriate jumpers must be removed (see rear sticker). (jumpers are placed under the cover)*



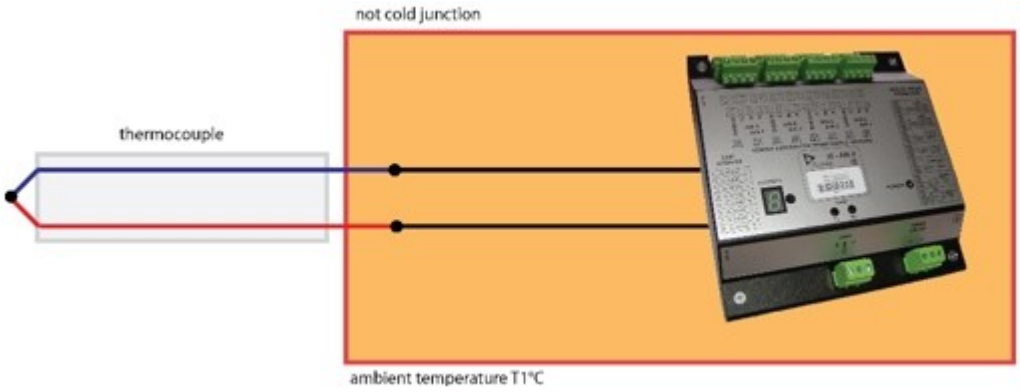
Cold Junction Compensation (CJC)

Cold junction compensation is also called reference junction compensation. When measuring temperature using thermocouples, the reference terminal may not be held at 0°C, but at the surrounding temperature of T1°C instead. Without any compensation, the thermocouple output will be changed (reduced) by T1°C. This is compensated by adding potential difference to the IS-AIN8 corresponding to T1°C.

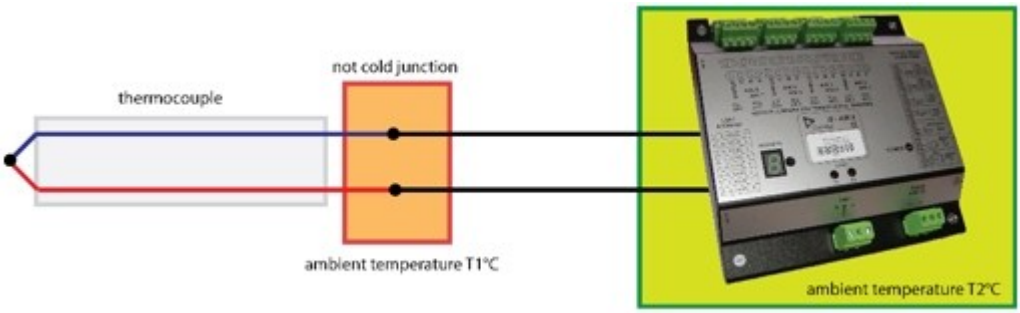
1



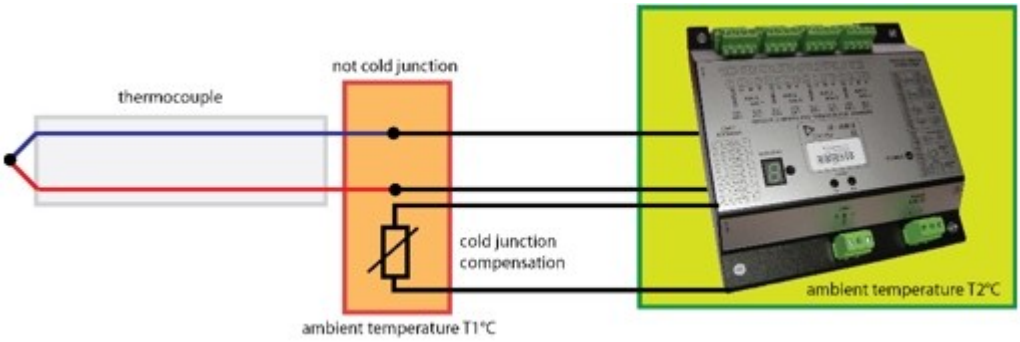
2



3



4

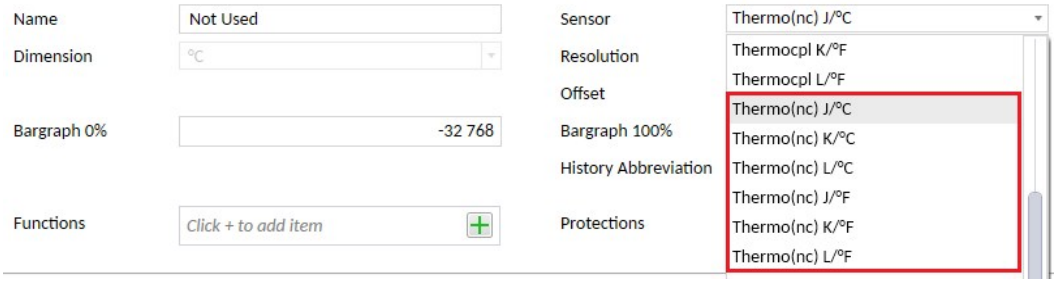


- **Example 1** shows the correct temperature measurement. The 3rd metal (the cable between IS-AIN8 and thermocouple) is connected in cold bath which temperature is 0°C. This is very difficult to provide in real application.
- **Example 2** shows the correct temperature measurement. The 3rd metal (the cable between IS-AIN8 and thermocouple) is connected in ambient environment which temperature is not 0°C, but T1°C. Resultant temperature is correct, because is compensated by internal IS-AIN8 temperature sensor. The temperature of IS-AIN8 and junction is the same T-T1+T1 (reduced and compensated by T1).

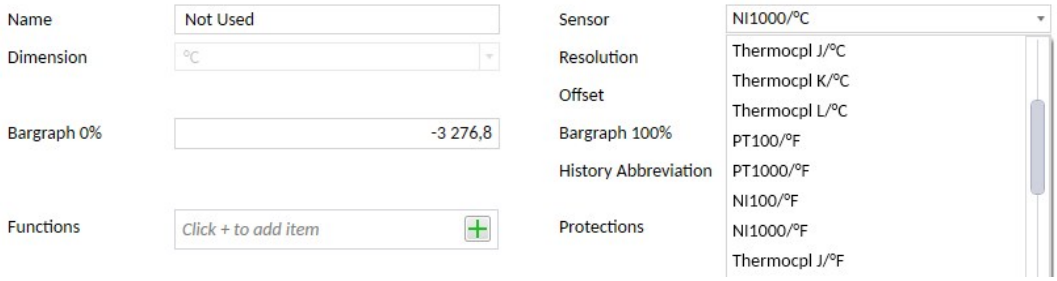
- **Example 3** shows the incorrect temperature measurement. The 3rd metal (the cable between IS-AIN8 and thermocouple) is connected in ambient environment which temperature is not 0°C, but T1°C. Resultant temperature is T-T1 (reduced by T1). Internal IS-AIN8 compensation should not by used because measures T2 temperature, not T1!
- **Example 4** shows the correct temperature measurement. The 3rd metal (the cable between IS-AIN8 and thermocouple) is connected in ambient environment which temperature is not 0°C, but T1°C. Resultant temperature is correct, because is compensated by external temperature sensor, T+T1 (reduced and compensated by T1).

Cold Junction Compensation (CJC) settings

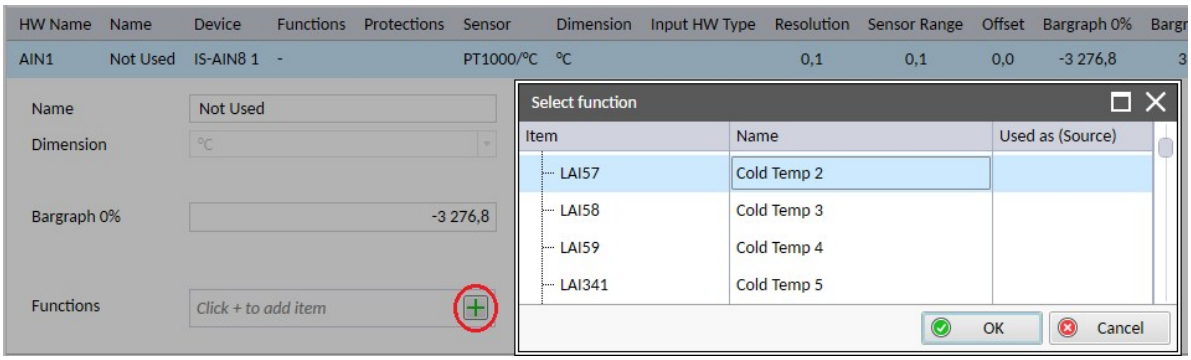
- **Example 1** is not a practical in regard of ice bath. In this case should any of not compensated (nc) sensors for analog input be selected base on used thermocouple.



- **Example 2** is a standard wiring between thermocouple sensor and IS-AIN8. IS-AIN8 is placed in the same ambient temperature as thermocouple terminal; it means IS-AIN8's internal temperature sensor measures the same temperature as is on thermocouple terminal. In this case, could junction compensation is done by IS-AIN8 itself. Any of standard (compensated) sensors should be selected.



- **Example 3** is a standard wiring between thermocouple sensor and IS-AIN8. Regardless selected type of sensor the resultant temperature will be incorrect
  - Not compensated sensor – temperature T1 is not calculated
  - Compensated sensor – IS-AIN8 measures different T2 temperature, not T1
- **Example 4** External temperature T1sensor is included. Resultant temperature is correct if
  - Any of **not compensated sensors** (nc) is selected
  - External sensor **has a function Cold Temp 1**



Note: *LAI (logical analog input) Cold Temp 1 compensates every of 8 thermocouples inputs of IS-AIN8 on address 1IS-AIN8 on address 2 – 10 is not compensated by this LAI Cold Temp1.*

- *Any of non thermocouple configured input is not compensated anyway*
- *Any of non thermocouple input with sensor adjusted as compensated is not compensated by external compensation (IS-AIN8 compensates it itself)*
- *IS-AIN8 on address 2 – 10 is not compensated by this LAI Cold Temp1.*

LAI Cold Temp 2 compensates every of 8 thermocouples inputs of IS-AIN8 on address 2, etc.
Up to 32 (Cold Temp 1-4 times 8 analog input of IS-AIN8) may by compensated by external sensor.
Even only one external sensor may be configured for more than one LAI Cold Temp.

Technical data

Dimension (W × H × D)	146 × 160 × 46 mm (5.79’ × 6.6’ × 1.83’)
Interface to Controler	CAN1
Analog inputs	8, galvanic separated from power supply, 16 bit *
Power supply	8 to 36 V DC
Current consumption	250 mA at 24 V
Protection front panel	IP20
Humidity	95% without condensation
Storage temperature	-40 °C to +80 °C
Operating temperature	- 30 °C to + 70 °C
Heat radiation	2 W

* each analog input can be software configured to:				
		Measuring range		Accuracy
		From	To	
Resistance		0 Ω	2400 Ω	± 0.5 %
		0 Ω	250 Ω	± 1.0 %
Current	Passive	0/4 mA	20 mA	± 0.5 %
	Active	4 mA	20 mA	± 0.5 %
	Active	0 mA	± 20 mA	± 0.5 %
Voltage	Thermocouples J, K, L type			± 0.2 %
		0 mV	100 mV	± 0.2 %
		- 1000 mV	+ 1000 mV	± 0.5 %
		0 mA	2500 mV	± 0.5 %

Standard conformity	
Low Voltage Directive	EN 61010-1:95 +A1:97
Electromagnetic Compatibility	EN 50081-1:94, EN 50081-2:96 EN 50082-1:99, EN 50082-2:97

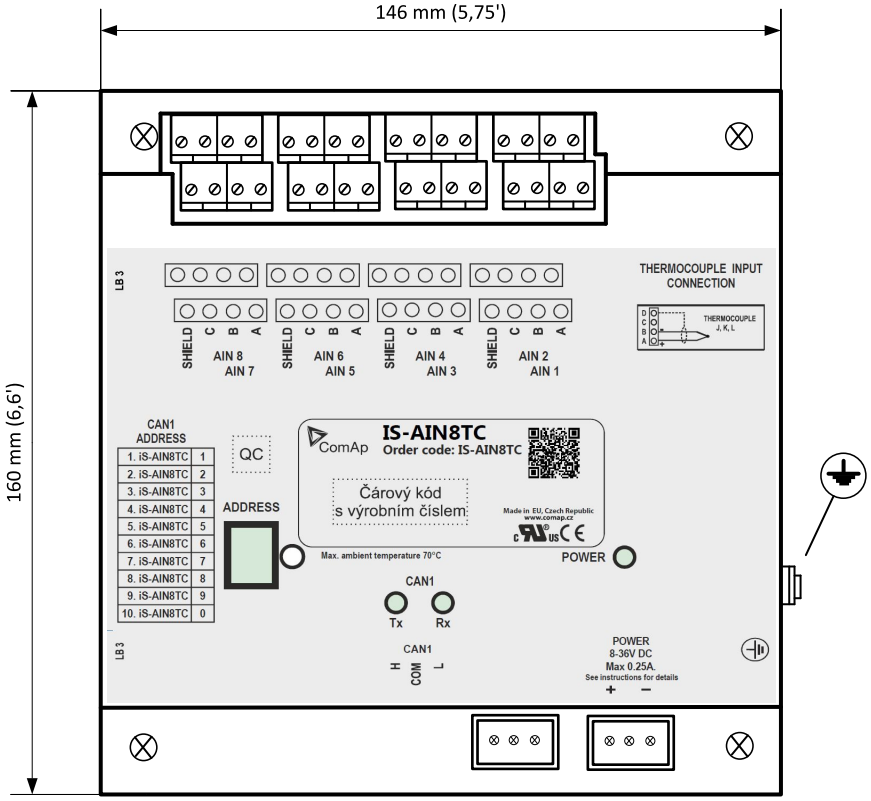
back to Extension modules

IS-AIN8TC

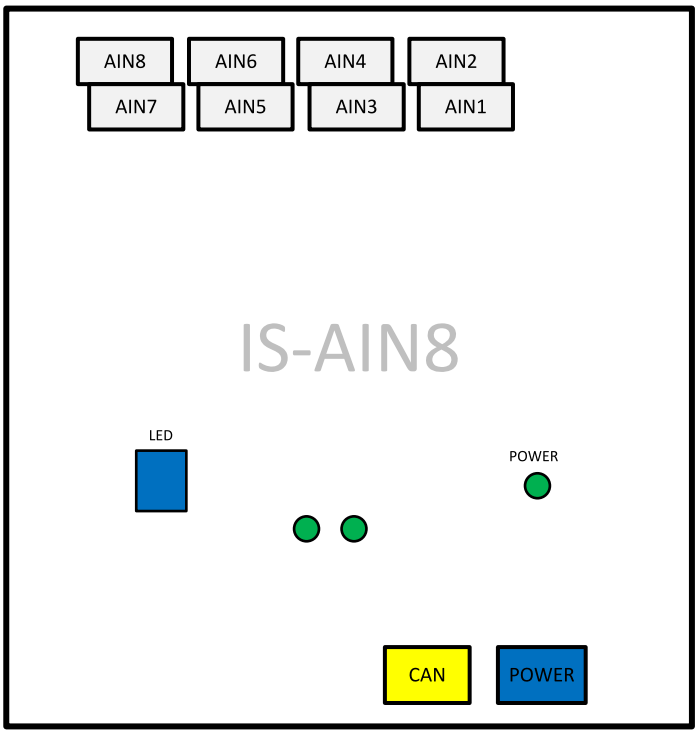
IS-AIN8 is input extension module equipped with 8 analog inputs dedicated for thermocouple sensors only.

All inputs can be configured to any logical function or protection. It is possible to connect up to 10 IS-AIN8TC external units to one controller. IS-AIN8TC is connected to controller **CAN1A** bus.

The detection of communication speed is indicated by fast flashing of status LED. Once the speed is detected the module remains set for the speed even when the communication is lost. Renewal of communication speed detection is done by reset of the module.


146 mm (5,75')
160 mm (6,6')
LB 3
THERMOCOUPLE INPUT CONNECTION
THERMOCOUPLE J, K, L
SHIELD C B A
AIN 8 AIN 7
AIN 6 AIN 5
AIN 4 AIN 3
AIN 2 AIN 1
CAN1 ADDRESS
1. iS-AIN8TC 1
2. iS-AIN8TC 2
3. iS-AIN8TC 3
4. iS-AIN8TC 4
5. iS-AIN8TC 5
6. iS-AIN8TC 6
7. iS-AIN8TC 7
8. iS-AIN8TC 8
9. iS-AIN8TC 9
10. iS-AIN8TC 0
QC
ADDRESS
ComAp
IS-AIN8TC
Order code: IS-AIN8TC
Čárový kód s výrobním číslem
Made in EU, Czech Republic
www.comap.cz
Max. ambient temperature 70°C
POWER
CAN1
Tx Rx
CAN1
H COM L
POWER
8-36V DC
Max 0.25A.
See instructions for details
+ −

Terminals



AIN1 – AIN8	8 analog inputs
CAN	CAN1 line
POWER	Power supply
POWER	State indication
Rx, Tx	Data transmitted and received on CAN1 line
LDD	CAN1 address

Supported sensors

Sensors	
Thermocpl J [°C] (fix)	Thermocpl (nc) J [°C] (fix)
Thermocpl K [°C] (fix)	Thermocpl (nc) K [°C] (fix)
Thermocpl L [°C] (fix)	Thermocpl (nc) L [°C] (fix)
Thermocpl J [°F] (fix)	Thermocpl (nc) J [°F] (fix)
Thermocpl K [°F] (fix)	Thermocpl (nc) K [°F] (fix)
Thermocpl L [°F] (fix)	Thermocpl (nc) L [°F] (fix)

Note: *“nc” means“ not cold junction compensation (by external sensor).In this case is used internal temperature sensor on the PCB*

CAN Address

CAN1 address is set by following procedure:

1. Press Address button during IS-AIN8TC power supply on to switch to addressing mode.
2. Then repeatedly press or keep pressed address button to adjust required address according to controller configuration.
3. After setting requested address, release the buttons and wait until the digits blink – it indicates writing of the change address to EEPROM memory.

	CAN11 Address
1. IS-AIN8TC	1
2. IS-AIN8TC	2
3. IS-AIN8TC	3
4. IS-AIN8TC	4
5. IS-AIN8TC	5
6. IS-AIN8TC	6
7. IS-AIN8TC	7
8. IS-AIN8TC	8
9. IS-AIN8TC	9
10. IS-AIN8TC	0

Table 22.7 Table of recommended CAN1 address setting

SW version check

Shortly press address button. Following sequence appears on the display: number “1”, one second pause, number “4”, two second pause, number “1”, one second pause, number “4”, two second pause and finally IS-AIN8TC actual address.

Error message (e.g. SD BOUT2) appears on Controller screen when Binary input or output Address x is configured but corresponding unit is not recognized (no message is received from CAN bus). Check IS configuration and corresponding external IS-AIN8TC, IS-BIN8/16 unit address setting.

LED indication

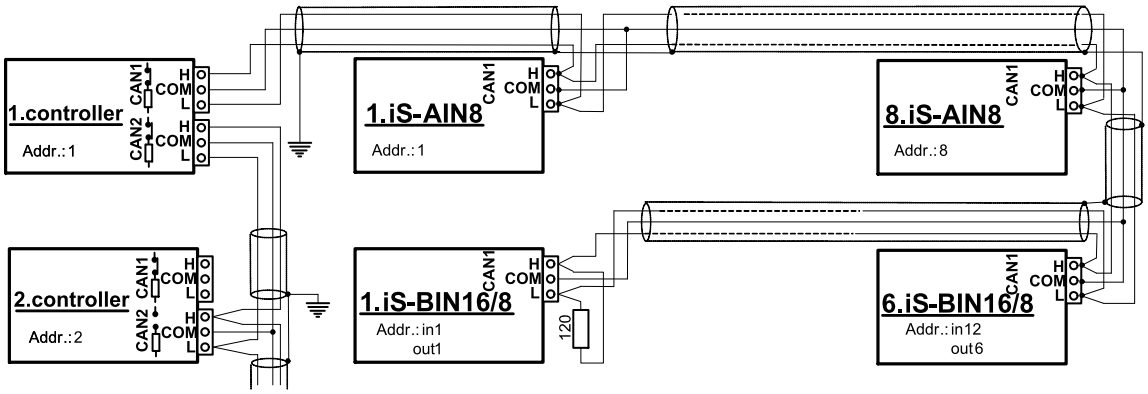
Power LED		Address LDD	
Lighting	Blink	Lighting	Blink
Power supply and CAN address are with no problems	CAN1 address is adjusted different in IS-AIN8TC and in controller	Displaying current CAN1 address	Displaying current SW version

Table 22.8 LED/LDD status

Tx		Rx	
Dark	Blink	Dark	Blink
Any data are transmitted on the CAN1 line	Data are transmitted on the CAN1 line	Any data are received on the CAN1 line	Data are received on the CAN1 line

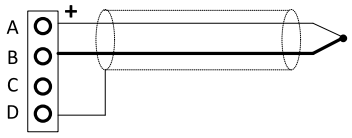
Table 22.9 Tx/Rx LED status

Wiring



Note: *CAN bus line has to be terminated by 120 ohm resistors on the both ends.*
For longer distances is recommended to connect CAN COM terminals between all controllers and cable shielding to the ***ground in one point!***
External units can be connected on the CAN bus line in any order, but line arrangement (no tails no star) is necessary.
Recommended CAN bus data cables see in Chapter Technical data.
IG-MU and IG-IB units are connected to CONTROLLER CAN2 bus.

Select sensor characteristic from the list or define user sensor characteristic in PC configuration tool.

	Thermocouple J, K, L, D terminal is shielding

Cold Junction Compensation (CJC) settings

Please have a look at **Cold Junction Compensation (CJC)** IS-AIN8 chapter.

Technical data

Dimension (W × H × D)	110 × 110 × 46 mm (4.3” × 4.3” × 1.8”)
Weight	237.5 grams
Interface to controller	CAN1

Analog inputs (not electric separated)	8, no galvanic separated
Measuring	±100 mV
Accuracy	± 0.1 % of actual value + ± 100 µV (± 3 °C)

Internal sensor for measuring cold junction - Accuracy	±1 °C in temperature range -20 °C ÷ +70 °C
Galvanic separation	CANbus is galvanic separated from the measurement and power supply. All analog inputs are galvanic separated from power supply. Analog inputs are not galvanic separated between channels

Power supply	8 to 36 V DC
Protection	IP20
Current consumption	35 mA at 24 V ÷ 100 mA at 8 V
Storage temperature	-40 °C to +80 °C
Operating temperature	- 30 °C to + 70 °C
Heat radiation	2 W

back to Extension modules

IS-BIN16/8

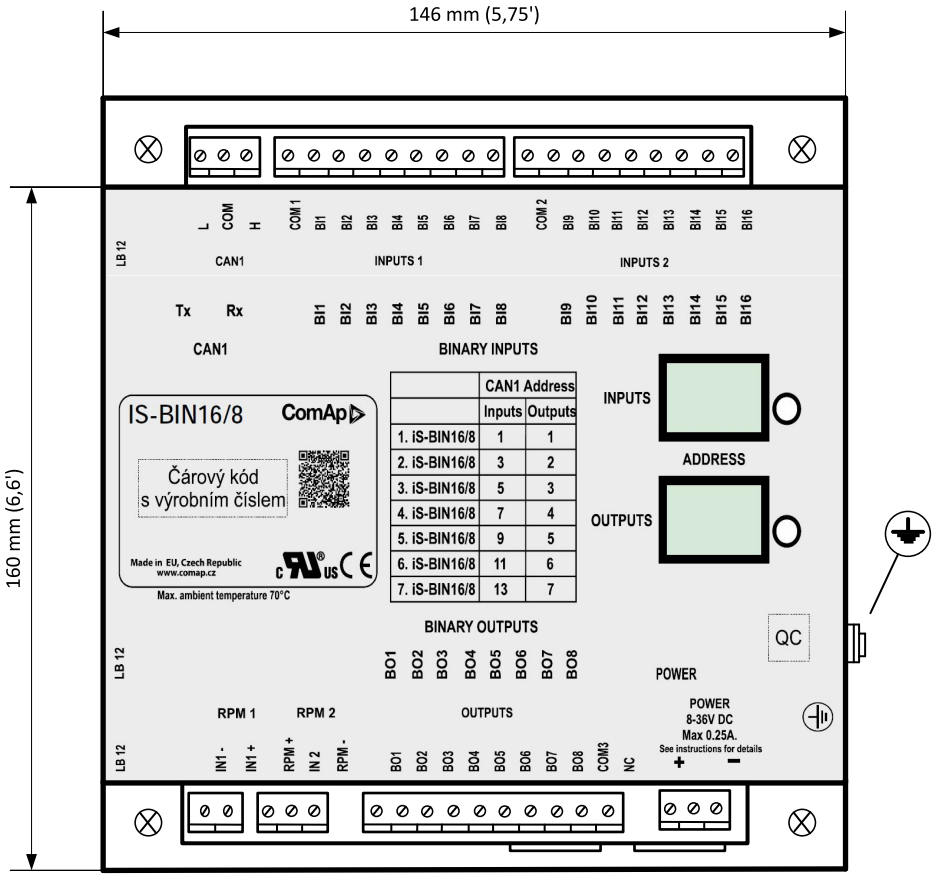
IS-BIN16/8 is an extension module with 16 binary inputs (galvanic separated) and 8 binary output (galvanic separated), 2 pulse inputs (frequency measurement or pulse counting). All I/O can be configured to any logical function or protection. It is possible to connect up to 7 IS-BIN16/8 external units to one controller. External modules IS-BIN16/8 is connected to controller **CAN1A** bus. To operate external modules:

- Connect all external modules to CAN1 bus line
- On each module adjust I/O CAN1 address in the range of 1 to 7 for IS-BIN16/8 output, 1,3,5,7,9,11,13 for IS-BIN18/8 inputs
- In case of use generic module in configuration you can set CAN address from 1 – 12
- In case of set 0 CAN address - inputs/ outputs are deactivated
- Input output address is displayed on the front panel LCD's
- Use PC configuration tool to configure controller according external modules setting

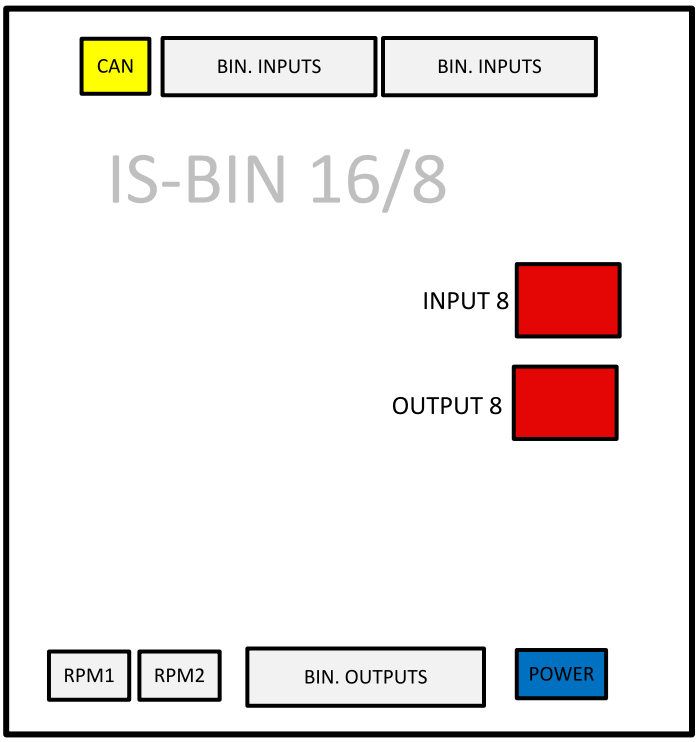
IS-BIN16/8 module has two separate CAN1 addresses for binary inputs Group 1, Group 2 and binary output Group (total three addresses). The CAN1 address for BI Group 1 and for BO Group 2 can be adjusted on the IS-BIN16/8. The address for BI Group 2 is set automatically to the address following BI Group 1.

Note: *CAN address 0 disables corresponding CAN message (Group data are not send).*

Tx
Rx
CAN1
BINARY INPUTS
CAN1 Address
Inputs
Outputs
1. IS-BIN16/8 1 1
2. IS-BIN16/8 3 2
3. IS-BIN16/8 5 3
4. IS-BIN16/8 7 4
5. IS-BIN16/8 9 5
6. IS-BIN16/8 11 6
7. IS-BIN16/8 13 7
INPUTS
ADDRESS
OUTPUTS
ComAp IS-BIN16/8
Max. ambient temperature 70°C
BINARY OUTPUTS
POWER
RPM 1
RPM 2
OUTPUTS


146 mm (5,75')
160 mm (6,6')
LB 12
L
COM
H
COM 1
BI1
BI2
BI3
BI4
BI5
BI6
BI7
BI8
COM 2
BI9
BI10
BI11
BI12
BI13
BI14
BI15
BI16
CAN1
INPUTS 1
INPUTS 2
Tx
Rx
BINARY INPUTS
CAN1 Address
Inputs
Outputs
1. iS-BIN16/8 1 1
2. iS-BIN16/8 3 2
3. iS-BIN16/8 5 3
4. iS-BIN16/8 7 4
5. iS-BIN16/8 9 5
6. iS-BIN16/8 11 6
7. iS-BIN16/8 13 7
INPUTS
ADDRESS
OUTPUTS
IS-BIN16/8
ComAp
Čárový kód
s výrobním číslem
Made in EU, Czech Republic
www.comap.cz
Max. ambient temperature 70°C
BINARY OUTPUTS
BO1
BO2
BO3
BO4
BO5
BO6
BO7
BO8
QC
POWER
RPM 1
RPM 2
OUTPUTS
IN1 -
IN1 +
RPM +
IN 2
RPM -
COM3
NC
POWER
8-36V DC
Max 0.25A.
See instructions for details
+
−

Terminals



CAN	CAN1 line
BINARY INPUTS	16 binary inputs
BINARY OUTPUT	8 binary output
RPM1, RPM2	2 frequency inputs
POWER	Power supply
INPUTS	LDD CAN address
OUTPUT	LDD CAN address

CAN Address

CAN 1 address is setting by following procedure:

- Press Address buttons (for INPUTS address and OUTPUT address) during IS-BIN8 power supply on to switch to addressing mode.
- Then repeatedly press or keep pressed address button to adjust required address according to CONTROLLER configuration.
- After setting requested address, release the buttons and wait until the digits blink – it indicates write the changed address to EEPROM memory.

	CAN 1 Address	
	Inputs	Output
1. IS-BIN16/8	1	1
2. IS-BIN16/8	3	2
3. IS-BIN16/8	5	3

4. IS-BIN16/8	7	4
5. IS-BIN16/8	9	5
6. IS-BIN16/8	11	6
7. IS-BIN16/8	16	7

Table 22.10 Table of recommended CAN1 address setting

SW version check

Let suppose IS-AIN8 of SW version 1.4. Shortly press address button. Following sequence appears on the display: number “1”, one second pause, number “4”, two second pause, number “1”, one second pause, number “4”, two second pause and finally IS-AIN8 actual address.

Error message (e.g. SD BOUT2) appears on Controller screen when Binary input or output Address x is configured but corresponding unit is not recognized (no message is received from CAN bus). Check IS configuration and corresponding external IS-AIN, IS-BIN unit address setting.

LED indication

Tx			Rx		
Dark	Blink	Light	Dark	Blink	Light
Any data are transmitted on the CAN1 line	Data are transmitted on the CAN1 line		Any data are received on the CAN1 line	Data are received on the CAN1 line	

Table 22.11 Tx / Rx LED status

Wiring

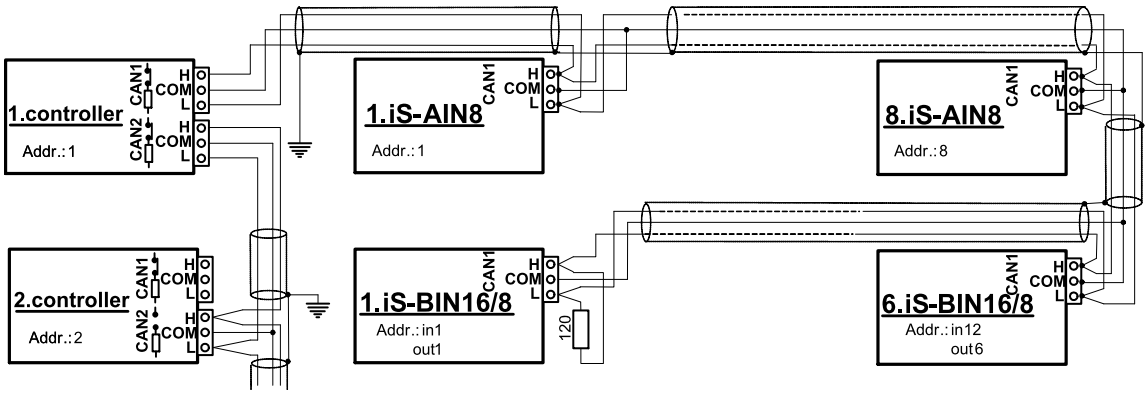


Image 22.114 CAN bus line has to be terminated by 120 ohm resistors on the both ends.

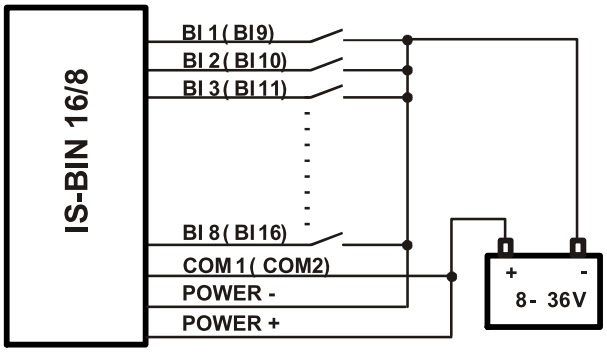
Note: *CAN bus line has to be terminated by 120 ohm resistors on the both ends.*
For longer distances is recommended to connect CAN COM terminals between all controllers and cable shielding to the ***ground in one point!***
Recommended CAN bus data cables see in Chapter Technical data.
External units can be connected on the CAN bus line in any order, but line arrangement (no tails no star) is necessary-
Recommended CAN bus data cables see in Chapter Technical data.

Binary inputs

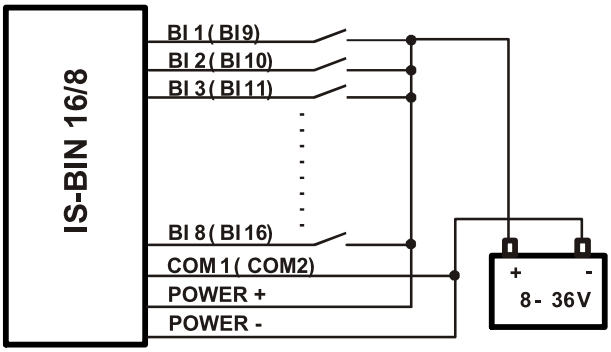
There are two groups of eight Binary inputs BI1 to BI8 and BI9 to BI16. Each group has a separate Common terminal COM1 and COM2. The Common terminal can be connected to positive or negative pole – see following drawing. Binary inputs are galvanically separated from IS-BIN16/8 power supply.

Note: *See the **Theory of binary inputs and outputs** (Pull Up,Pull Down, High side switch, Low side switch).*

Binary inputs Common terminal is connected to **positive** supply terminal, Binary inputs contacts are closed to **negative** supply terminals.



Binary inputs common terminal is connected to **negative** supply terminal, Binary inputs contacts are closed to **positive** supply terminals.



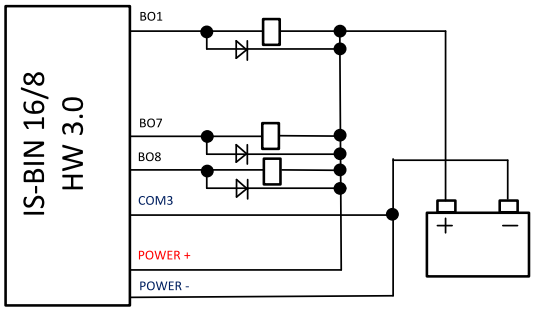
Input voltage range for opened contact is from 8 VDC to Power supply VDC. Input voltage range for closed contact is from 0 to 2 VDC. Voltage level is defined between Binary input and Binary input COM terminal and does not depend on “positive” or “negative” connection.

IMPORTANT: Impulse inputs are not supported by the controller.

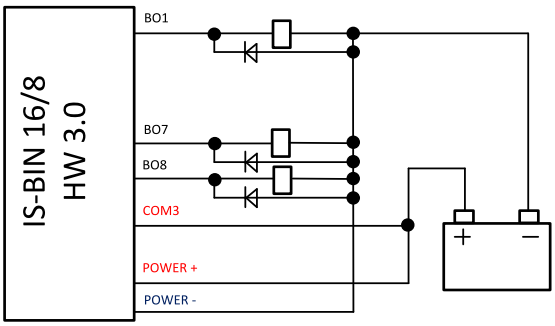
Binary output

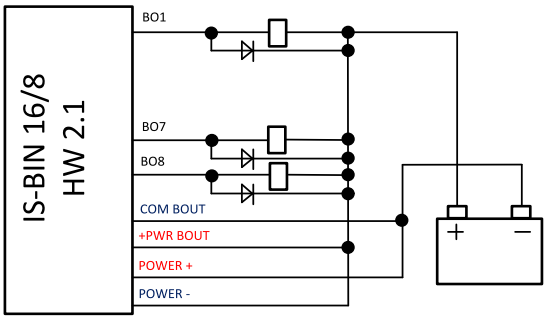
The Common terminal can be connected to positive or negative pole (HW3.0 only) – see following drawing. Binary outputs are galvanic separated from IS-BIN16/8 power supply (have a look at technical data). The maximum load values are 0.5 A / 36V for one output.

Binary output common terminal is connected to **negative** supply terminal, Binary output contacts are closed to **positive** supply terminals.



Binary output common terminal is connected to **positive** supply terminal, Binary output contacts are closed to **negative** supply terminals.





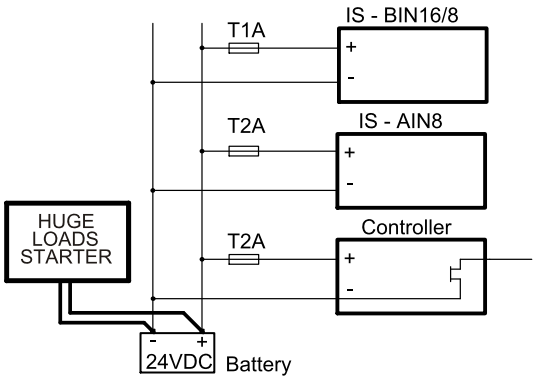
Power supply fusing

A (2) respectively (1) amp fuse should be connected in-line with the power to the controller and modules, these items should never bee connected directly to the starting battery.

Take care for proper controller, extension units and relays power supply fusing. Fuse value and type depends on number of connected devices and wire length.

Controller or unit	Fuse
Controller	T1A or T2A
IS-AIN8	T2A
IS-BIN16/8	T1A

Table 22.12 Recommended fuse (not fast) types



For more extension units use separate fusing according to the table above.

Controller power supply should never be connected to starter terminals.

Technical data

Dimension (W × H × D)	146 × 160 × 46 mm (5.79’ × 6.6’ × 1.83’)
Interface to controller	CAN1

Binary inputs (galvanic separated) ***Voltage level is defined between binary input and binary input COM terminal***	
Number of inputs	8 + 8
Input resistance	3000 Ω

Input voltage range	0-36 VDC
Input voltage level for open contact	8 to Power supply VDC
Input voltage level for close contact	0 to 2 VDC

Frequency inputs* (for IS-CU only)	
RPM1	
Type of sensor	Magnetic pick-up
Minimum input voltage	2 Vpk-pk (from 4 Hz to 4 kHz)
Maximum input voltage	50 Veff
Maximum measured frequency	8 kHz (min. input voltage 6Vpk-pk), frequency mode
RPM2	
Type of sensor	Contact or Active sensor
Minimal pulse width	10 ms, integration mode
Maximum measured frequency	60 Hz, integration mode

Relays outputs *(galvanic separated) only HW 3.0 (non galvanic separated) HW 2.1*	
Number of output	8
Maximum current	0.5A DC
Maximum switching voltage	36 VDC

Power supply	8 to 36 V DC
Protection front panel	IP20
Current consumption	250 mA** at 24 V
Humidity	95% without condensation
Storage temperature	-40 °C to +80 °C
Operating temperature	- 30 °C to + 70 °C
Heat radiation	2 W

Standard conformity	
Number of output	8
Low Voltage Directive	EN 61010-1:95 +A1:97
Electromagnetic Compatibility	EN 50081-1:94, EN 50081-2:96 EN 50082-1:99, EN 50082-2:97

*RPM1, RPM2 are available in IS-CU only

**During powering up current can be up to 1.5A

back to Extension modules