

# InteliNeo 530 BESS

## Controller For Battery Energy Storage System Applications

### SW version 2.1.0

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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 IntelliNeo 530 BESS controller that shall be followed during installation and maintenance of the controllers.

This manual provides general information how to install and operate IntelliNeo 530 BESS 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

**This End User's Guide/Manual** as part of the Documentation is an inseparable part of ComAp's Product and may be used exclusively according to the conditions defined in the "END USER or Distributor LICENSE



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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 its 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	<a href="#">license</a>	Copyright (C) 2020 Amazon.com, Inc. or its affiliates. All Rights Reserved.
FreeRTOS	✓	MIT	<a href="#">license</a>	Copyright (C) Amazon Web Services, Inc. or its affiliates. All rights reserved.
Mbed TLS	✓	Apache 2.0	<a href="#">license</a>	Copyright (C) 2006-2015, ARM Limited, All Rights Reserved
lwIP	✓	BSD 3	<a href="#">license</a>	Copyright (c) 2001-2004 Swedish Institute of Computer Science. All rights reserved.
MD5	–	Free ad-hoc license	<a href="#">license</a>	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	<a href="#">license</a>	Copyright (c) 2016 jwellbelove <a href="http://www.etlcpp.com">www.etlcpp.com</a>
STM32Cube_FW_H7	✓	BSD 3	<a href="#">license</a>	
FatFs	✓	Modify BSD	<a href="#">license</a>	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.



Tiny Mersenne Twister	–	BSD 3	<a href="#">license</a>	Copyright (c) 2011, 2013 Mutsuo Saito, Makoto Matsumoto, Hiroshima University and The University of Tokyo All rights reserved.
USB	✓	SLA0044	<a href="#">license</a>	Copyright (c) 2018 STMicroelectronics International N.V. All rights reserved  THIS SOFTWARE IS PROVIDED BY STMICROELECTRONICS AND CONTRIBUTORS "AS IS" AND ANY EXPRESS, IMPLIED OR STATUTORY WARRANTIES, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE AND NON-INFRINGEMENT OF THIRD PARTY INTELLECTUAL PROPERTY RIGHTS ARE DISCLAIMED TO THE FULLEST EXTENT PERMITTED BY LAW. IN NO EVENT SHALL STMICROELECTRONICS OR CONTRIBUTORS BE LIABLE FOR ANY DIRECT, INDIRECT, INCIDENTAL, SPECIAL, EXEMPLARY, OR CONSEQUENTIAL DAMAGES (INCLUDING, BUT NOT LIMITED TO, PROCUREMENT OF SUBSTITUTE GOODS OR SERVICES; LOSS OF USE, DATA, OR PROFITS; OR BUSINESS INTERRUPTION) HOWEVER CAUSED AND ON ANY THEORY OF LIABILITY, WHETHER IN CONTRACT, STRICT LIABILITY, OR TORT (INCLUDING NEGLIGENCE OR OTHERWISE) ARISING IN ANY WAY OUT OF THE USE OF THIS SOFTWARE, EVEN IF ADVISED OF THE POSSIBILITY OF SUCH DAMAGE.
heatshrink	–	ISC	<a href="#">license</a>	Copyright (c) 2013-2015, Scott Vokes <vokes.s@gmail.com> All rights reserved  Permission to use, copy, modify, and/or distribute this software for any purpose with or without fee is hereby granted, provided that the above copyright notice and this permission notice appear in all copies.
GCC Runtime Library	–	GPL 3	<a href="#">license exception, license</a>	<a href="#">GCC Runtime Library Exception - GNU Project - Free Software Foundation</a>

## 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



**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).

## 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 IntelliConfig performs a compatibility check when the firmware upload menu is opened and displays the compatible software for the connected controller.

**CAUTION:** When using the IntelliConfig functions FW Upgrade / Current Configuration and Bulk/Offline Upgrade, we strongly recommend paying close attention to the report generated by this operation. Due to the nature of firmware upgrades, inconsistencies between the original and new configuration may occur, which can result in a non-functional configuration or, in certain situations, even create hazardous states. Careful review of the logs can prevent this issue.

## 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.

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	Undercurrent	37	Power factor	55
Stopping device	5	Excitation loss	40	Overvoltage	59
Multi-function device	11	Unit sequence starting	44	Pressure switch	63
Speed and frequency matching device	15	Current unbalance	46	Liquid level switch	71
Data communications device	16EFT 16SC	Voltage unbalance	47	Alarm relay *	74
Starting-to-running transition contractor	19	Incomplete sequence relay	48	Vector shift	78
Synchronizing-check	25	Temperature monitoring	49T	Reclosing relay	79
Thermal relay	26	Overcurrent	50/50TD	Overfrequency	81H
Undervoltage	27	Earth fault current	50N+64	Underfrequency	81U
Annunciator	30	Overcurrent IDMT	51	ROCOF	81R
Overload	32	Earth fault current IDMT	51+64	Auto selective control/transfer	83
Load shedding	32P	Voltage restraint time OverCurrent	51V	Regulating device	90
Reverse power	32R	Voltage controlled time Overcurrent	51C		
Master sequence device	34	AC circuit breaker	52		

\* extension module IGL-RA15 required



## 1.7 Certifications and standards

<ul style="list-style-type: none"> <li>&gt; EN 61000-6-2</li> <li>&gt; EN 61000-6-4</li> <li>&gt; EN 61010-1</li> <li>&gt; EN 60255-1</li> <li>&gt; EN 60529 (IP20)</li> </ul>	<ul style="list-style-type: none"> <li>&gt; EN 60068-2-1 (-40 °C/16 h)</li> <li>&gt; EN 60068-2-2 (70 °C/16 h)</li> <li>&gt; EN 60068-2-6 (2÷25 Hz / ±1,6 mm; 25÷100 Hz / 4,0 g)</li> <li>&gt; EN 60068-2-27 (a=500 m/s<sup>2</sup>; T=6 ms)</li> <li>&gt; EN 60068-2-30 (25/55 °C, RH 95%, 48 h)</li> </ul>	<ul style="list-style-type: none"> <li>&gt; UKCA</li> </ul>	
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


























































<b>Supplier's Declaration of Conformity</b> <b>47 CFR § 2.1077 Compliance Information</b>
<b>Unique identifier:</b> INEO530BBAANU
<b>Responsible Party:</b> ComAp LLC 5253 Mainsail Drive Roscoe Roscoe, IL 61073 USA
Tel: +1 815 636 2541 E-mail: <a href="mailto:info.us@comap-control.com">info.us@comap-control.com</a>
<b>FCC Compliance Statement</b> 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
3	2.1.0	15.12.2025	ComAp
2	1.2.0	15.01.2025	ComAp
1	1.0.0	10.11.2023	ComAp



## 1.9 Symbols in this manual

	3 x Phases		Coil		Fuel solenoid		Passive current sensor
	Active current sensor		Connector - female		Fuse		Pick - up
	AirGate		Connector - male		Fuse switch		Relay coil
	Alternating current		Contact		Generator		Relay coil of slow-operating
	Analog modem		Contactor		Generator schematic		Renewables
	Battery		Controller simplified		Grounding		Resistor
	Energy Storage		Module simplified		GSM		Resistor adjustable
	Binary output		Current measuring		GSM modem		Resistive sensor RPTC
	Breaker contact		Current measuring		IG-AVRi		RS 232 male
	Breaker contact		Danger		IG-AVRi TRANS		RS 232 female
	Breaker		Danger - Electric Hazard		Jumper		Shaft Generator
	Breaker		DC to AC Inverter		Load		Starter
	Breaker		Diode		Mains		Switch - manually operated
	Capacitor		Ethernet male		Mains		Transformer
			Ethernet female		Mobile provider		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
<b>BESS</b>	Battery Energy Storage System – device for storing electrical energy in batteries.
<b>CAN</b>	Controller Area Network – communication bus for connecting devices.
<b>Grid Following</b>	Control mode where the device follows the grid voltage and frequency and adjusts accordingly.
<b>Grid Forming</b>	Control mode where the device (e.g., BESS) sets the voltage and frequency in island mode.
<b>InteliConfig</b>	PC tool for configuring and managing ComAp control units.
<b>InteliVision</b>	External display for visualization and control of control units.
<b>Modbus</b>	Communication protocol for data transfer between devices.
<b>PCS</b>	Power Conversion System – device for converting electrical energy between AC and DC.
<b>Precharge</b>	Process of charging the DC bus before connecting the BESS to the load.
<b>Soft Load / Unload</b>	Gradual connection or disconnection of power using ramping.

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## 1.11 Used Abbreviations

Abbreviation	Description
<b>AC</b>	Alternating Current
<b>AOUT</b>	Analog Output
<b>AIN</b>	Analog Input



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



Abbreviation	Description
<b>BMS</b>	Battery module System
<b>BESS</b>	Battery Energy Storage System
<b>ES</b>	Energy Storage
<b>ESCB</b>	Energy Storage Circuit Breaker
<b>SBMB</b>	String Battery Module Breaker

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## 2.1 General description

The IntelINeo 530 BESS is an advanced energy management system for directly integrating the Battery Management System (BMS) with the Power Conversion System (PCS) within a Battery Energy Storage System (BESS) as well as control, monitoring and protection of the auxiliary systems to ensure the highest level of Storage System performance.

### 2.1.1 The key features of IntelINeo 530 BESS

- Grid forming (V/F), grid following (P/Q) and droop (VSG) modes supported
- BMS to PCS integration via Modbus RTU/TCP device list
- Control, monitoring and protection of auxiliary systems within the battery storage system
- Direct AC voltage and current sensing
- DC voltage and current sensing via Modbus or I-DC4/4 module
- AC and DC startup sequence and breaker control
- Compatible load/Var sharing and power management with other ComAp solutions
- Alarm and fault management of all components within the battery storage system
- Event-based history for fast and easy troubleshooting
- Slots for plug-in modules for 4G and GPS, additional Ethernet port, RS232/485 connection or additional binary inputs/outputs
- Secure Modbus TCP interface for higher level external control systems
- Built-in PLC interpreter with the use of ComAp's free PLC Editor
- Remote control and monitoring of your battery storage system with WebSupervisor, our cloud-based fleet management tool
- AirGate 2.0 for easy connection to your equipment remotely, without worrying about your asset's IP address User-defined protections and setpoints on top of default parameters
- Keeping your business and data safe with design to the ISA 62443 level 2 - level 3 security requirements



## 2.2 Getting Started

Congratulations on your new IntelliNeo 530 BESS 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".

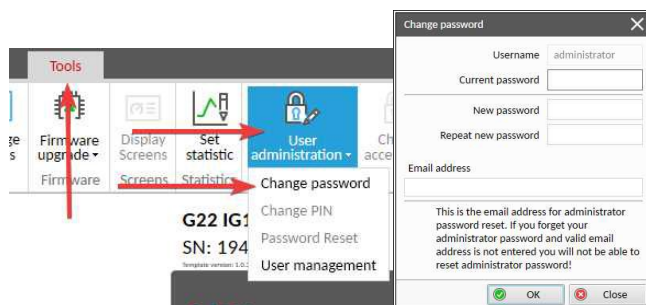
- Username = administrator
- Password = serial number of your controller

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 IntelliVision displays wiring diagram see the chapter **IntelliVision Displays**.
- See more information about using the display in the chapter **Operator Guide (page 1)**.

## 2.3 Measurement methods

The IntelliNeo 530 BESS 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 **Bus Voltage** and **Bus Voltage Relative**.

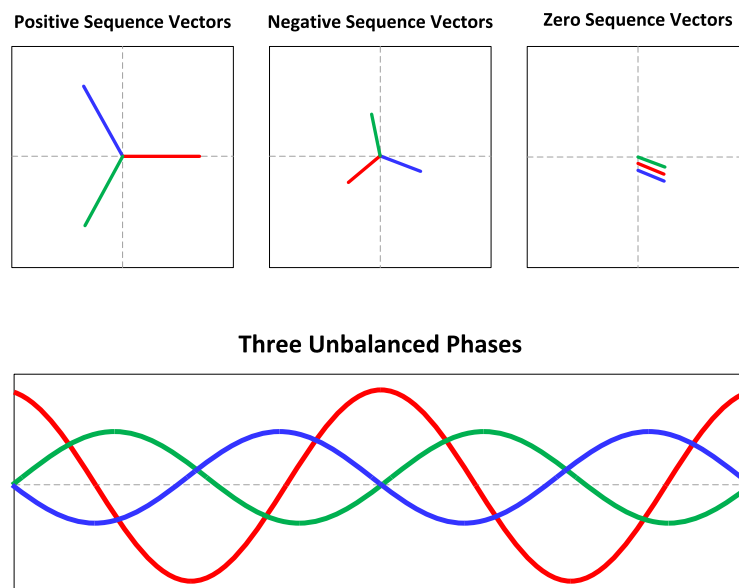
### 2.3.1 True RMS measurement

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](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 IntelliNeo 530 BESS 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 setpoint **Mains/Bus Voltage Input Range**, **BESS Nominal Voltage Ph-N**, **BESS Nominal Voltage Ph-Ph**, **Mains/Bus Nominal Voltage Ph-N**, **Bus Nominal Voltage Ph-Ph**.

#### 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**, **Aux CT Ratio Prim** and **Aux CT Ratio Sec**.

### 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 in the PF/Q Control setpoint group. Using LAI **PF CONTROL: ANEXT BASE PF** can allow the system to work with PF of up to a 0.001 resolution and using setpoint **#System Power Factor** only up to 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**

### 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

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



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

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

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 DC measurement

With IntelliNeo 530 BESS it is possible to measure DC quantities using external module **Inteli DC4/4**. Module measures DC current and DC voltages and converts them into analog signals. IntelliNeo 530 BESS use dedicated LAIs with sensor curve to convert received signals into DC quantities. You can use for DC Measurement on AIN 1 .. AIN 4. Other ways how to obtain DC values are using Modbus, PLC etc., which requires the mapping of dedicated LAIs in controller configuration.

### 2.5.1 DC Voltage Measurement

To measure DC voltage use LAIs **ES VOLTAGE MEAS**, **PCS VOLTAGE MEAS**. You can see measured values in **ES Voltage Meas** and **PCS Voltage Meas**. Terminals for voltage measurement on **Inteli DC4/4** are 18 - 14 for Channel 1 and 9 -13 for Channel 2.

### 2.5.2 DC Current Measurement

To measure DC current you can use **PCS CURRENT MEAS**. Measured values you can see in **PCS Current Meas**. Terminals for current measurement on **Inteli DC4/4** are 18 - 17 for Channel 1 and 9 -10 for Channel 2.

## 2.6 Communication peripherals

IntelliNeo 530 BESS contains 1x Ethernet terminal, 1x 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
<b>CAN1</b>	This terminal is used for connecting of external modules and Electronic Control Units. Connectivity with CAN1 is available for 1939 CAN protocol devices. See the chapters <b>Supported combinations of modules</b> and <b>Multiple ECU</b> for more information.	<b>CAN bus wiring</b>
<b>CAN2</b>	This terminal is used for CAN Intercontroller Communication. .	
<b>RS485</b>	This terminal is used for Modbus RTU communication.(see here for details <b>Modbus-RTU, Modbus/TCP</b> ).	<b>RS485 wiring</b>
<b>USB Type B</b>	This terminal is used for UART communication eg. IntelliConfig, WinScope1000, etc.	<b>Controller configuration and PC tools connection</b>
<b>Ethernet</b>	The Ethernet port is considered as Untrusted interface. It is used for remote communication eg. IntelliConfig, WinScope1000, etc. The user account with password has to be used in order to connect to the controller. It is also used for Modbus-TCP, SMTP, SNMP and Modbus server (see here for details <b>Modbus-RTU, Modbus/TCP</b> ).	<b>Ethernet</b>

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

## 2.7 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.

### 2.7.1 Supported configuration and monitoring tools

- IntelliConfig - 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
- IntelliSCADA - customizable SCADA diagram for monitoring



## 2.7.2 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 J1939 CAN protocol ECU (electronic control unit) or/and Modbus devices (Photovoltaic Inverters, Battery Inverters)
- Changing the language of the controller interface

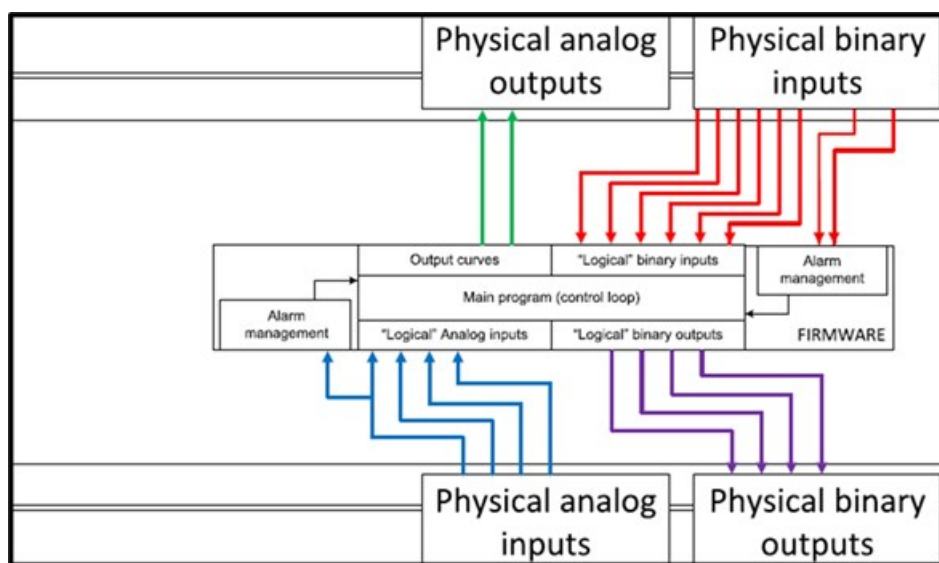


Image 2.1 Principle of inputs and outputs configuration

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 IntelliConfig software. See IntelliConfig 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.



## 2.8 PC tools

### 2.8.1 IntelliConfig

PC Tool for configuration and monitoring of controllers. See more in the [IntelliConfig Global Guide](#).

**This tool provides the following functions:**

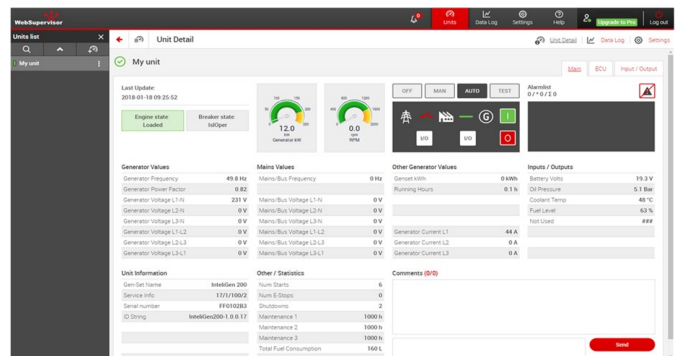
- Direct or remote internet communication with the controller
- Offline or online controller configuration
- Controller and module configuration, programming and cloning
- Remote display programming
- Reading/writing/adjustment of setpoints
- Reading of measured values
- Controllers and ECU Alarm monitoring + 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

### 2.8.2 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](http://www.websupervisor.net)

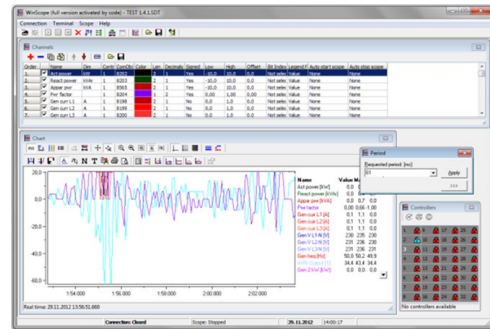


## 2.8.3 WinScope 1000

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

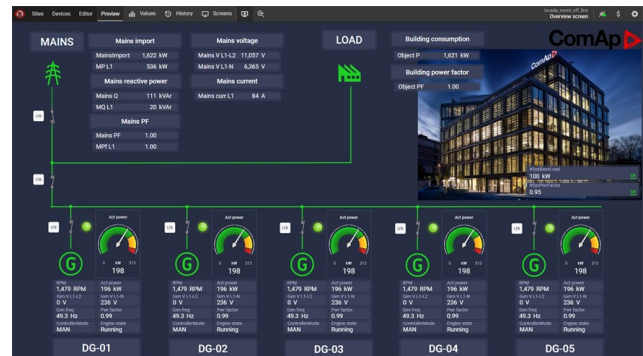


## 2.8.4 IntelISCADA

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

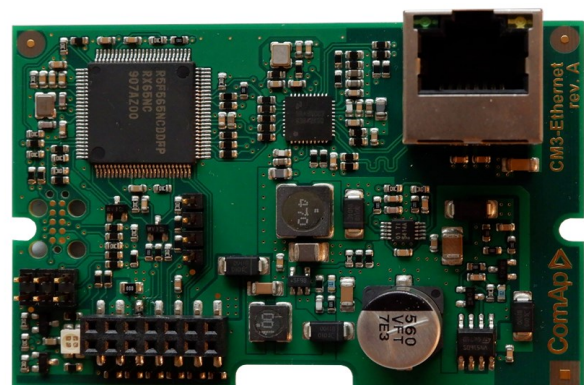


## 2.9 Plug-in modules

### 2.9.1 CM3-Ethernet

Internet/Ethernet module including web server.

- 10/100 Mbit interface over RJ45 socket
- Remote control and monitoring of the controller via IntelliConfig, WebSupervisor
- Modbus TCP support
- Full SNMP support including traps (v1 & v2c)
- Active e-mail sending
- AirGate 2.0 technology support for easy connection – no need of public and static IP address

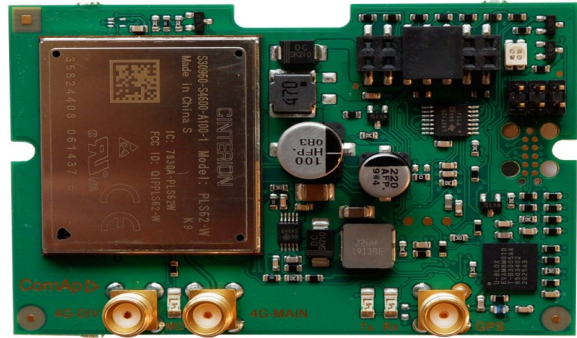




## 2.9.2 CM2-4G-GPS

GSM/4G module

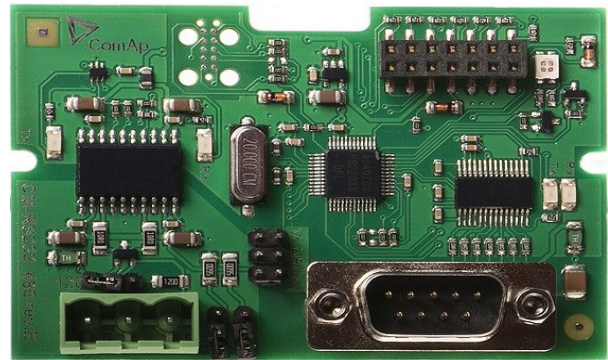
- GSM/4G Internet module and GPS locator
- Global 4G (LTE) module with 3G/2G backup
- Remote control and monitoring of the controller via IntelliConfig, WebSupervisor
- Active e-mail and SMS support
- AirGate 2 technology support for easy connection – no need of public and static IP address
- Tracking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



## 2.9.3 CM-RS232-485

Communication module with two communication ports.

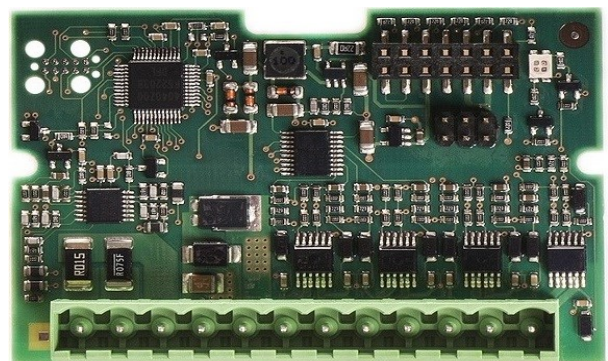
- RS232 and RS485 interface
- MODBUS
- Serial connection to IntelliConfig



## 2.9.4 EM-BIO8-EFCP

Input and binary input/output extension module.

- Up to 8 additional configurable binary inputs or outputs



## 2.10 Displays

Remote Displays / Panel PC Displays



## 2.10.1 IntelliVision 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 [IntelliVision 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 IntelliConfig)
- 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



## 2.10.2 IntelliVision 10Touch

Panel PC Display equipped with a projective capacitive touch display. See more in the [IntelliVision 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 IntelliFieldbus 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



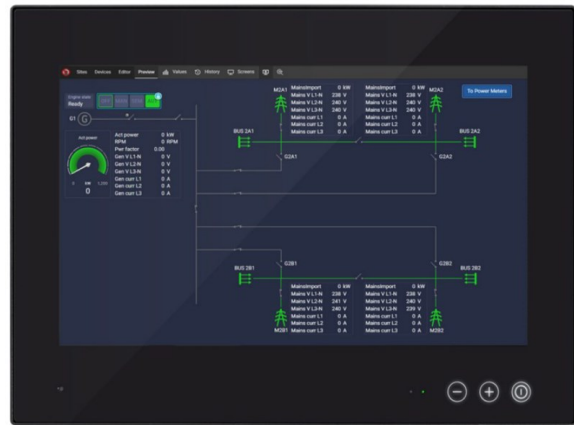


## 2.10.3 IntelliVision 13Touch

Marine certified Panel PC Display with multi-controller support and buttons for brightness change on its front face. See more in the [IntelliVision 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



## 2.10.4 IntelliVision 18Touch G1/G2

Panel PC Display perfectly suitable for the most complex applications and also the simple ones. With IntelliVision 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 [IntelliVision 18Touch Global Guide G1](#) / [IntelliVision 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



## 2.11 CAN Extension Modules

**IMPORTANT:** The following CAN extension modules are designed for operating at 125, 250 kbit/s CAN speed. Having the controller configured to have the CAN speed set up at 500 kbit/s will create a setup that will no longer provide support to communicate with the CAN extension modules .



## 2.11.1 Intel 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 [Intel 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.

🔍 back to CAN Extension Modules

## 2.11.2 Intel 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 [Intel 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

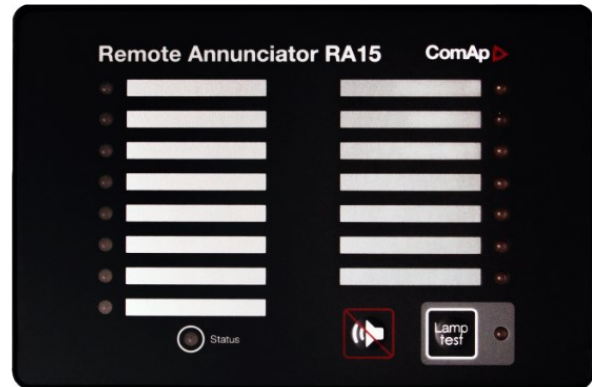




## 2.11.3 IGL-RA15

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

## 2.11.4 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



## 2.11.5 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  $\pm 65$  V DC
- 4x shielded, galvanic separated sensors: thermocouples J,K,L,  $\pm 75$  mV inputs
- Resistance analog input (sensors: 0-2400 $\Omega$ , PT1000 or NI1000)
- Analog output with options : 0-20mA, 0-10V or PWMt



🔍 back to CAN Extension Modules

## 2.11.6 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

## 2.11.7 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 Modulation)



⬅ back to CAN Extension Modules

## 2.11.8 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

## 2.11.9 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

## 2.11.10 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.

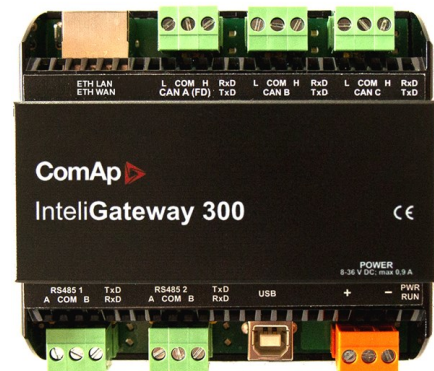
🔍 back to CAN Extension Modules

## 2.12 CAN Communication Modules

### 2.12.1 IntelliGateway 300

IFG is communication gateway with configurable interfaces between Modbus TCP/RTU, ComAp CAN, WebSupervisor and IntelliScada protocols allowing user-defined interconnection of all attached devices. See more information on web page [IntelliGateway](#).

- > 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

### 2.12.2 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

## 2.13 Other Modules

### 2.13.1 Intel DC4/4

Module for DC Voltage/Current measurement

- Unipolar voltage measurement
- 2 galvanically isolated input measuring channels, both having voltage + current

#### Analog Inputs

- 4 channels – 2 for Voltage and 2 for Current measurement
  - Voltage input up to 1500 V DC – direct measurement
  - Current loop input: Measurement with external shunt up to 3000 A DC (0-100 mV shunt voltage range)

#### Analog Outputs

- 4 channels – 2 for Voltage and 2 for Current measurement
  - 4 .. 20 mA current loop output





## Wiring

### Measure: HV Bus Voltage and Current (SHUNT)

The module I-DC4/4 allows to measure high bus voltage and current. Wiring for such measurement is shown on **Image 2.2**. Current is measured via an external shunt resistor. Information of a measured values is provide via current loops.

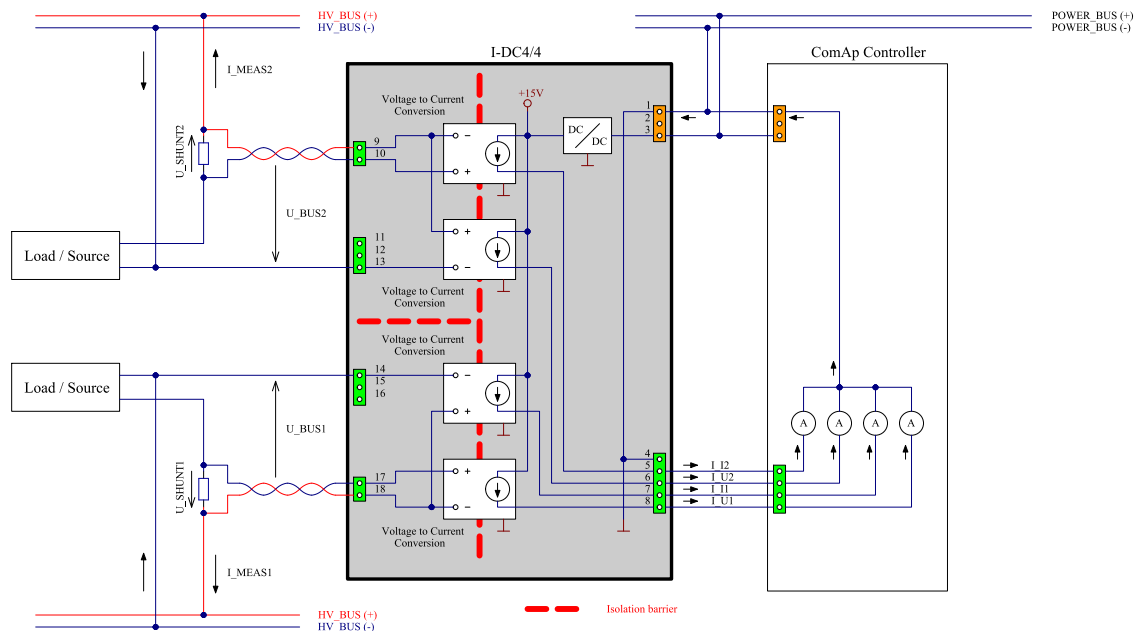


Image 2.2 SHUNT wiring scheme

The shunt resistor for current measurement should be connected in the positive pole of a HV bus. On the **Image 2.3** configuration is illustrated for current measurement via the external shunt resistor in the negative pole of the HV bus.

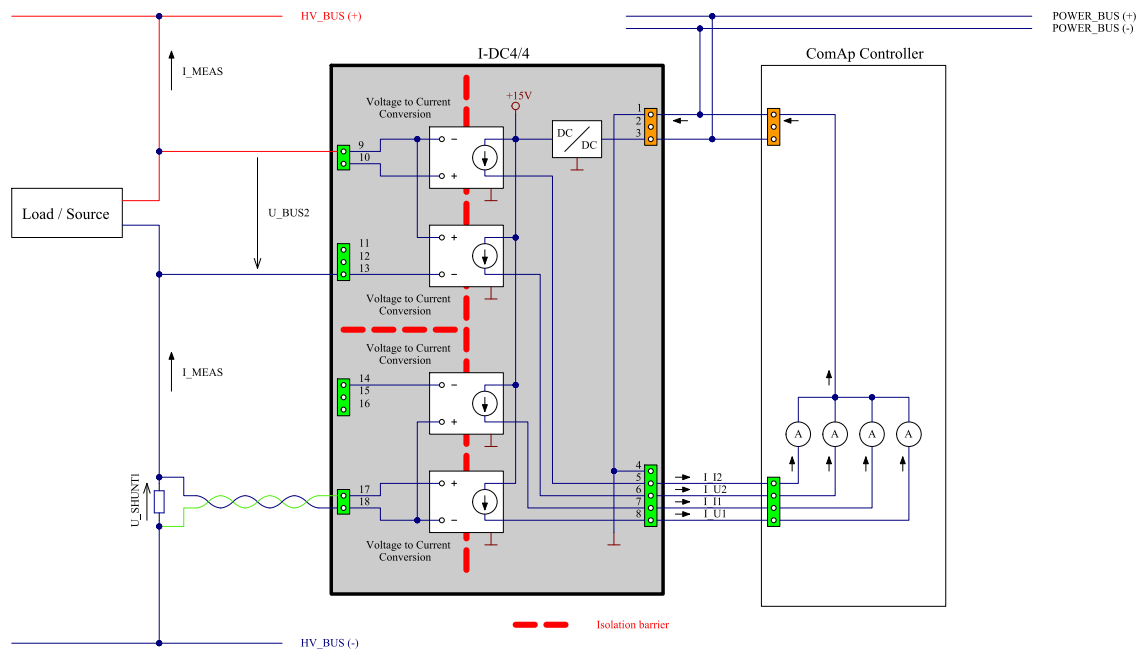


Image 2.3 SHUNT in negative branch



When current loops are read by a ComAp controller the negative power supply terminals of both the modul I-DC4/4 and the controller should be interconnected. This allows the return current to flow back to the module (closed current loop).

### Isolated floating current loop measurement

When the current loops are measured by an isolated (floating) external unit the return current cannot flow back to the module via the negative power supply terminal. In such case the external unit must be connected to the terminal 4 (COM) so the current loops are properly closed, see **Image 2.4**.

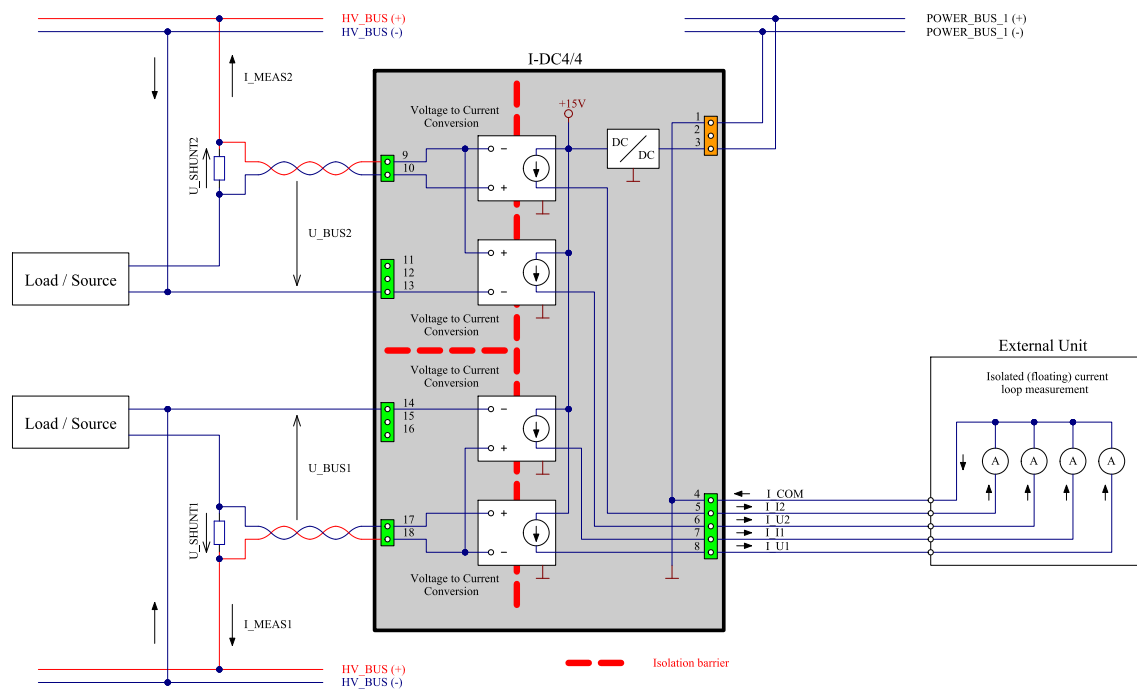


Image 2.4 Isolated floating current loop

## 2.14 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** .

### 2.14.1 Shared modules

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 . 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.

Proper alarm from a range **SHBIN 1** to **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

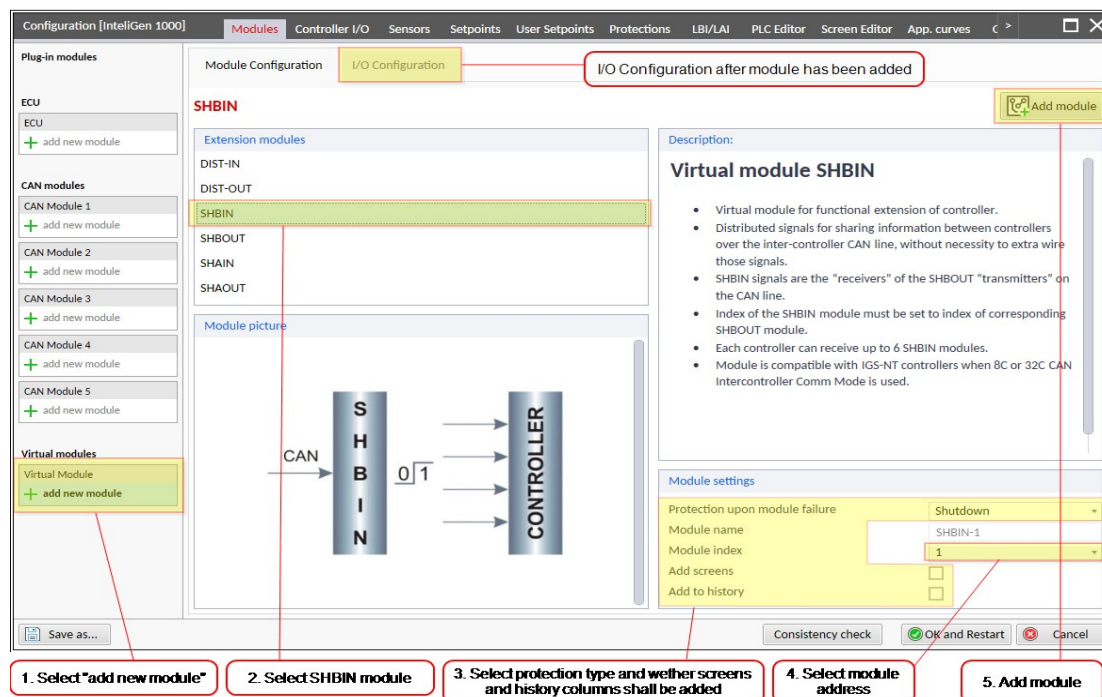


Image 2.5 Configuration of shared module SHBIN

## SHBOUT

SHBOUT virtual modules share binary values to other controllers via . 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.

## Binary Outputs

### > SHBOUT-1

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



## Configuration

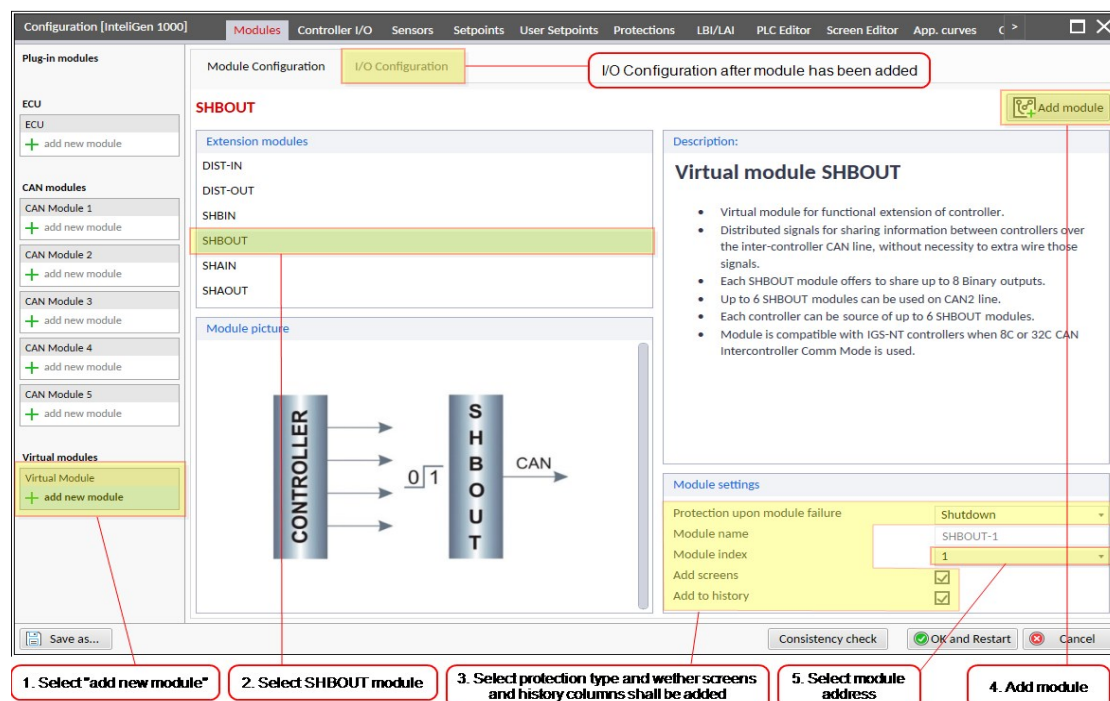


Image 2.6 Configuration of shared module SHBOUT

## 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 SHAIN 1 to 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

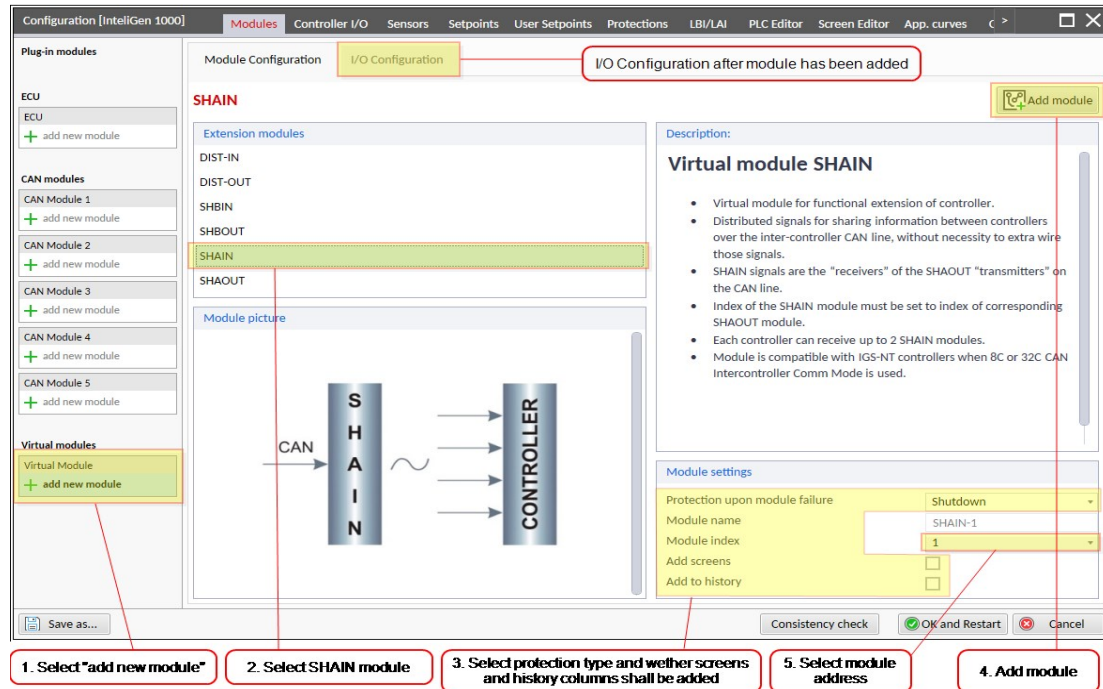


Image 2.7 Configuration of shared module SHAIN

## SHAOUT

SHAOUT virtual modules share analog values to other controllers via **CAN Intercontroller Communication**. There are 2 modules, SHAOUT-1 and SHAOUT-2, which are 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

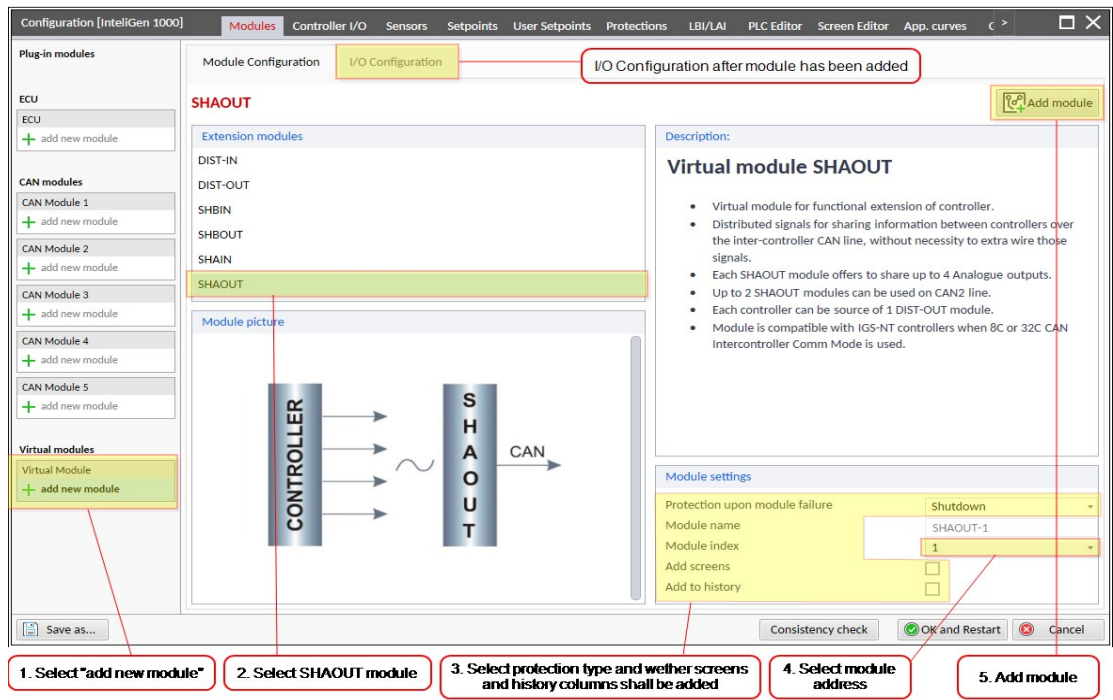


Image 2.8 Configuration of shared module SHAOUT

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# 3 Applications overview

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3.1.1 MINT System Schematic ..... 45

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## 3.1 MINT – Multiple island-parallel

The MINT system architecture represents complex systems where there are multiple mains incomers, synchronous generators and renewable energy sources. There are individual source controllers at the mains and paralleling controllers on each gen-set; all of which cooperate with the IntelliNeo under a distributed architectural principle. This means 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 IntelliNeo continue operation to the loads.

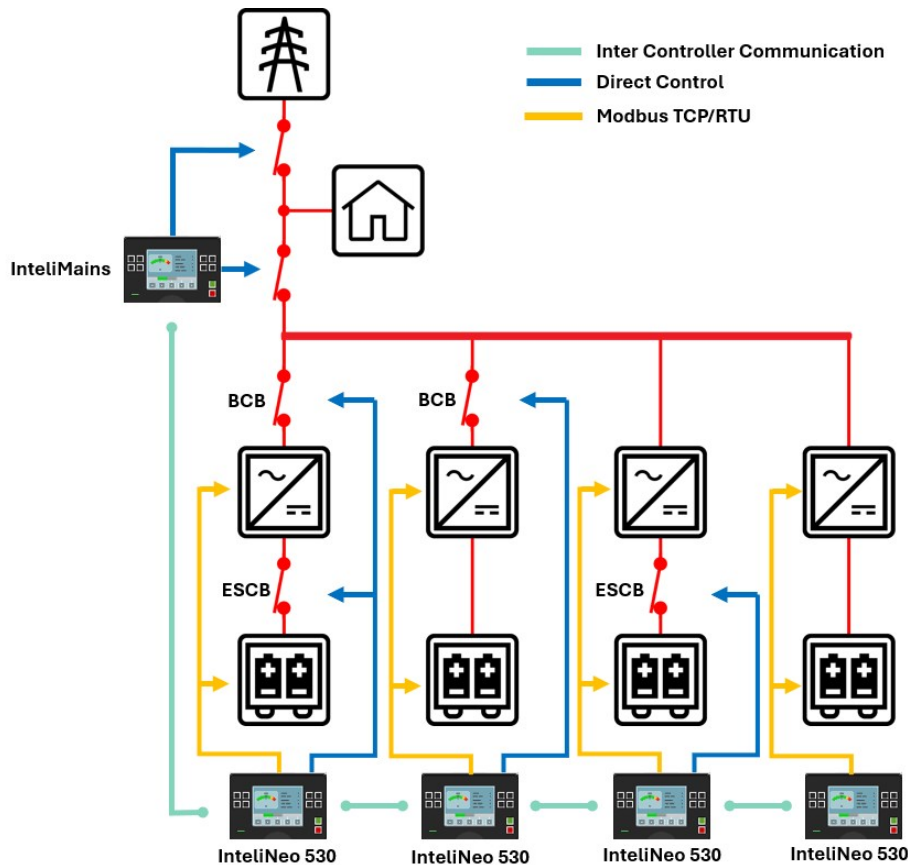


Image 3.1 MINT application – general overview

The image 3.1 MINT application - general overview is showcasing 4x IntelliNeo530 connected together on the AC BUS. Each IntelliNeo 530 showcasing a setup with or without the need to control the breakers. For better understanding how to configure the setup see **BESS starting sequence and BESS states**. Inter controller communication between the IntelliNeo 530 is recommended to be utilized with the IntelliMains controller.

### Features supported by IntelliNeo 530 BESS 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)

### 3.1.1 MINT System Schematic

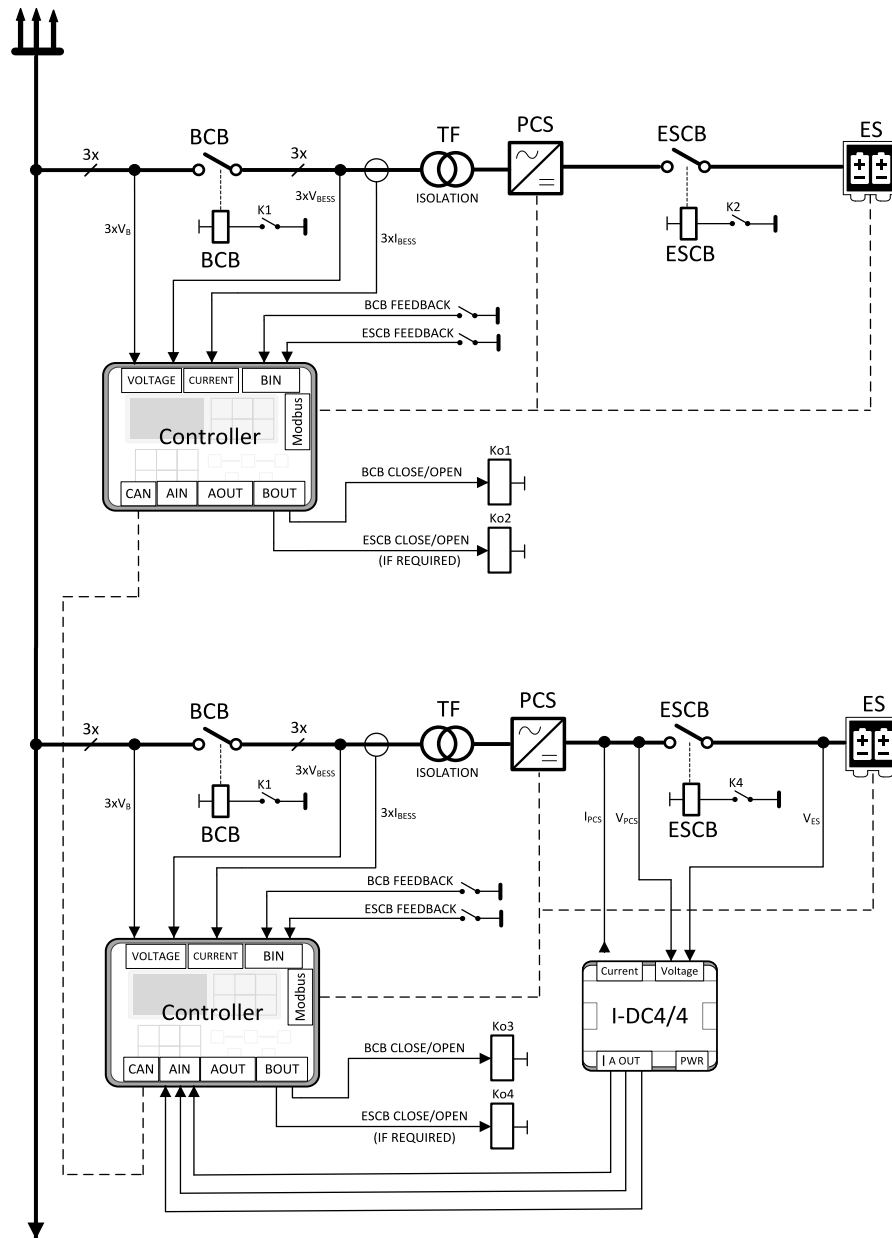


Image 3.2 Multiple island-parallel application without mains

The image 3.2 Multiple island-parallel application without mains is showcasing 2x IntelINeo530. The top controller in the schematic is receiving data about the dc values from the PCS and ES via modbus (or via J1939 CAN protocol is also possible). The bottom controller is measuring the values using the **Intel DC4/4** module and converting the data via physical analog inputs into the controller. In both cases it is important for the controller to receive data on what is occurring on the DC area.

**Note:** The controller can control the opening and closing of the BCB and ESCB using the LBO **BCB CLOSE/OPEN** or LBO **ESCB CLOSE/OPEN** if the setup requires it.



**IMPORTANT:** The controller must receive information via the LBI ESCB Feedback that the connection of the ES and PCS is established.

**IMPORTANT:** The controller must receive information via the LBI BCB FEEDBACK that the connection of the PCS and AC Bus is established.

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# 4 Installation and wiring

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## 4.1 Package content

The package contains:

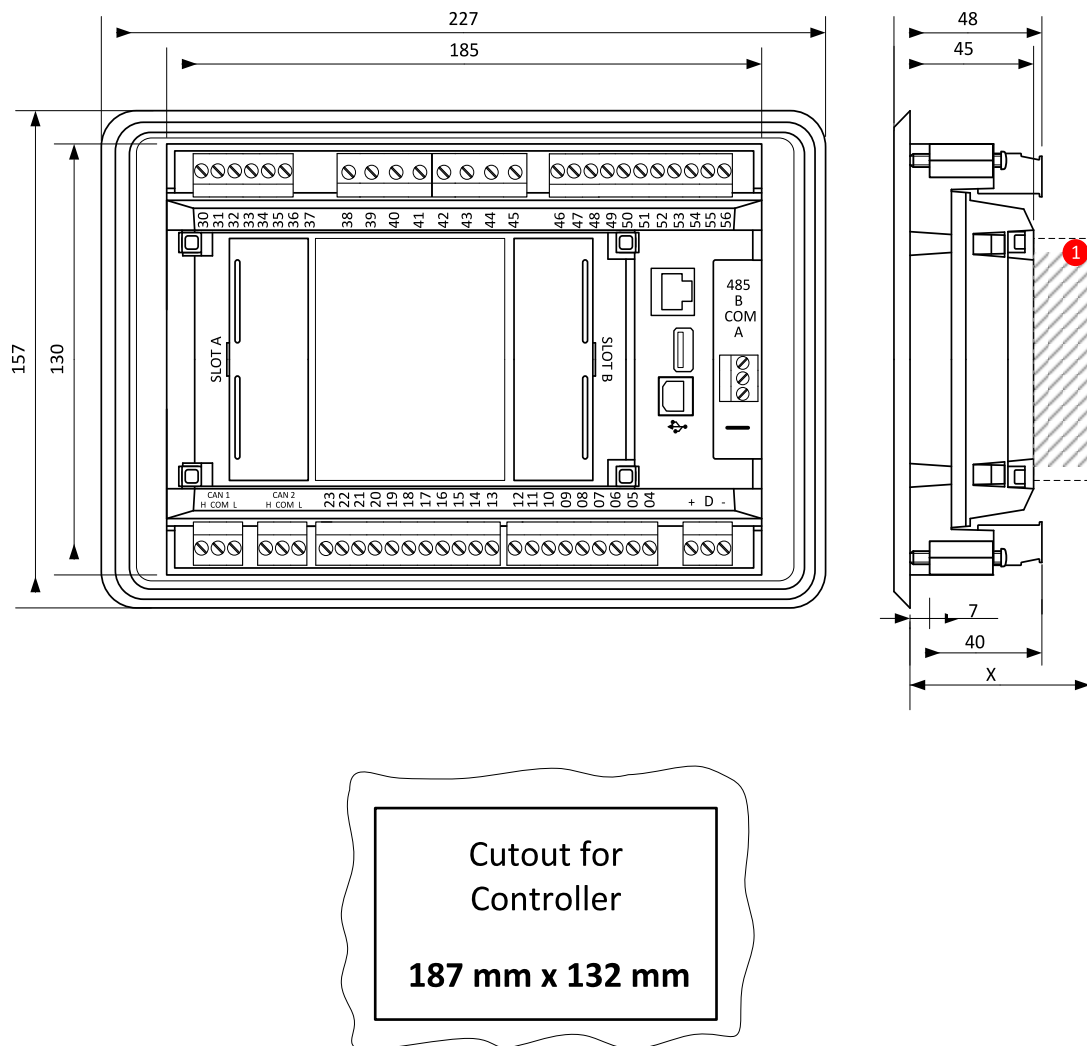
- Controller IntelliNeo 530 BESS
- Terminal blocks

**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



**Note:** Dimension x depends on plug-in module.

**Note:** Dimensions are in millimeters.

Image 4.1 Controller dimensions

### 4.2.2 Mounting

The controller unit should be mounted onto the backside of the switchboard door and after the installation it should be inaccessible for nonauthorized people.



### Mounting in switchboard doors

The controller should be mounted onto the switchboard door. Requested cutout size is 187 × 132 mm. Use the screw holders delivered with the controller to fix the controller into the door as described in pictures below. Recommended torque for holders is 0.15 N·m.

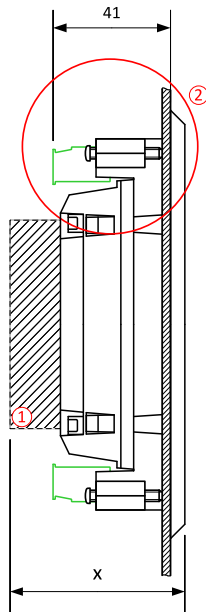


Image 4.2 Controller mounting in the switchboard doors

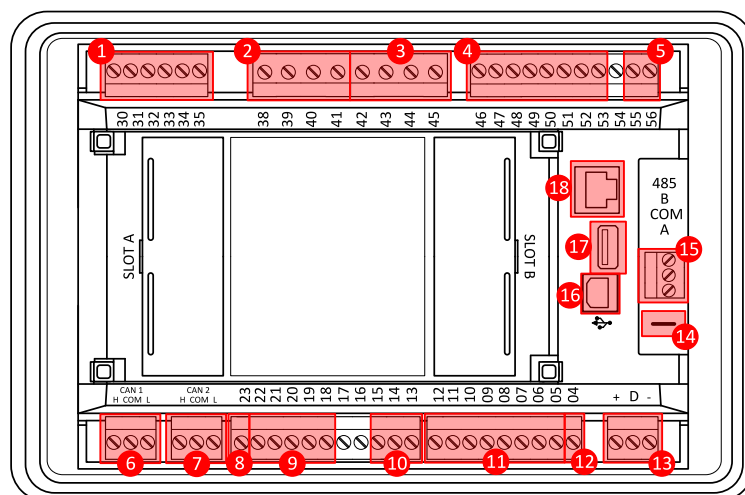
### Mounting in DIN rail

The controller should be mounted onto the DIN rail by using dedicated bracket. IntelliNeo 530 BESS package does not include a additional bracket. Dedicated bracket for DIN rail needs to be acquired separately. The controller then faces by the display site to the rear to allow easy terminal access.

## 4.3 Terminal Diagram

① BESS CURRENT / BUS AUX CURRENT		② BESS VOLTAGE		③ BUS VOLTAGE		④ BINARY INPUTS		⑤ AOUT1	
T30	COM	T38	N	T42	N	T46	BI1	T55	COM
T31	L1	T39	L1	T43	L1	T47	BI2	T56	OUT
T32	L2	T40	L2	T44	L2	T48	BI3	⑥ CAN1	
T33	L3	T41	L3	T45	L3	T49	BI4	T29	H
T34	COM					T50	BI5	T28	COM
T35	L1					T51	BI6	T27	L
						T52	BI7		
						T53	BI8		



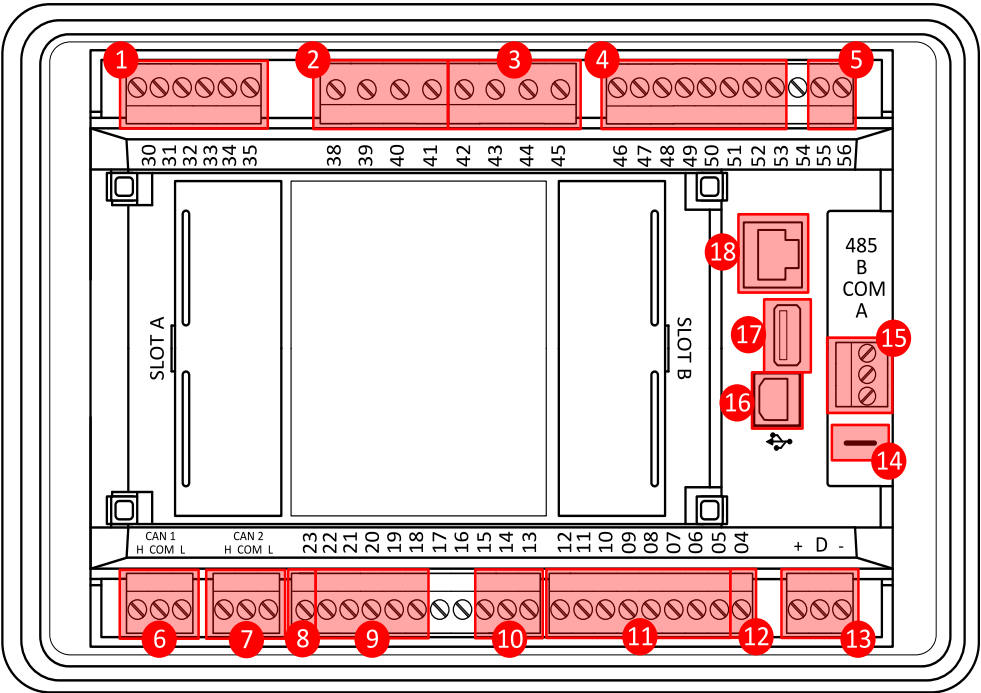


7 CAN2		9 ANALOG INPUTS		11 BINARY OUTPUTS		12 E-STOP		15 RS485	
T26	H	T22	AI4	T12	BOUT8	T04	E-STOP	T57	B
T25	COM	T21	AI3	T11	BOUT7	13 POWER SUPPLY		T58	COM
T24	L	T20	AI2	T10	BOUT6	T01	BATT -	T59	A
8 +5 V		T19	AI1	T09	BOUT5	T02	N/A	16 USB	
T23	+5 V	T18	ACOM	T08	BOUT4	T03	BATT +	17 USB HOST	
10 AOUT2				T07	BOUT3	14 EMC TERMINAL		18 ETHERNET	
T15	PWM			T06	BOUT2				
T14	OUT			T05	BOUT1				
T13	COM								



# 4.4 Recommended wiring

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<b>1</b>	Current inputs	30-35	<b>Current measurement wiring</b>
<b>2</b>	BESS voltage inputs	38-41	
<b>3</b>	Bus voltage inputs	42-45	
<b>4</b>	Binary inputs	46-53	<b>Binary Inputs</b>
<b>5</b>	AOUT1	54, 55	
<b>6</b>	CAN1	H, COM, L	<b>CAN bus and RS485 wiring</b>
<b>7</b>	CAN2	H, COM, L	<b>CAN bus and RS485 wiring</b>



8	+5 V	23	Analog Inputs
9	Analog inputs	18-22	Analog Inputs
10	AOUT2	15, 14, 13	
11	Binary outputs	05-12	Binary Outputs
12	E-Stop	04	E-Stop
13	Power supply	"+", D, "-"	Power supply
14	EMC Grounding		
15	RS485	A, B, C	CAN bus and RS485 wiring
16	USB	USB B	USB
17	USB Host	USB A	USB
18	Ethernet	RJ45	Ethernet

### 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<sup>2</sup>.

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<sup>2</sup>
- 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 lightning 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  $\mu\text{F}$ . The capacitor size should be 5 000  $\mu\text{F}$  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.



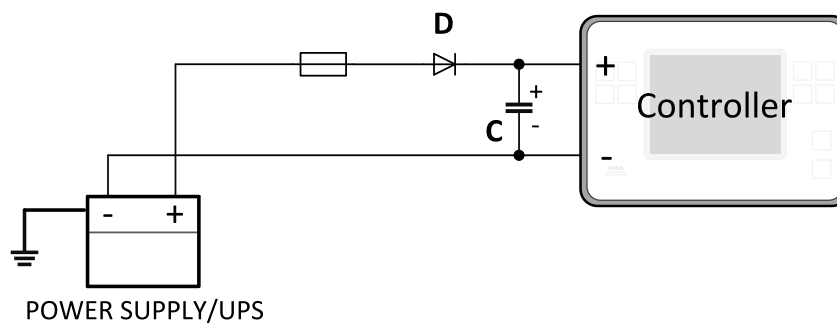


Image 4.3 Controllers power supply with external capacitor, separating diode and fusing

**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.

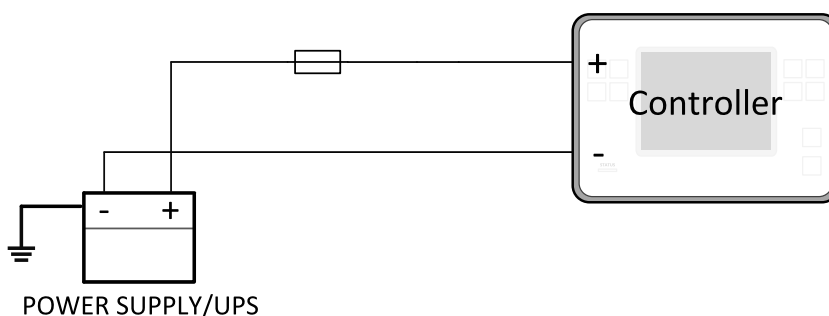


Image 4.4 Controllers power supply fusing

**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<sup>2</sup> cables for voltage connection and 2.5 mm<sup>2</sup> for current transformers connection. Adjust **Connection type**, **Mains/Bus Nominal Voltage Ph-N**, **Bus Nominal Voltage Ph-Ph**, **BESS Nominal Voltage Ph-N**, **BESS Nominal Voltage Ph-Ph** and **BESS 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

**IMPORTANT:** It is necessary to ensure that potential difference between current COM terminal and power supply "-" terminal is maximally  $\pm 2$  V. To do so ground properly both terminals.

The number of CT's is automatically selected based on selected value of setpoint **Connection type** [3Ph4Wire / High Leg D / 3Ph3Wire / SplPhL1L2 / SplPhL1L3 / Mono Ph].

BESS currents and power measurement are suppressed if current level is below <1 % of CT range.

To ensure proper function:

- > Use cables of 2.5 mm<sup>2</sup>
- > Use transformers with 5 A or 1A secondary windings
- > Connect CT according to following drawings:

#### 3 phase application

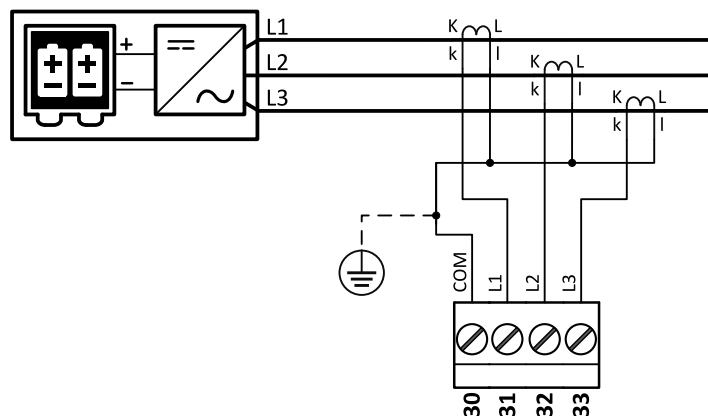


Image 4.5 3 phase application



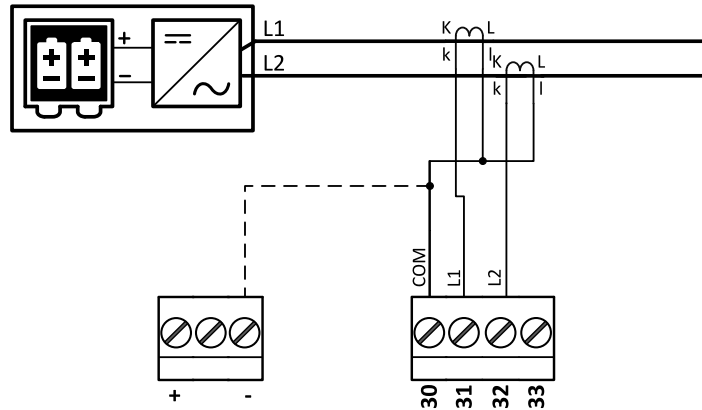


Image 4.6 3 phase application India

**Note:** This wiring is recommended for Indian market.

### SpIPhL1L2 application

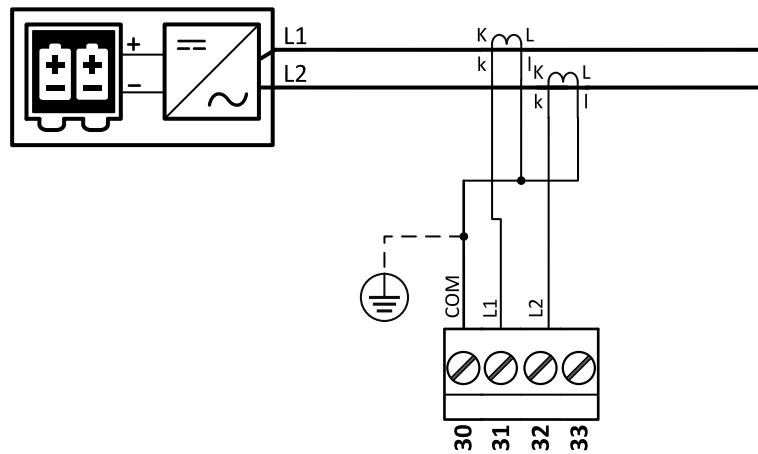


Image 4.7 SpIPhL1L2 application application

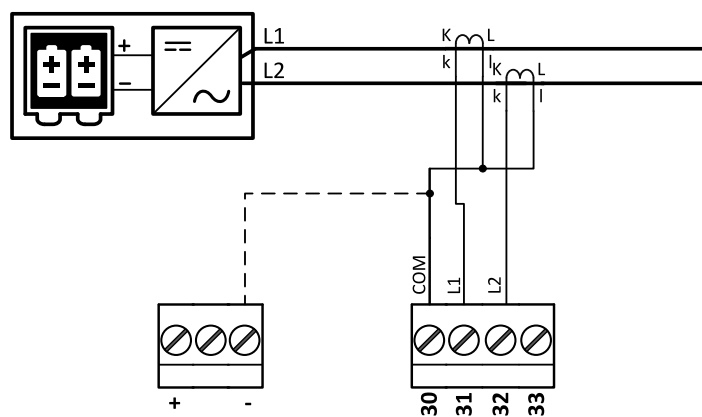


Image 4.8 SpIPhL1L2 application application India

**Note:** This wiring is recommended for Indian market.



## SpIPhL1L3 application

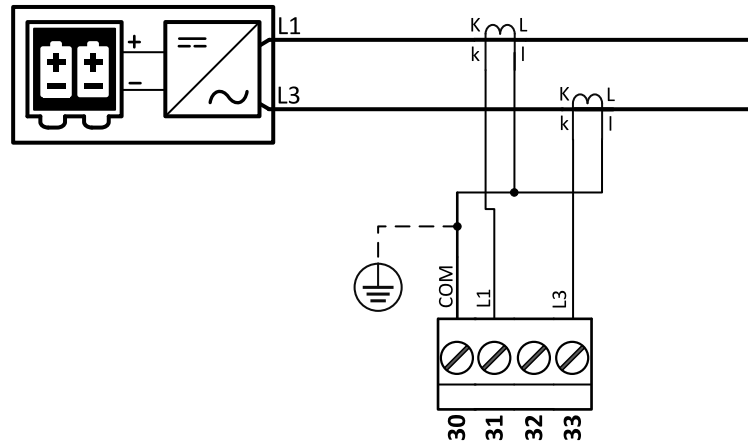


Image 4.9 SpIPhL1L3 application

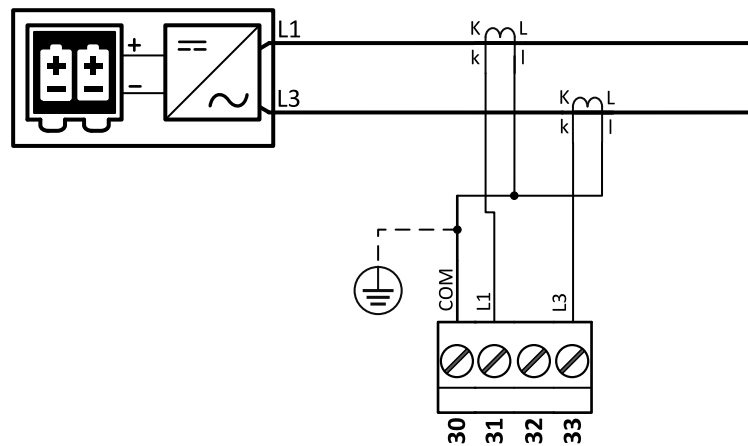


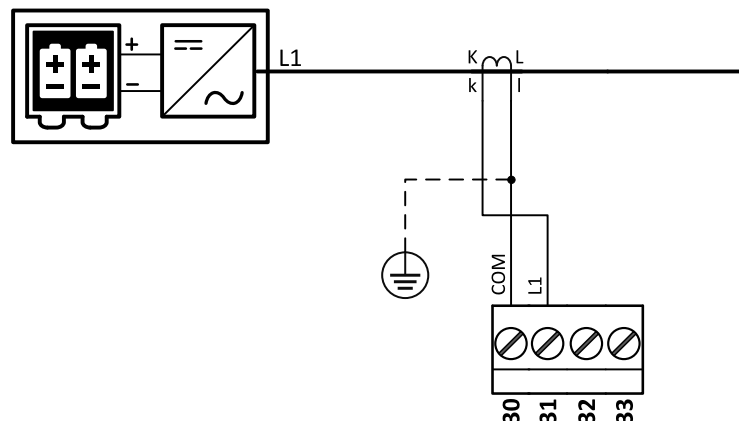
Image 4.10 SpIPhL1L3 application India

**Note:** This wiring is recommended for Indian market.

**IMPORTANT:** If the second phase of the split phase application is phase L2 use current input 32, if its phase L3 use current input 33.

## Mono phase application

Connect CT according to following drawings. Terminals phase 2 and phase 3 are opened.









## ConnectionType: 3 Phase 4 Wires

Connection type = 3Ph4Wire

**Note:** Changing the setpoint **3Ph CT Location** influences the voltage measurement based on the setting. The change that occurs is the movement of the terminals for measurement of voltage.

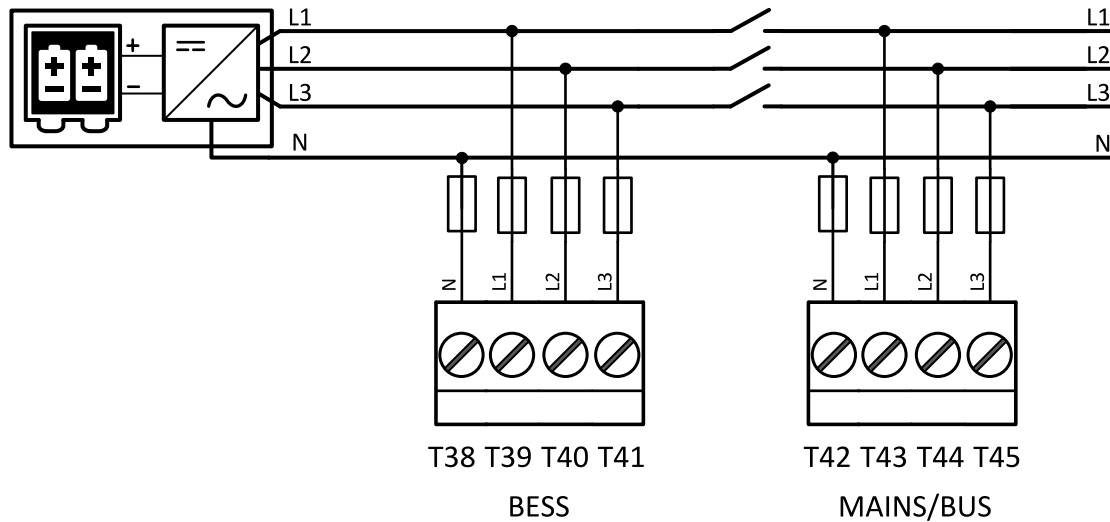


Image 4.14 Controller wiring for voltage measurement of 3 phase application with neutral

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

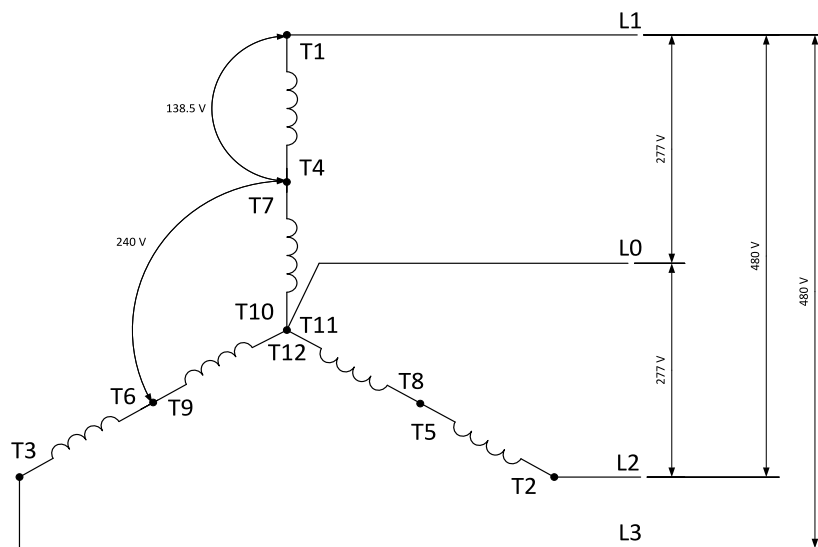


Image 4.15 Typical BESS wiring of 3 phase application with neutral

**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.



**Connection type** = High Leg D

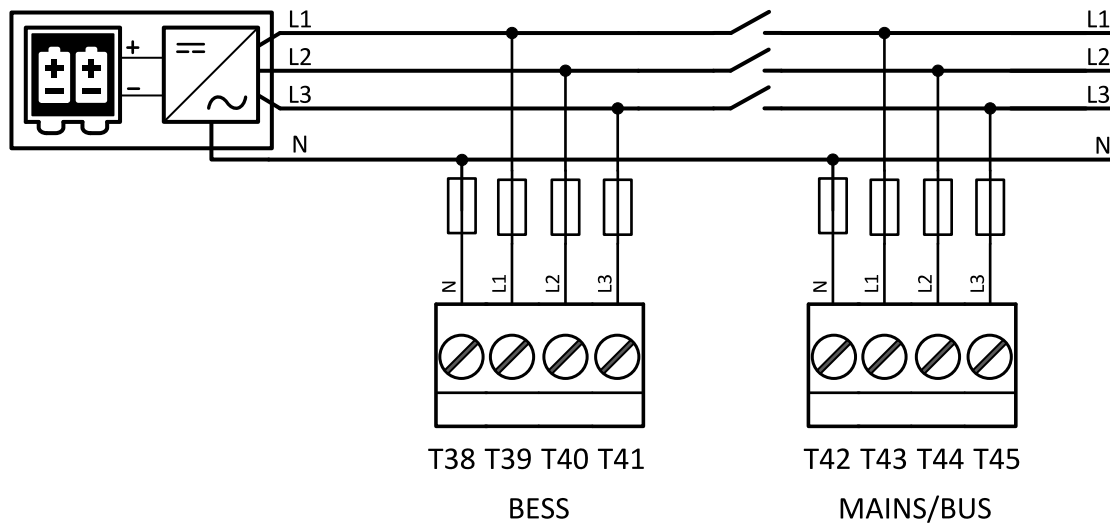


Image 4.16 Controller wiring for voltage measurement of High Leg Delta application

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

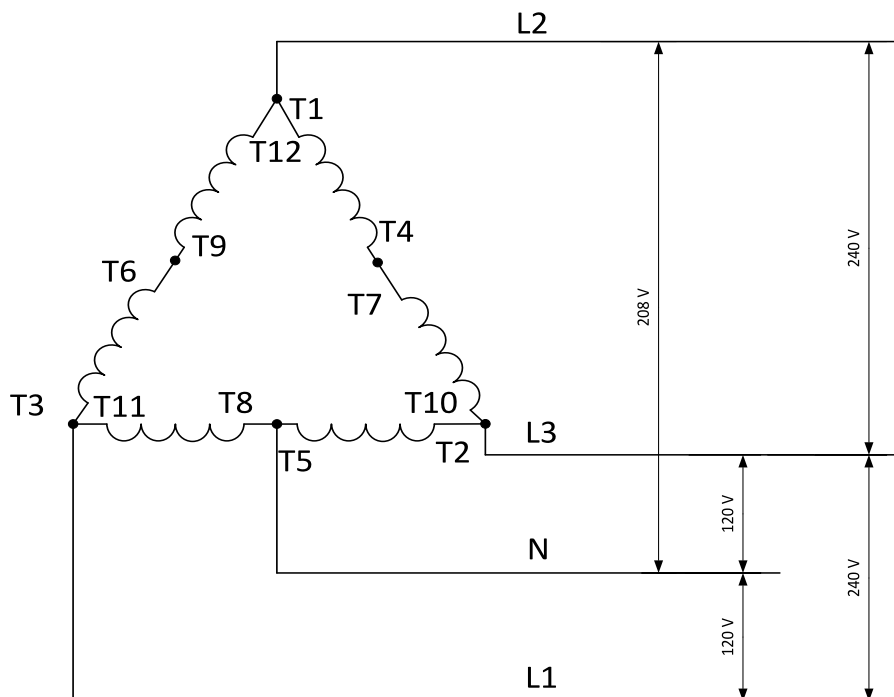


Table 4.1 Typical BESS wiring of High Leg Delta application

**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

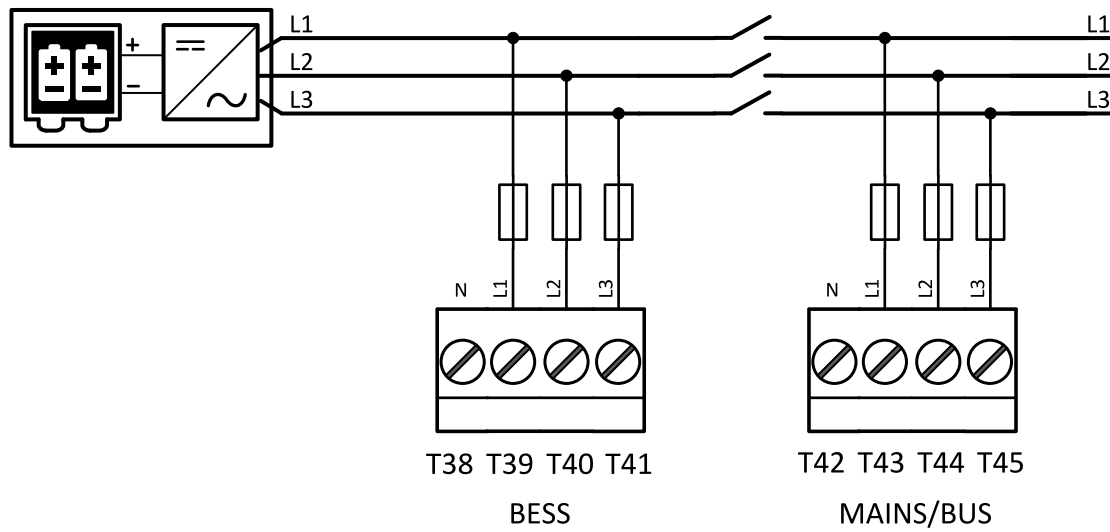


Image 4.17 3 Controller wiring for voltage measurement of 3 phase application without neutral

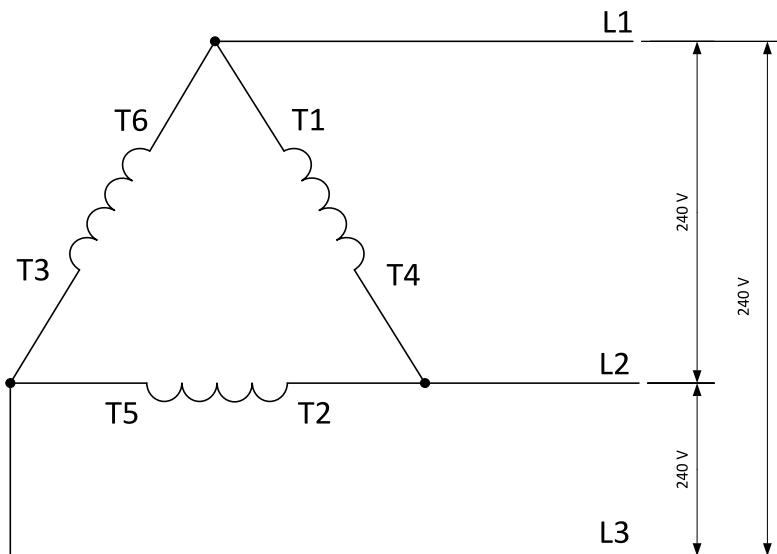


Image 4.18 Typical BESS wiring of 3 phase application without neutral

**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

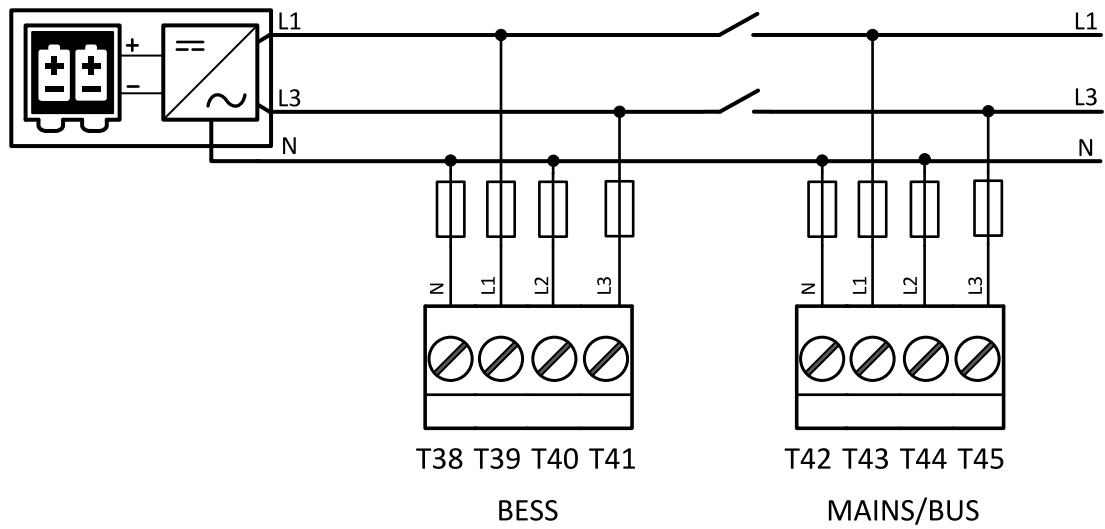
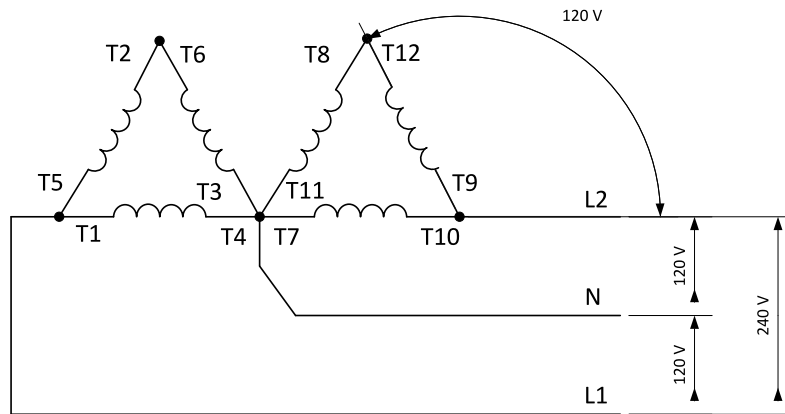


Image 4.19 Controller wiring for voltage measurement of SplitPhase application

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



## DOUBLE DELTA Connection



## ZIG ZAG (DOG LEG) Connection

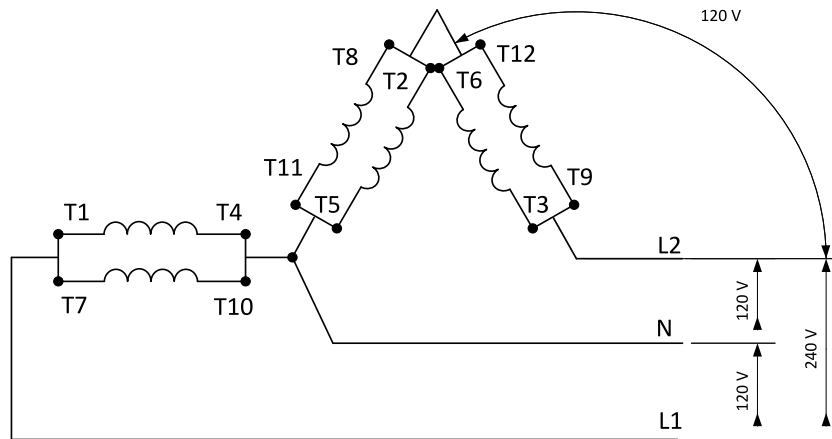


Image 4.20 Typical BESS wiring of SplitPhase application

**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

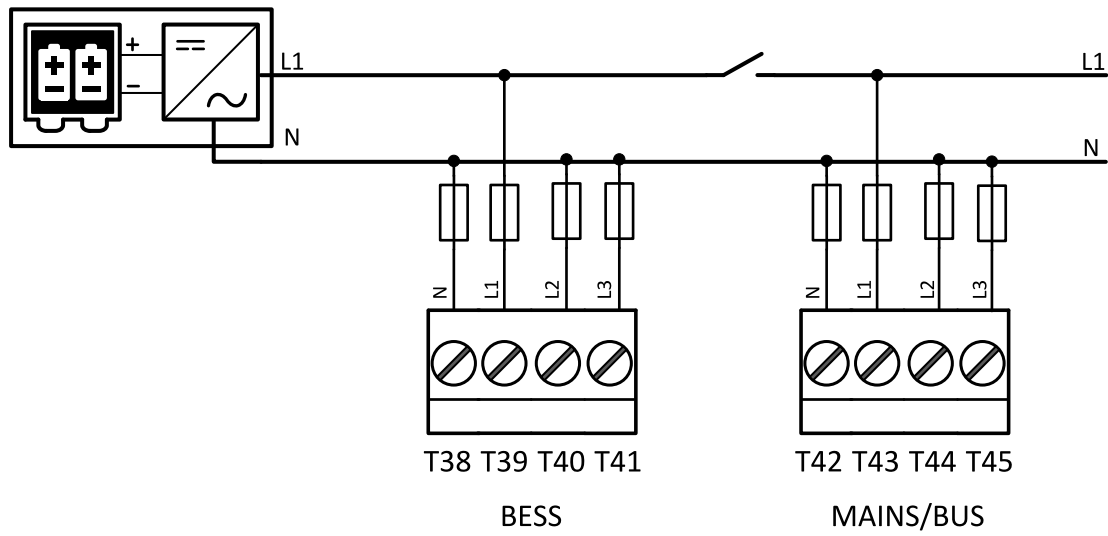


Image 4.21 Controller wiring for voltage measurement of MonoPhase application

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



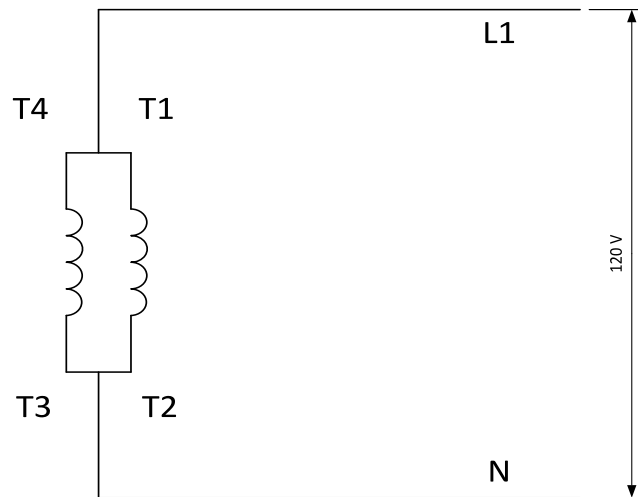


Image 4.22 Typical BESS wiring of MonoPhase application

**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

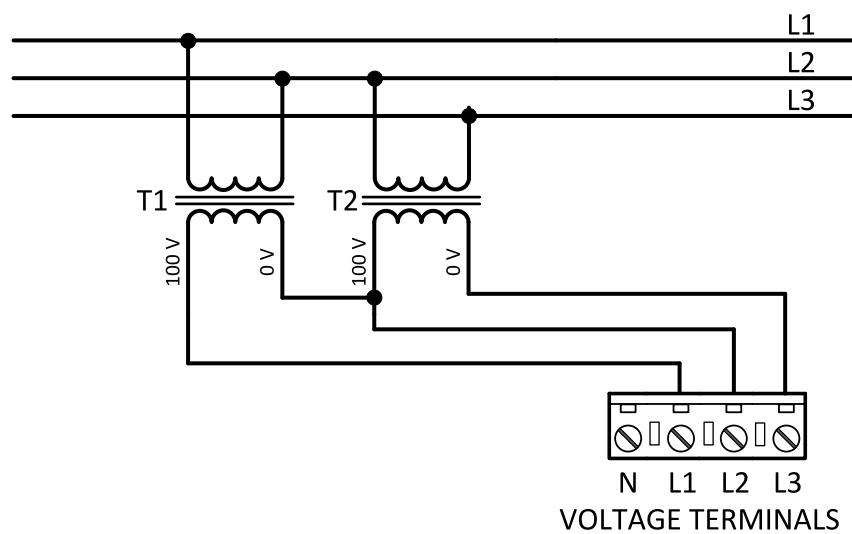


Image 4.23 Principle of two voltage transformers measuring



## 4.4.5 Binary Inputs

Use minimally 1 mm<sup>2</sup> 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.

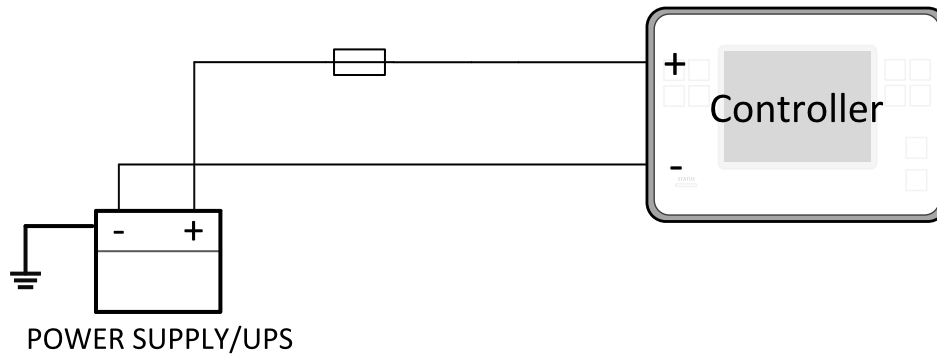


Image 4.24 Wiring binary inputs - Pull Down

## 4.4.6 Binary Outputs

Use min. 1 mm<sup>2</sup> 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 .. BO). Every single binary output can provide up to 0.5

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

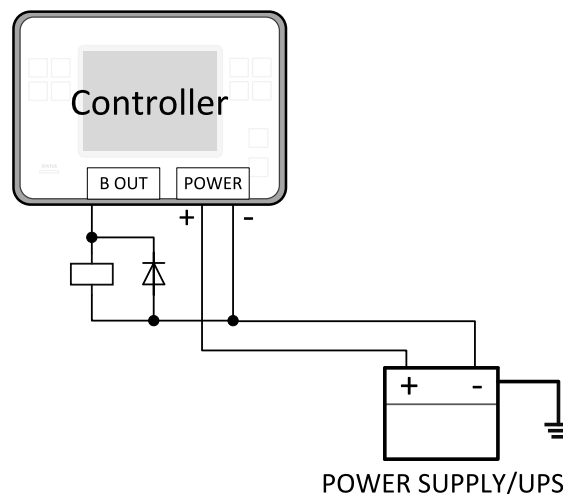


Image 4.25 Binary outputs wiring



## 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 through 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**.

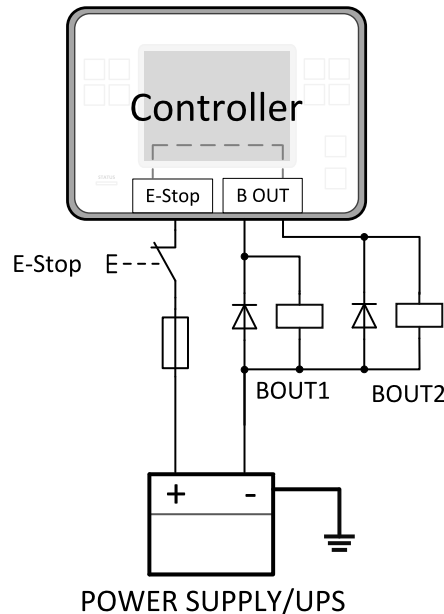


Image 4.26 E-Stop wiring

**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.



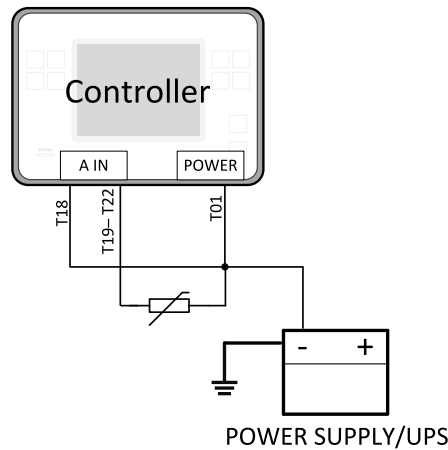


Image 4.27 Isolated sensors

**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.

## Analog Voltage sensor

Controller is equipped with +5 V terminal which can be used as power supply for a voltage analog sensor.

### Voltage sensors

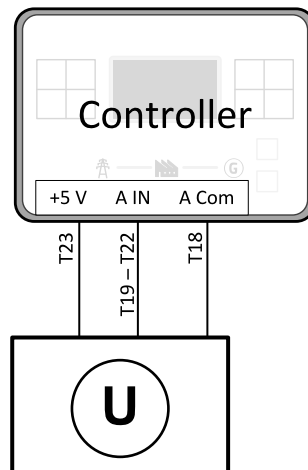


Image 4.28 Analog Voltage sensor

**Note:** Maximal current of 5V output is 100 mA.

### 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.



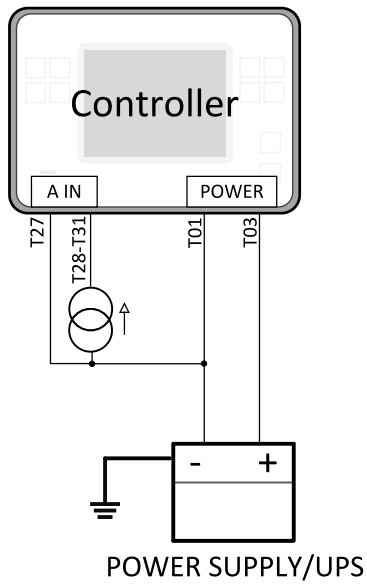


Image 4.29 Wiring of analog input with active current sensor

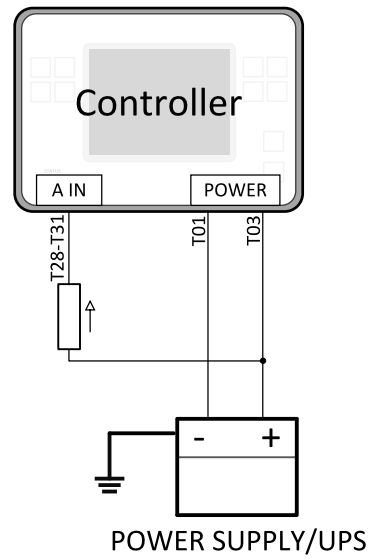


Image 4.30 Wiring of analog input with passive current sensor



## 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  $\Omega$ . In the case of tri-state, values lower than 10  $\Omega$  and values over 2400  $\Omega$  are evaluated as sensor failure (short or open circuit). This can be used for example to prevent running the BESS with failed temperature sensor, so it won't be overheated.

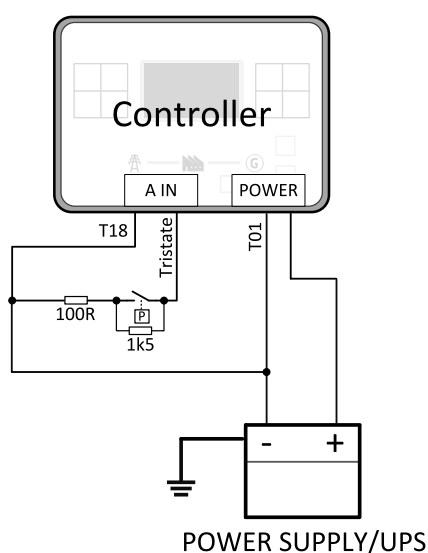


Image 4.31 Analog inputs as tristate

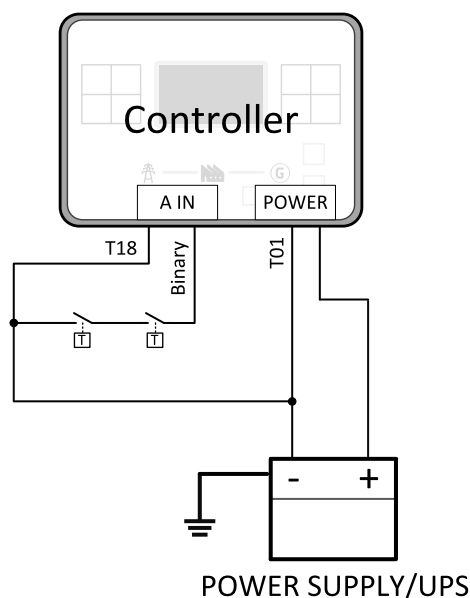


Image 4.32 Analog inputs as binary

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

**Note:** Tristate and binary sensors are not suitable for Analog Switch functions.

Curve of tristate sensor is prepared for resistive analog inputs 0 .. 2500  $\Omega$ .

**Tristate sensor has 3 states:**

- > Fls – fail of sensor
- > 1 – value is in logical 1
- > 0 – value is in logical 0

**Curve of sensor:**

- > < 10  $\Omega$  – fail of sensor
- > 10 .. 750  $\Omega$  – logical 1
- > 750 .. 2500  $\Omega$  – logical 0
- > > 2500 – fail of sensor

## 4.4.9 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 **CAN1** bus (extension modules, ECU) and **CAN2 (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<sup>1</sup> 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:

<b>Cable type</b>	Shielded twisted pair
<b>Impedance</b>	120 $\Omega$
<b>Propagation velocity</b>	$\geq 75\%$ (delay $\leq 4.4$ ns/m)
<b>Wire crosscut</b>	$\geq 0.25$ mm <sup>2</sup>
<b>Attenuation (@1MHz)</b>	$\leq 2$ dB/100 m

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

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

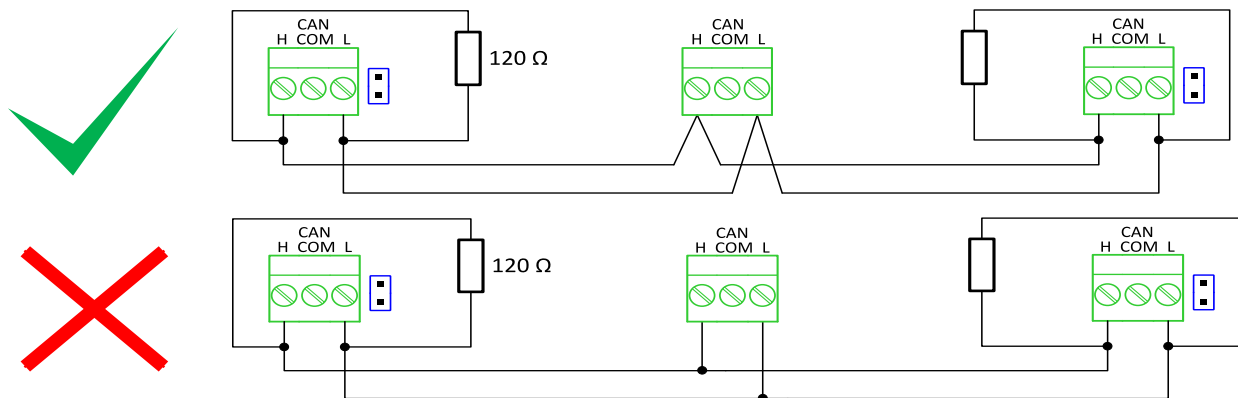


Image 4.33 CAN bus topology

<sup>1</sup>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)



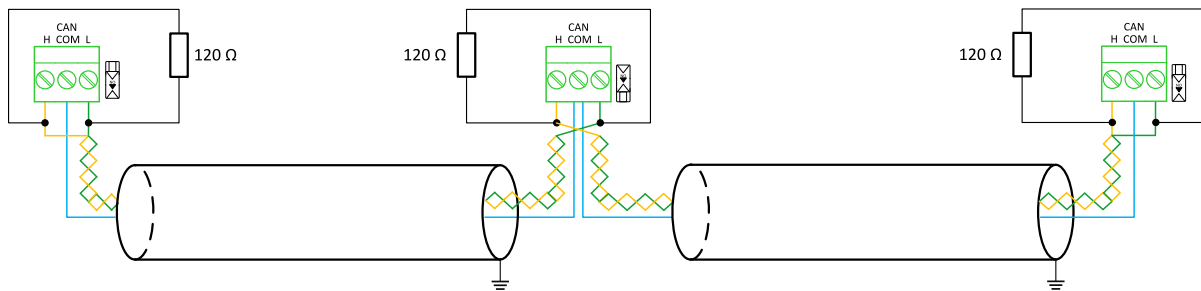


Image 4.34 CAN bus wiring for longer distances

**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<sup>1</sup>.

## 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<sup>2</sup> 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).

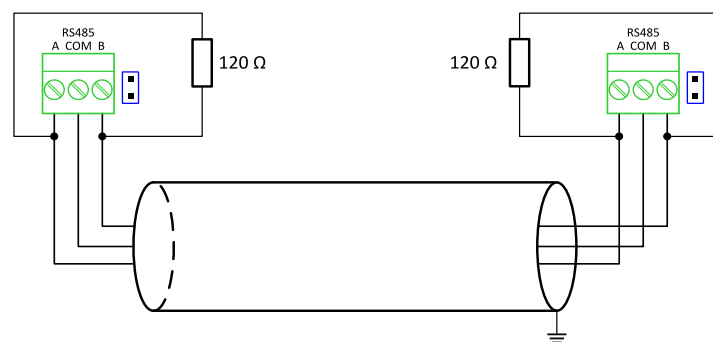


Image 4.35 RS485 wiring for shorter distances

<sup>1</sup>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

<sup>2</sup>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.)

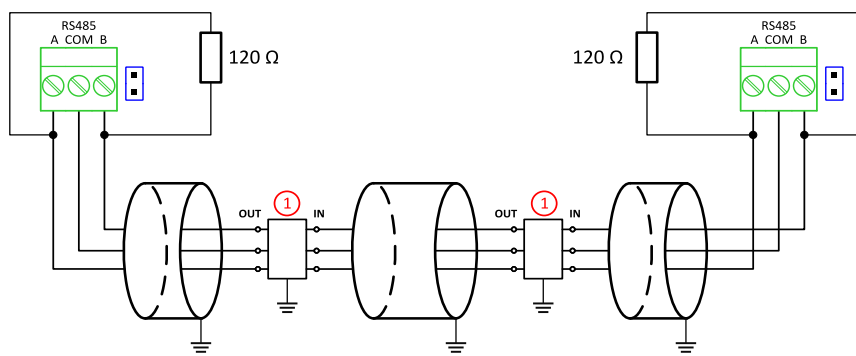


Image 4.36 RS485 wiring for longer distances

① Recommended PT5HF-5DC-ST<sup>1</sup>

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

<sup>1</sup>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.

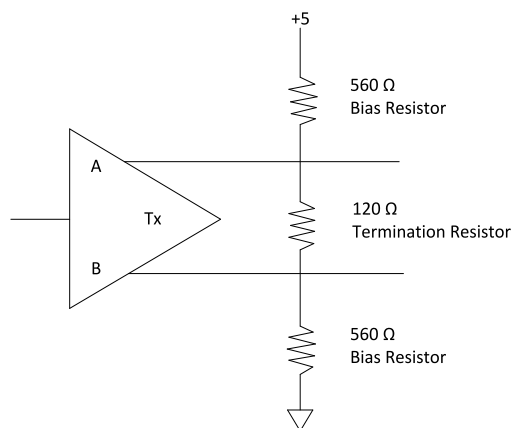


Image 4.37 Balancing resistors

120Ω terminator resistor  
Balancing resistor GND  
Balancing resistor +5V

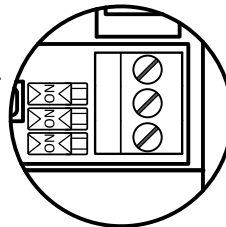


Image 4.38 RS485 on board

## 4.4.10 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.

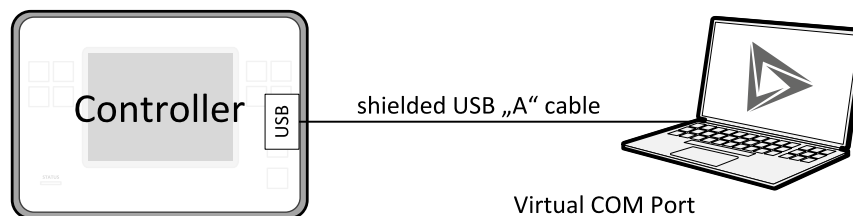


Image 4.39 USB connection

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.



## 4.4.11 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.

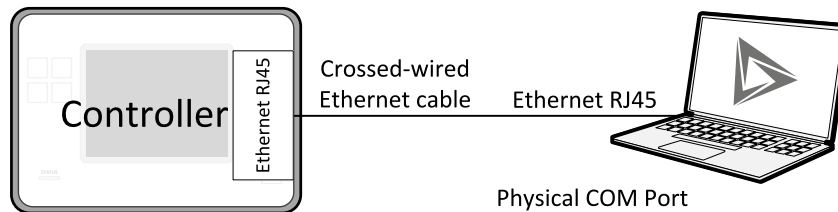


Image 4.40 Ethernet Connection

## 4.5 External display

InteliNeo 530 BESS has an integrated display. Utilizing an External Remote Displays or PC Panel Displays can be used depending on the needs. InteliNeo 530 BESS 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. Direct connection of InteliVision display to InteliNeo 530 BESS 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 530 BESS at one time.

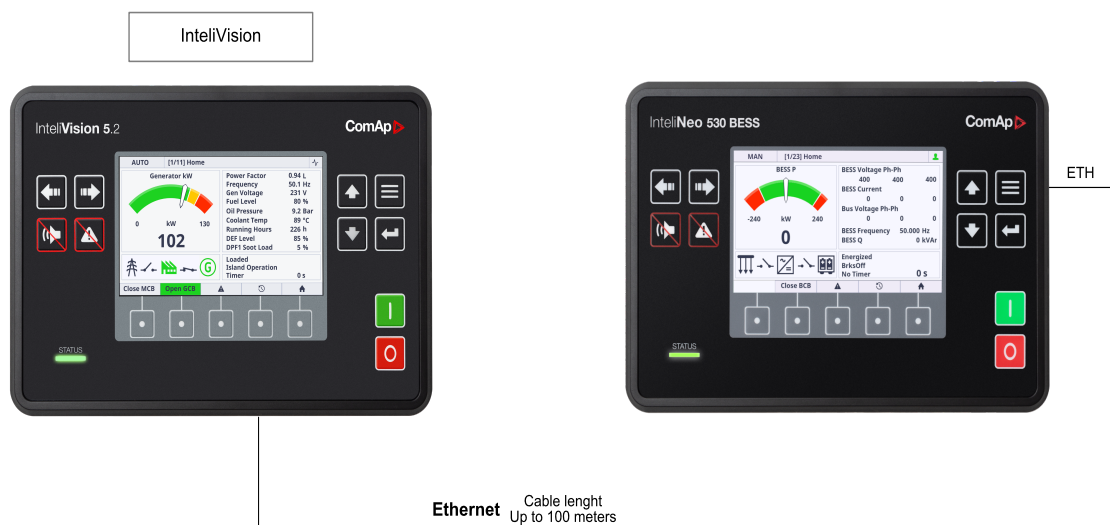


Image 4.41 Connection of InteliVision display to InteliNeo 530 BESS



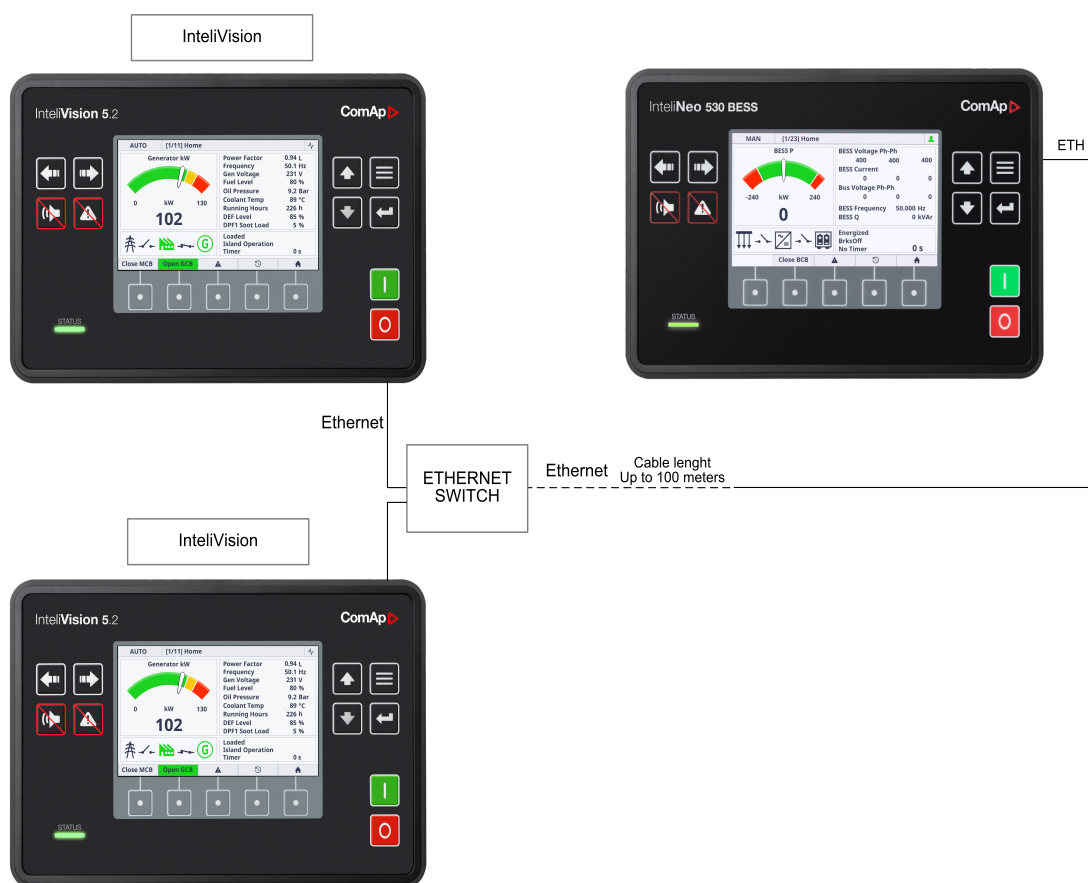


Image 4.42 Multiple connection to a single controller via switch

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

**Note:** IntelliVision 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.

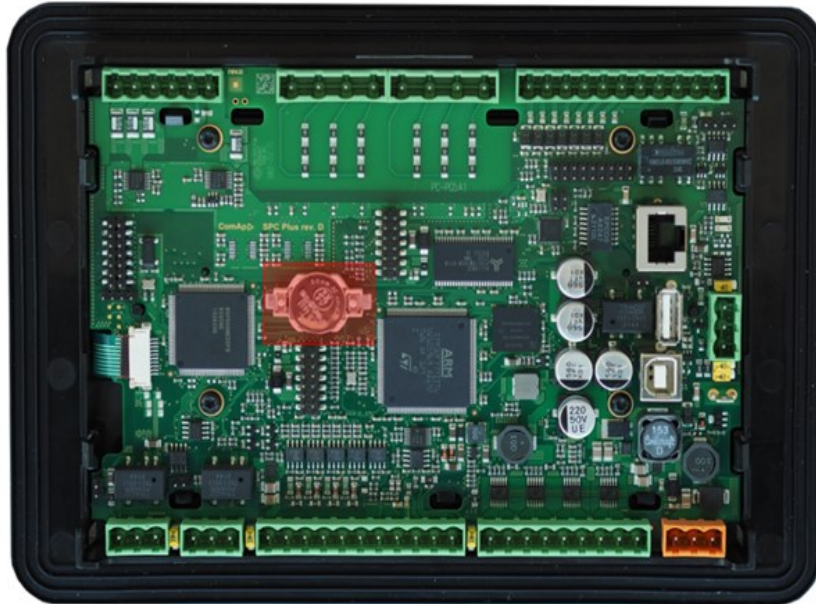




- The battery is located in a holder on the circuit board. Remove the old battery with a small sharp screwdriver and push with a finger the new battery into the holder.



**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.

🔍 **back to Installation and wiring**



# 5 Controller setup

- 5.1 Operator Guide ..... 79
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- 5.3 Default configuration ..... 125
- 5.4 General functions ..... 126
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# 5.1 Operator Guide

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## 5.1.1 Front panel elements

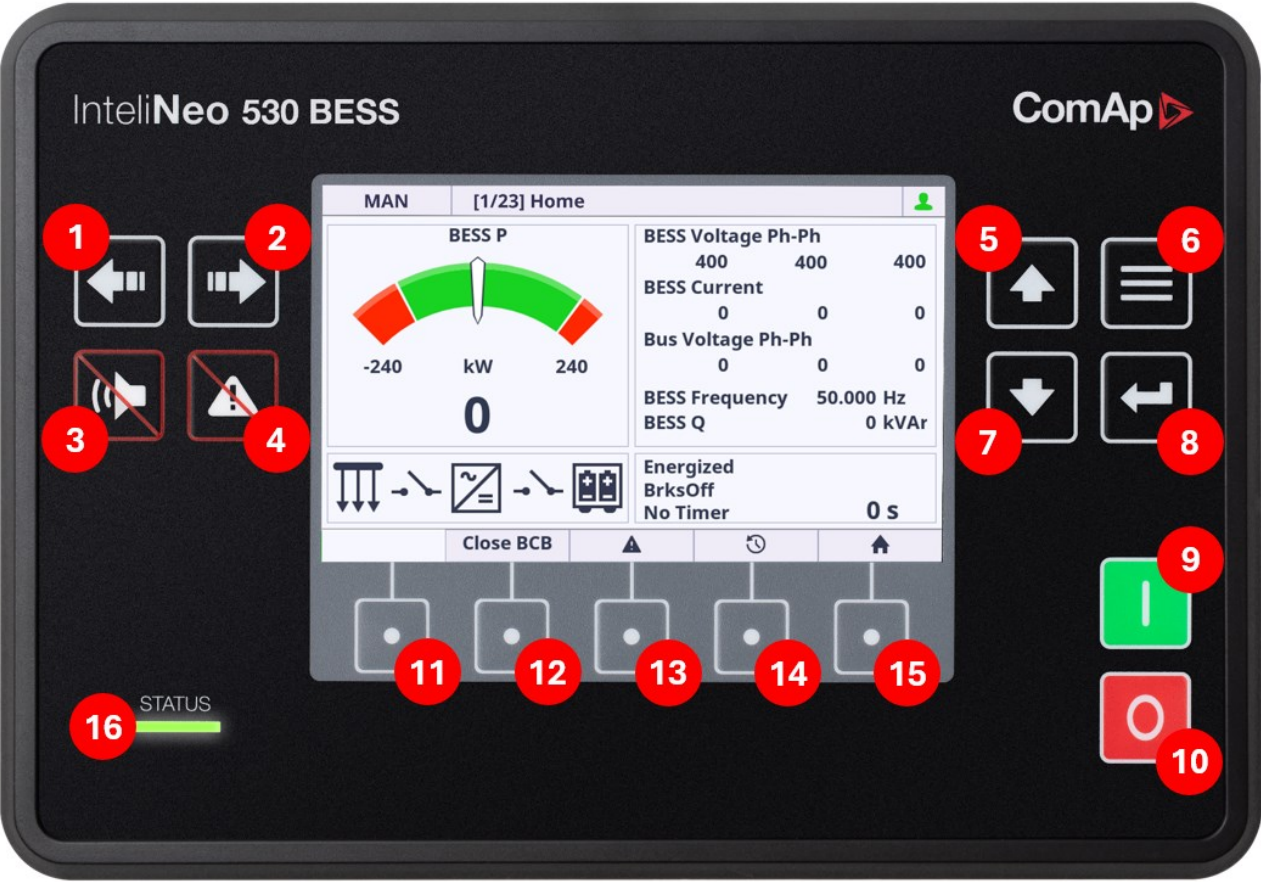














Image 5.1 Operator interface of IntelliNeo 530 BESS

Control buttons		
Position	Picture	Description
1		<b>LEFT</b> button. Use this button to move left or to change the mode. The button can change the mode only if the main screen with the indicator of currently selected mode is displayed.



		<b>Note:</b> This button will not change the mode if the controller mode is forced by one of binary inputs listed in the Reference Guide – "Operating modes" chapter.
2		<b>RIGHT</b> button. Use this button to move right or to change the mode. The button can change the mode only if the main screen with the indicator of currently selected mode is displayed. <b>Note:</b> This button will not change the mode if the controller mode is forced by one of binary inputs listed in the Reference Guide – "Operating modes" chapter.
3		<b>HORN RESET</b> button. Use this button to deactivate the horn output without acknowledging the alarms.
4		<b>FAULT RESET</b> button. Use this button to acknowledge alarms and deactivate the horn output. Inactive alarms will disappear immediately and status of active alarms will be changed to "confirmed" so they will disappear as soon as their reasons dismiss.
5		<b>UP</b> button. Use this button to move up or increase value.
6		<b>PAGE</b> button. Use this button to switch over display pages.
7		<b>DOWN</b> button. Use this button to move down or decrease value.
8		<b>ENTER</b> button. Use this button to finish editing a setpoint or moving right in the history page.
9		<b>START</b> button. Works in MAN mode only. Press this button to initiate the start sequence of the engine.
10		<b>STOP</b> button. Works in MAN mode only. Press this button to initiate the stop sequence of the BESS. Repeated pressing of button will cancel current phase of stop sequence (like cooling) and next phase will continue.
11		<b>MCB</b> button. Works in MAN mode only. Press this button to open or close the MCB.
12		<b>GCB</b> button. Works in MAN mode only. Press this button to open or close the GCB.
13	<b>ALARMLIST</b> button. Use this button to get to the alarmalist screen.	
14	<b>HISTORY</b> button. Use this button to get to the history screen.	
15	<b>HOME</b> button. Use this button to get to the main screen.	
16	<b>Multicolor (RGB) LED.</b> The specified color and flashing function describes the actual state of the unit. For more information <b>see Status LED Indication on page 81.</b>	



## Status LED Indication

- 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 brightness 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

### Color and flashing function meaning:

- Red is flashing
  - Active unconfirmed level2 (shutdown) alarm
  - Inactive unconfirmed level2 (shutdown) alarm
  - Lost of internal communication line
  - Controller unit in init state
- Red lights
  - Active confirmed level2 (shutdown) alarm
  - Integrated color display unit in init state
  - Integrated color display unit booting procedure
- Cyan lights
  - temperature inside the housing exceeded the 85 °C (185 °F)
- 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
- Green lights
  - unit is running correctly without any errors or alarms

### Color state priority:

1. Red is flashing
2. Red lights
3. Cyan lights
4. Yellow lights
5. Green lights

🔍 back to Front panel elements

## 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:



- Metering screen
- Alarmlist
- Setpoints
- History
- Trends
- Values (applicable only in supported controllers)
- 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 IntelliConfig). The Screen Editor tool also has its own manual.

## Special screens

There are 2 special screens stored in the unit:

- Init screen
  - displayed during the booting procedure and in Administration menu
  - dedicated for specific user logo (by default predefined by ComAp)
- Service screen
  - displayed in Administration menu
  - dedicated for useful technical information (by default predefined by ComAp)

**Note:** More information about Init and Service screen modification is described in concrete chapter of this manual.

## Dialogs

Values and parameters and other can be set in the controller via dialogs. There are several dialogs in the GUI. Dialogs for numbers, texts and lists.

**Note:** Function and User buttons work on background (e.g. if any dialog is displayed).

**IMPORTANT:** Each dialog has its own structure corresponding to the value type.

**IMPORTANT:** QR Code is displayed on each dialog. Together with ComAp Smart Hint application the QR Code is dedicated for further help. Simply read the QR Code using Smart Hint application to get a help about actually edited setpoint.



### Dialog 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.

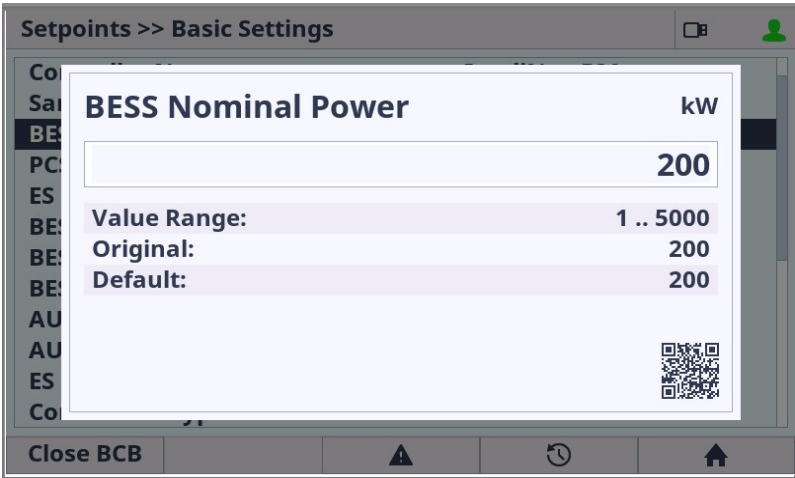


Image 5.2 : Dialog Value overview

### Dialog 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.

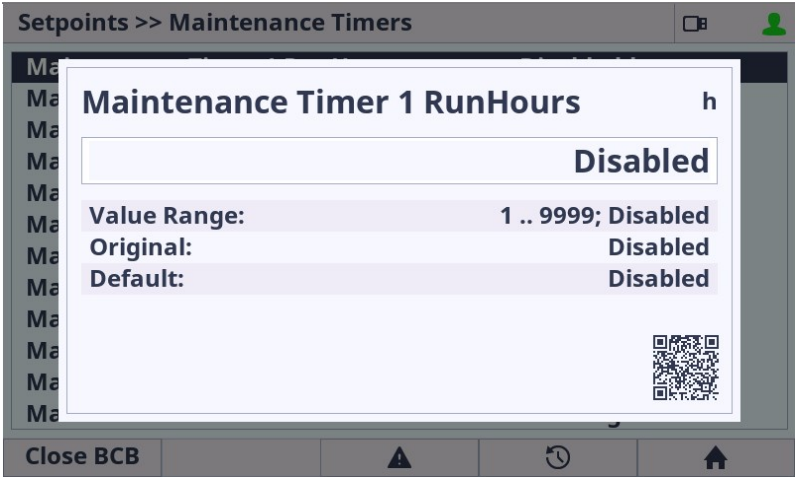


Image 5.3 : Dialog Value Extended overview



### Dialog String List

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.

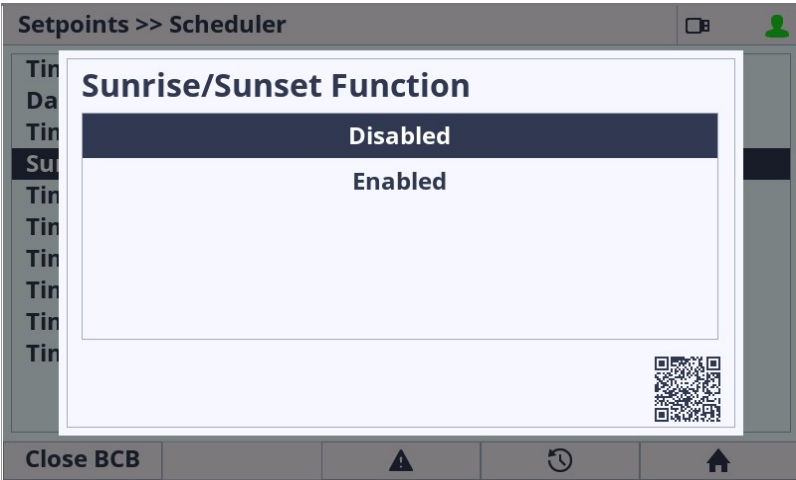


Image 5.4 : Dialog String List overview

### Dialog Text

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 actually 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.

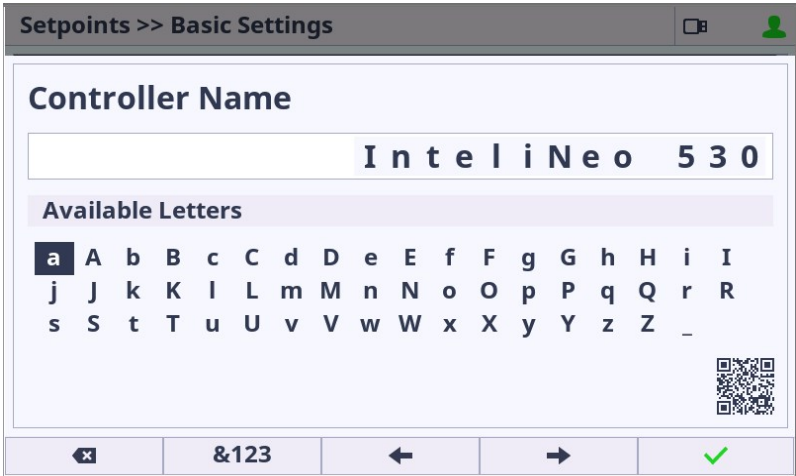


Image 5.5 : Dialog Text overview

Improved dialog for text inserting from version ICD 1.4.0 allows users better and user frinedly control. Arrows are used for movement in letter table. Enter is used for letter selection/confirmation. Function buttons is used for another functions. F1 button is used to delete letter. F2 button is used for changing the letter table to special characters and vise versa. F3 and F4 buttons are used for movement inside the text field between the letters. F5 button confirms the dialog and save changes. Menu button cancels the dialog without the saving changes.



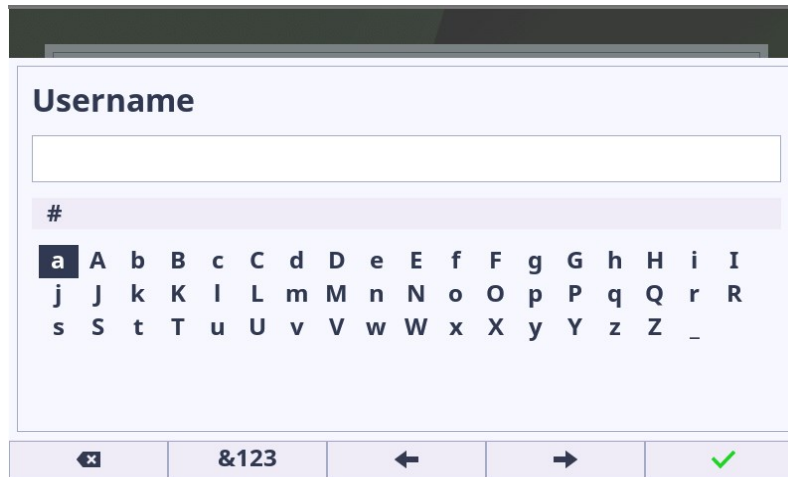


Image 5.6 : Dialog Text from ICD firmware version 1.4.0

**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.

## Dialog 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.

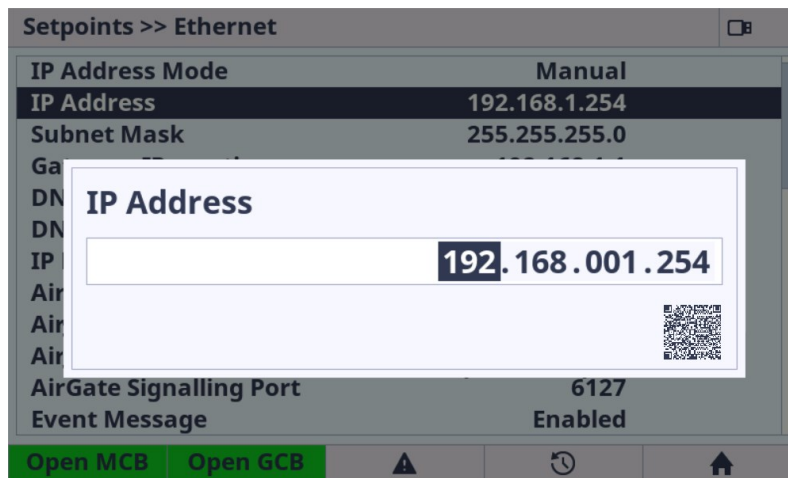


Image 5.7 : Dialog IP address overview

## Dialog Message

The dialog message has informal character about the result of any action. Enter or Menu button cancels the dialog without saving. There is no need to confirm the selection. There two types of message dialogs :

- > Stop - dedicated for error indication
- > Information - dedicated for general message



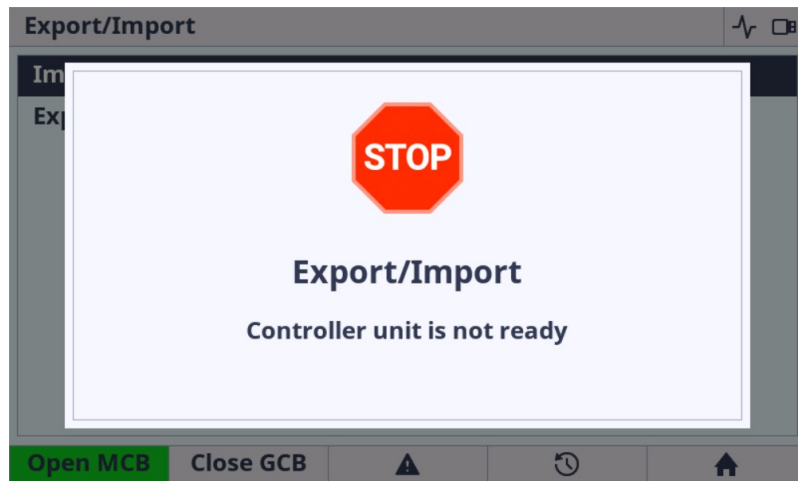


Image 5.8 : Dialog Message overview

## Dialog Progress

The dialog progress has informal character about the result of any action. The progress bar and percents are also displayed during the action performing. Enter or Menu button cancels the dialog without saving. There is no need to confirm the selection.

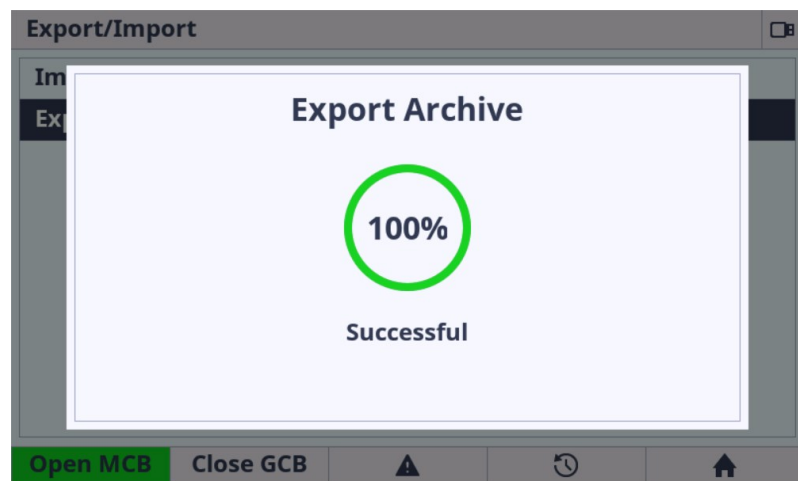


Image 5.9 : Dialog Progress overview



### Dialog 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.

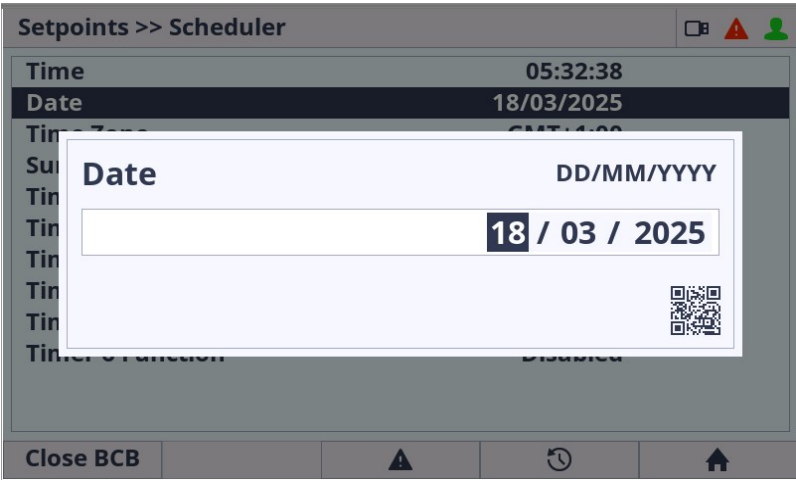


Image 5.10 : Dialog Date overview

### Dialog 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.

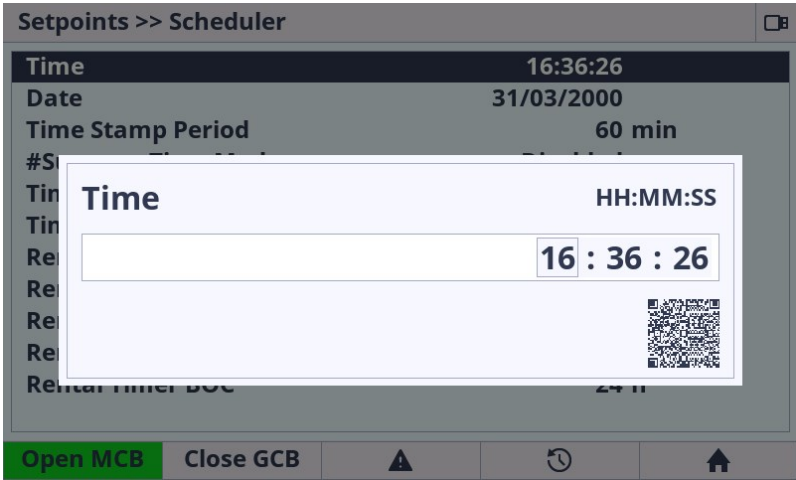


Image 5.11 : Dialog Time overview



## Dialog Login

The dialog login is dedicated for login 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.

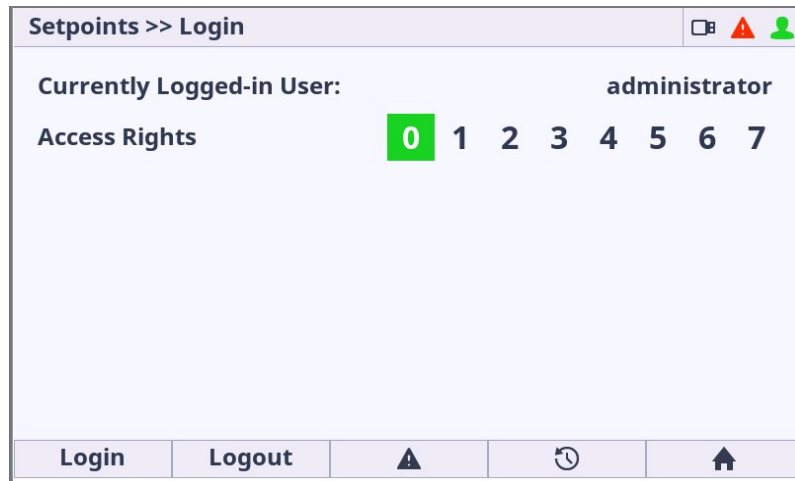


Image 5.12 : Dialog Login overview

## 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. GCB open, GCB close, etc.), jump to the specified page (e.g. alarmlist, history) or special functions on some pages.



Image 5.13 : Example (bottom status bar on Home metering screen)

1. **User button 1** – emitting the command to the controller or link to page in GUI or special function
2. **User button 2** – emitting the command to the controller or link to page in GUI or special function
3. **User button 3** – emitting the command to the controller or link to page in GUI or special function
4. **User button 4** – emitting the command to the controller or link to page in GUI or special function
5. **User button 5** – emitting the command to the controller or link to page in GUI or special function

**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.



## Top status bar

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

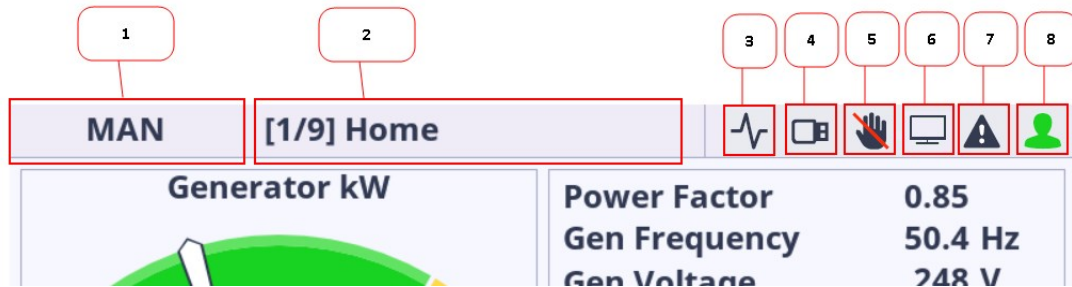


Image 5.14 Top Status Bar description



Image 5.15 : 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.
6. **PC connection** – PC connection icon is active if the unit established connection to the PC using the USB cable. Icon is inactive if there is not established connection to the PC.
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.



## 5.1.2 Display screens and pages structure

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 following pages:

- > **Metering screens**
- > **Alarmlist**
- > **Trends**
- > **Values**
- > **Administration**
  - » Page administration is accessible only by pressing the combination of the Enter and Menu buttons from the only Metering screen.

### Metering screens

Metering screens are dedicated for important controller values and setpoints.

InteliNeo 530 BESS 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
  - » Connected Plug-In modules
  - » Configured CAN modules
  - » Aftertreatment ECU list settings

### InteliNeo 530 BESS metering screens by default

1. Home
2. BESS 1/2
3. BESS 2/2
4. Bus
5. Synchronization
6. Power Management
7. Analog Inputs
8. Binary Outputs
9. Binary Inputs
10. Grid Codes
11. Statistics
12. Ethernet



13. CM-4G-GPS
14. EM-BIO8-EFCP-A
15. EM-BIO8-EFCP-B
16. CAN modules
17. ECU modules
18. Virtual modules

**Note:** Some of the screens are added automatically If external modules, ECU modules and others are added using IntelliConfig software. The screens are automatically removed if the respective module is removed from the configuration.



Image 5.16 : IntelliNeo 530 BESS metering screens overview

## 5.1.3 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 color. 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 color. These types of alarms protect the Gen-set or Engine during the wrong state.
- **ECU alarm** – represented by the BLUE color. This type of alarm comes from the connected external ECU units.
- **Sensor fail alarm** – represented by the WHITE color. A special kind of alarm that appears if any connected sensor emits the wrong state.

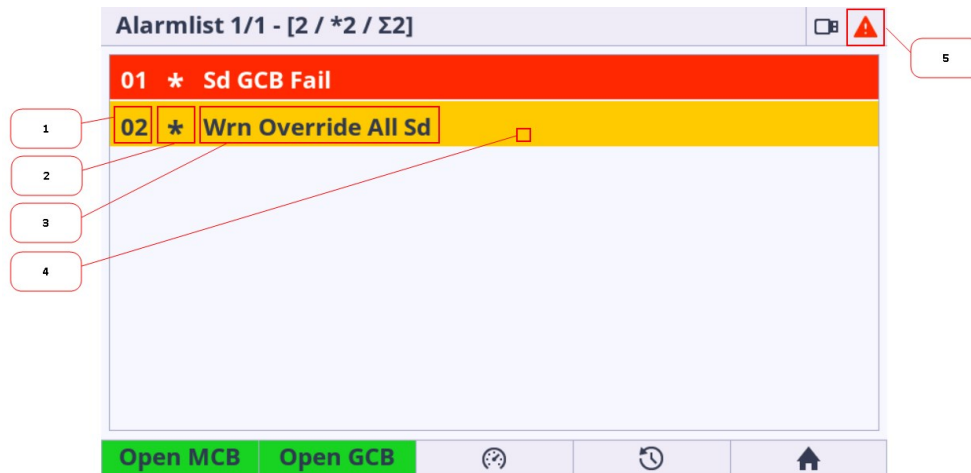


Image 5.17 : Alarmlist Page

1. **Alarm item number** – displays the number of the concrete alarm.
2. **Alarm item star** – describes if the alarm is CONFIRMED or NOT CONFIRMED. 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)
  - sensor fail alarm
    - Active/unconfirmed : **\* / white background / dark text** (asterix active)
    - Active/confirmed : **white background / dark text** (asterix inactive)
    - Inactive/unconfirmed : **\* / dark background / white 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 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. 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:** InteliNeo 530 BESS controller displays maximum of 16 alarms.

**IMPORTANT:** Alarm reset button confirms all the unconfirmed alarms stored in controller.

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

## User Access Management Alarm

By default the controller is preset with administrator password with no predefined email address for password reset procedure. Production mode is turned on. Due to security reasons the following access management alarms appear.

- **Wrn Production Mode** is present in the alarm list any time the production mode is turned on. To turn off the Production mode go to User management and uncheck the checkbox Production mode.
- **Wrn Default Credentials** appears in alarm list when the default administrator password is set. The purpose of alarm is to inform that the controller might be or is connected to an untrusted interface and cybersecurity rules are not fulfilled because there is default administrator password.
- **Wrn Password reset e-mail addr is not set** appears in alarm list when there is no email address set and the administrator password is not the default one. The purpose of alarm is to inform that there is possibility that the controller might not be accessible by administrator password due to a forgotten password. The password reset procedure cannot be performed without a filled email address. To fill out email address, the administrator password is required.

### 5.1.4 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 SPtM 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



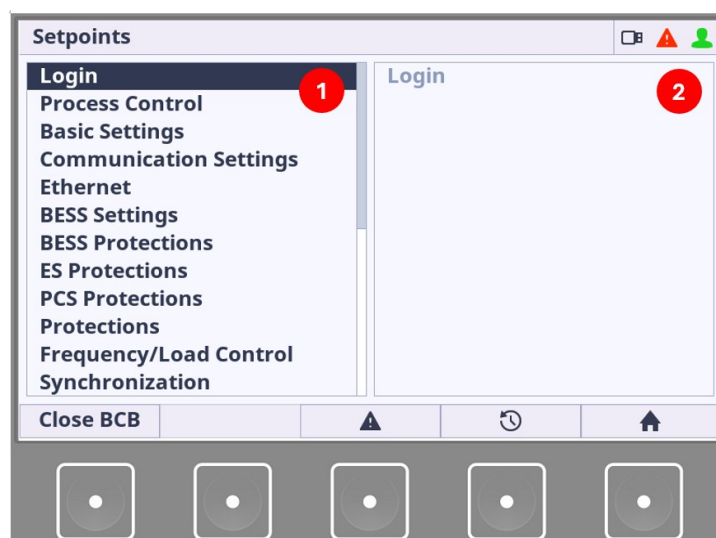


Image 5.18 : Setpoints Page overview

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.

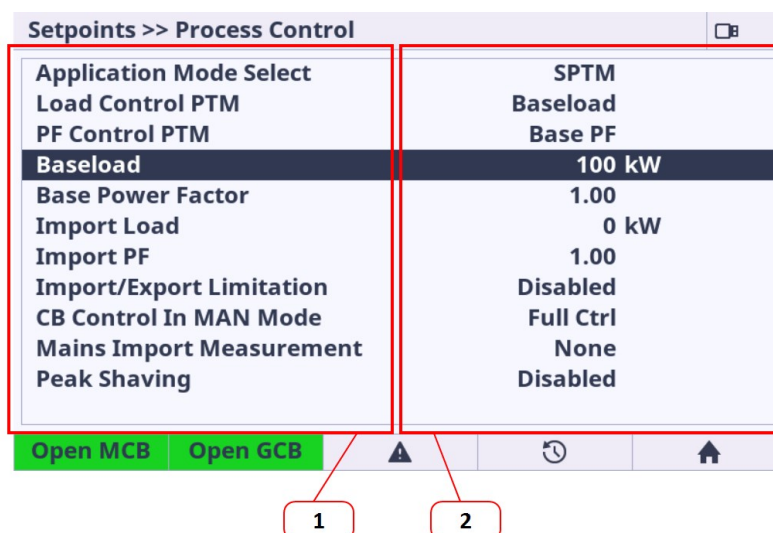


Image 5.19 : Group Setpoints Page

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 IntelliConfig.

## 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

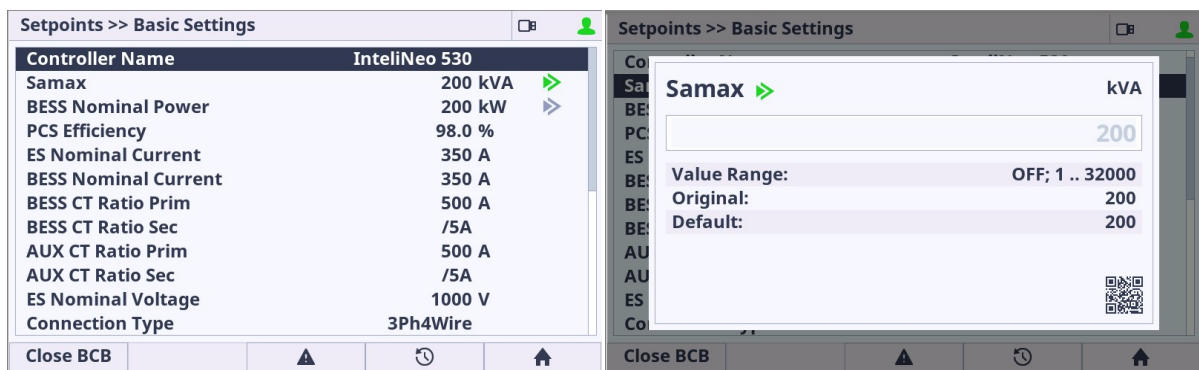


Image 5.20 : Force Value and Protected Setpoint Indication

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

## Login screen

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.

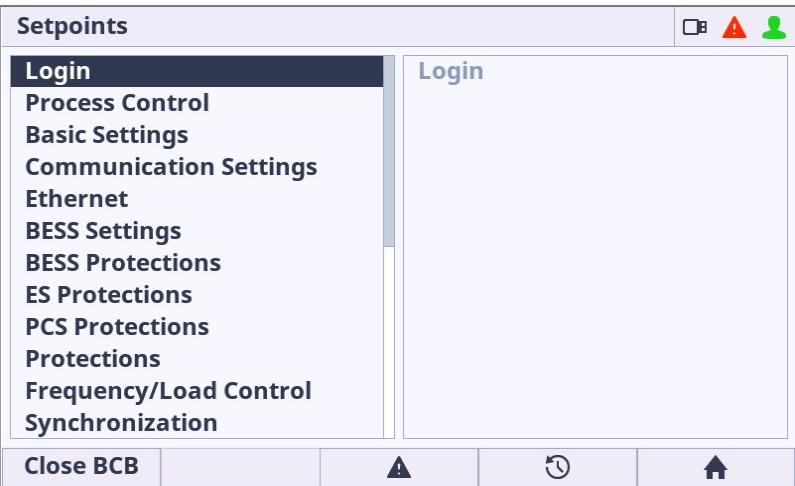


Image 5.21 : Main Setpoints Page



**Password item** – the item dedicated for the login and logout to the controller.

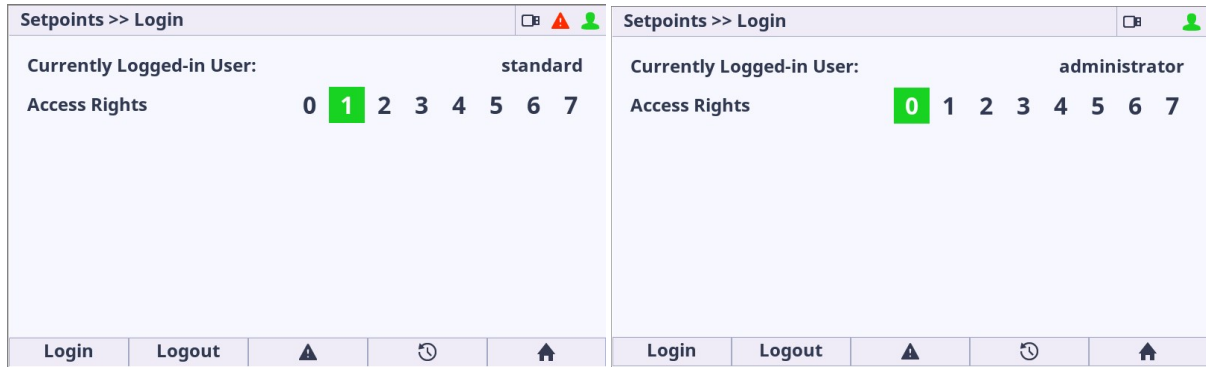


Image 5.22 : Setpoints Password Page

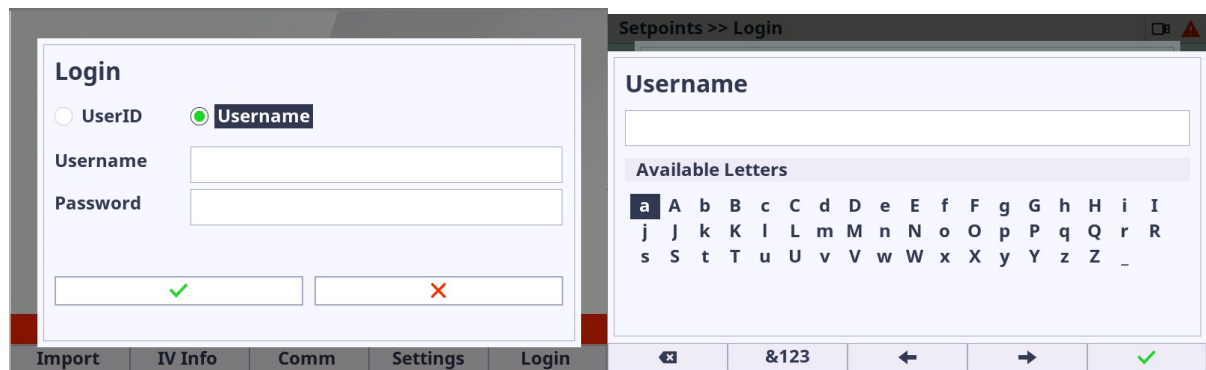


Image 5.23 : Login Dialog

**Currently Logged-in User** – the information about actually logged in user or his ID if logged 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.

## 5.1.5 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.



The screenshot shows a 'History' table with columns: No., Reason, Date, Time, and RPA. The first column is highlighted in a darker shade. A red box labeled '1' highlights the first row. A red box labeled '2' highlights the 'Reason' column. A red box labeled '3' highlights the 'RPA' column. A red box labeled '4' highlights the '1st Row/Col' button. A red box labeled '5' highlights the '1x' button.

No.	Reason	Date	Time	RPA
0.	Sd GCB Fail	25/02/2000	00:33:23	
-1.	SetpointChange	25/02/2000	00:30:44	T=USB C
-2.	Ready	25/02/2000	00:27:23	
-3.	Wrn Override All Sd	25/02/2000	00:27:21	
-4.	Gen-set Stop	25/02/2000	00:27:19	
-5.	Loaded	25/02/2000	00:27:18	
-6.	Soft Load	25/02/2000	00:27:12	
-7.	Sd GCB Fail	25/02/2000	00:27:12	

1st Row/Col 1x

Image 5.24 : 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.

The screenshot shows a 'History' page with a dialog box open for 'Bus <V L3-L1'. The dialog box displays the following information:

Date	18/03/2025
Time	06:20:13
Battery Volts	23.9
0	
BESS Q	0
BESS Power Factor	0.000
BESS Power Factor	0.00
BESS Load Character	
BESS Frequency	0.000

1st Row/Col 1x

Image 5.25 : 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 IntelliNeo 530 BESS supports 500 history records (750 in the Extended features version). Default configuration consists of 33 columns. Maximal column amount is approximately 100 columns based on the type of the observed value.

## 5.1.6 Trends

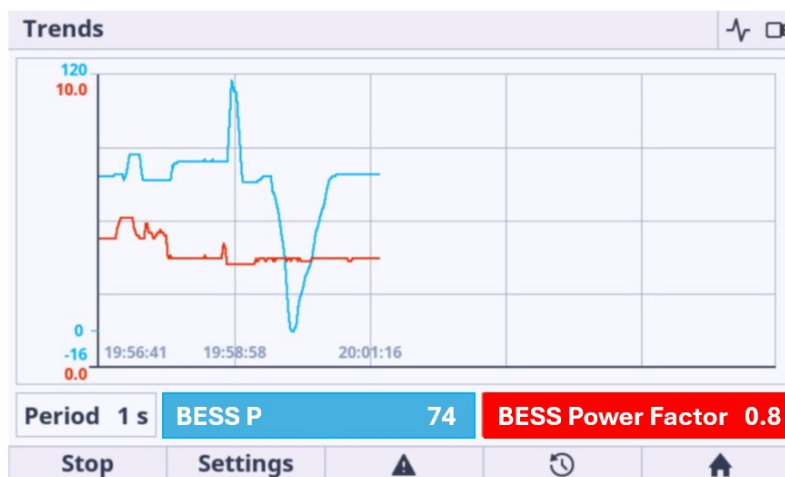


Image 5.26 : Trends page overview

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.

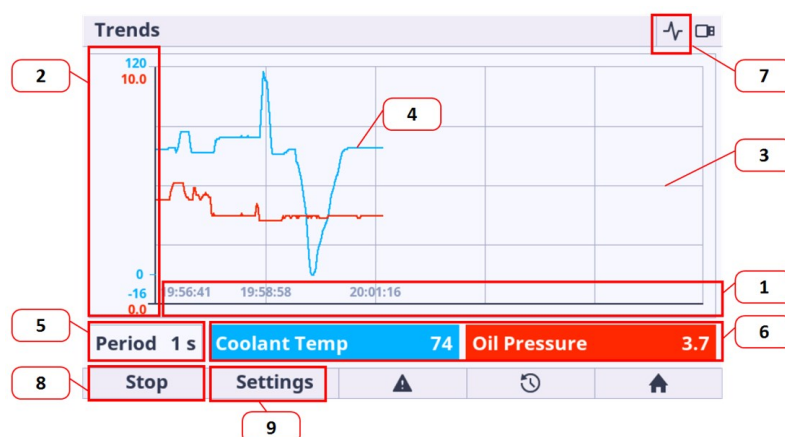


Image 5.27 : Trends page description

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 color 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.

## Trends settings

Trends settings page is dedicated for the available trends settings. The navigation in trends settings page is done by buttons arrow up, arrow down, arrow left, arrow right, enter, user button 1 and 2.

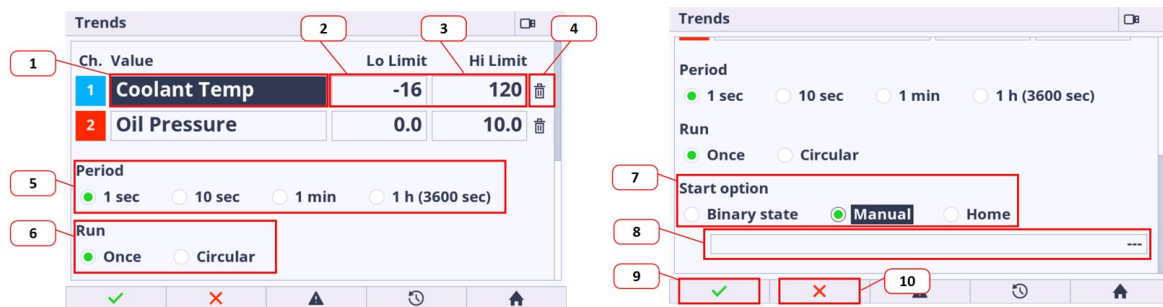


Image 5.28 : Trends page settings overview

1. **Channel value** – the channel value menu appears if the enter button is pressed just on the position. Inside the channel value menu the requested channel value can be selected. The value availability depends on the type of configuration stored in the controller.
2. **Low limit value** – the low limit value is intended for changing the low border of the value range. For the best view of the displayed trends it is highly recommended to set this limit to the minimum expected value with some reserve.
3. **High limit value** – the high limit value is intended for changing the high border of the value range. For the best view of the displayed trends it is highly recommended to set this limit to the maximum expected value with some reserve.
4. **Quick channel removal** – pressing the enter button on the trash bin icon the actual channel is not configured.
5. **Period** – section is dedicated for setting of the sample time period.
6. **Run** – the section is intended for the selection of the run mode
  - a. once – trending only until the trend chart window is full
  - b. circular – cyclic mode (trending is repeated continuously) – be aware the samples are stored only in internal temporal memory, the trend chart starts moving when the trend chart window is full, the oldest samples are trashed out
7. **Start option** – The start of trends are triggered by the start option. There are 3 start options.
  - a. Binary state - the trigger is the bit of the selected binary value. Manual start and stop is still active.
  - b. Manual (by default) – the trigger is the start button called by user.
  - c. Home – the trigger is the return to the Home metering screen from any GUI position. Manual start and stop is still active.



8. **Bit of binary value selection** – If the start option is set to Binary state then the field for the bit of the concrete binary value is activated.
9. **Acknowledgment button** – Pressing the user button 1 (Confirm) the settings are saved.
10. **Cancel button** – Pressing the user button 2 (Cancel) the settings are canceled and the main trends page is displayed without any change of the trends configuration.

**Note:** To get the best view of the displayed trends it is recommended to manually set the typical value range for each channel.

**IMPORTANT:** If the trending is started and the changes have been made in the settings the trending is restarted based on the new settings.

**IMPORTANT:** Be aware the samples are stored only in internal temporal memory. Trend chart starts moving when the trend chart window is full, the oldest samples are trashed out.

**IMPORTANT:** There is no option to store the trends to the external memories like USB stick, etc.

## 5.1.7 Values

The values page is intended to monitor the controller values. Each type of controller has specific set of values. Values screen is visually similar to setpoints screen.

To list across the values the navigation, enter and menu buttons is used.

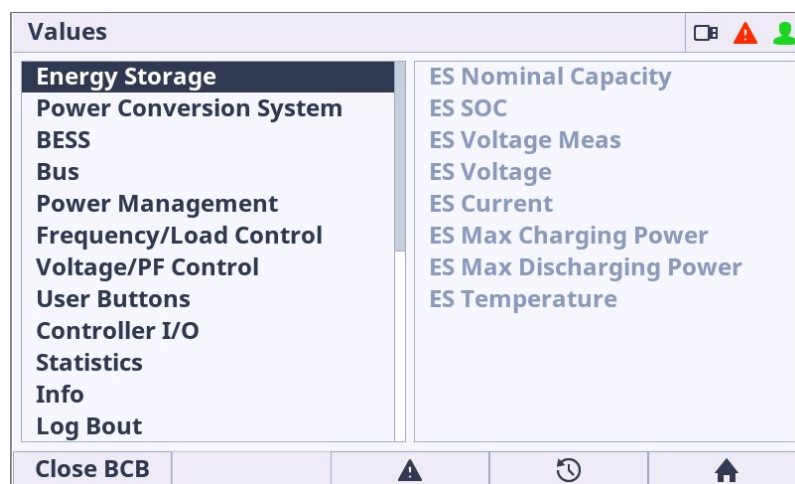


Image 5.29 : Values screen overview

## 5.1.8 Administration

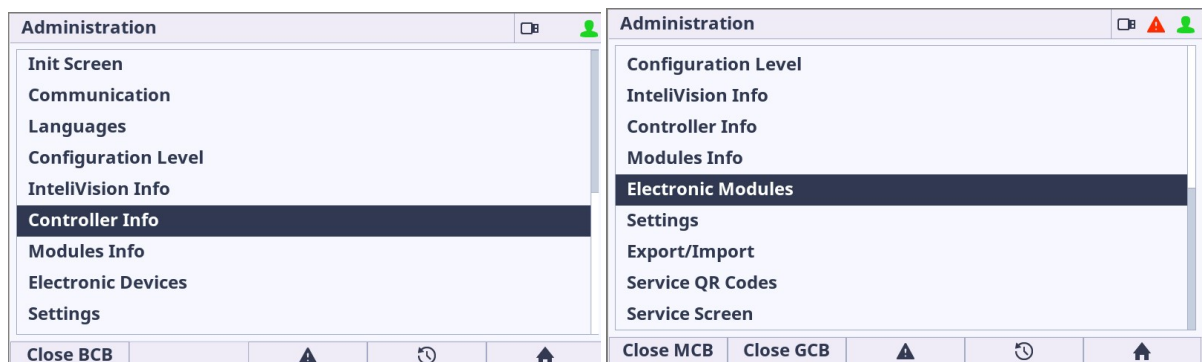


Image 5.30 : Administration Screen Overview



## Init screen

The init screen is the special screen (bitmap) defined and stored in the controller. The init screen is displayed during the booting procedure. The init screen is also accessible from administration as a first list item. The purpose of the init screen is to allow the user to create and show his own initial logo screen during the booting procedure. The init screen logo can be uploaded using the IntelliConfig. By default the init screen is predefined by ComAp.

I'm manageable  
remotely

websupervisor.net

Image 5.31 : Init screen overview

**Note:** Init 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 page is dedicated for important information about the entire unit. These information is useful mainly for issue troubleshooting .

Controller info page is divided into 3 main blocks of information :

- > Integrated Color Display unit
- > Controller unit
- > Configuration







Controller Info		  	
Name	Value		
ID String	InteliNeo 530-1.2.0.12		
Software Version	1.2.0.12		
Serial Number	24084280		
Controller Type (HW)	53		
Application Type (HW)	2		
Application Branch (HW)	1		
Hardware Type (PCB)	3		
Hardware Version	1.0.0.0		
Close BCB			
			

Image 5.32 : Administration Page – Controller Info

**Note:** Similar values with similar structure can be displayed using IntelliConfig 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.



## 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



Modules Info			
Module Name	HW Ver.	SW Ver.	Address

Image 5.33 : 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.

## Electronic Devices

Electronic Devices screen is dedicated for important information about the connected ECU.



Electronic Devices			
ID	Module Name	Device Addr.	Contr. Addr.
1	BMS 1		
2	BMS 2		
3	PCS		1

Image 5.34 : Administration Page – Electronic Devices

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

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



## Settings

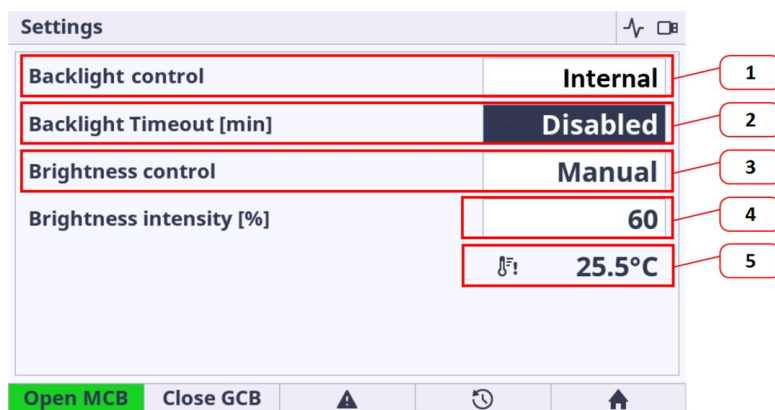


Image 5.35 : Administration Page – Settings

1. **Backlight Control** – can be controlled using Internal settings or external signal over LBI Dark Mode
  - a. Internal – Backlight timeout and backlight intensity is respected from the manual settings
  - b. LBI Dark Mode – if controller LBI Dark Mode is activated then the Status LED and LCD backlight is completely diabled. Be aware that the application and controller is still running. Keyboard is still in functional state. The Backlight Timeout is still respected in this option.
2. **Backlight Timeout** – 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 IntelliVision 5.2 the Backlight Timeout option is not mirrored with controller setpoint Backlight Timeout (it is mirrored in Integrated Color Display).
3. **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 given by the Analog Input settings in IntelliConfig and connected value of resistor, voltage or current (based on the type of the selected sensor).
4. **Brightness intensity** – the value is selected using the value dialog. Note the value is applied immediately during the change of the value.
5. **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 bellow 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 genset or engine 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 5.36 : Administration Page – Languages

- > **Language settings** – the list of languages stored in the controller configuration is displayed in the list of possible languages.
- > The integrated color display unit supports the following languages
  - » English
  - » Chinese
  - » Japanese
- > The integrated color display unit **partially** supports 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, Lithuanian, Vietnamese, Italian, Portuguese, Bosnian
- > The integrated color display unit supports 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, Katakana, Hangul Jamo, Thai

**IMPORTANT:** Even the language is configured in IntelliConfig the specific language is unavailable if the language is available in configuration (but empty) or the language is not supported by integrated color 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.



## Configuration Level



Image 5.37 : 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 IntelliConfig 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.

## Export/Import

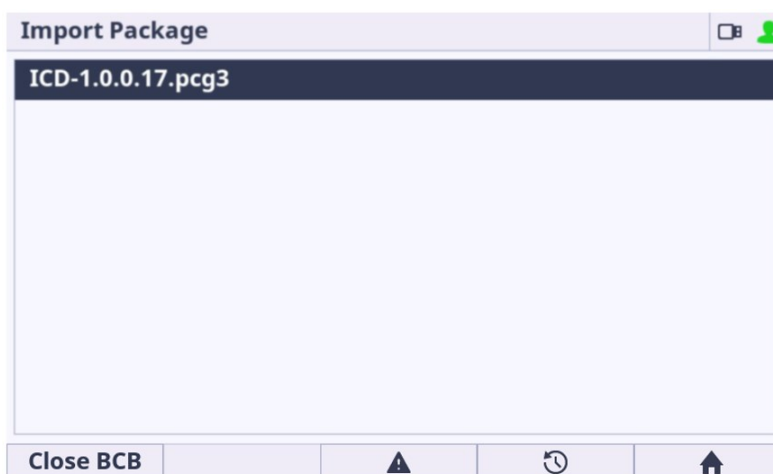
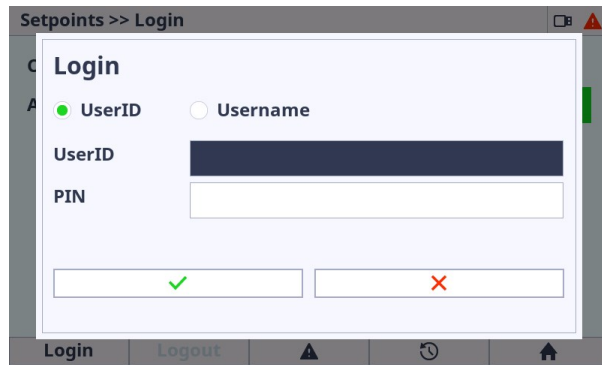


Image 5.38 : Administration Page – Export & Import

- **Import Package** – is dedicated for integrated color display unit firmware updated, controller firmware update, controller archive update. Extension modules firmware update is not supported.
  - » If the USB stick is not connected the import function is not available and visually indicated as a greyed text.



- » File packages used for firmware import can be prepared only in InteliConfig PC application **only**.
- » The files (\*.pcg3) prepared in InteliConfig (for import) must be stored in the root of USB stick folder – the only root folder is supported for import.
- » Import function is always protected by Administrator password. Until the correct credentials are not inserted the import function is unavailable. Be aware that there is implemented algorithm to have password protected against the brute force attempts. It is possible to insert credentials using UserID and PIN or Username and Password.



- » The message dialog (Controller unit is not ready) is displayed if the controller is not in state ready for programming (e.g. Gen-set running)
- > **Export Archive** – is dedicated for the entire archive export.
  - » If the USB stick is not connected the export function is not available and visually indicated as a greyed text.
  - » The archive files (Manual Specific.Archiv file) is exported to the fixed directory in the USB stick (root:/IG500/Archive. The directory structure is automatically created if does not exist.
  - » Export function is not protected by password.
  - » The message dialog (Controller unit is not ready) is displayed if the controller is not in state ready for archive export (e.g. Gen-set running)
  - » Waiting dialog is displayed during the export process.
  - » The message dialog is displayed after archive process.
    - » Archive Export Successful if successfully exported.
    - » Archive Export Failed if any error occurs during the export process.
  - » Integrated color display unit is restarted after export process.

**Note:** Once the USB stick is inserted to the display unit the directory and its subdirecotries are created automatically if does not exist.

**IMPORTANT:** Requested files to be imported must be saved in the root directory on a USB Stick.



## Imported File selection

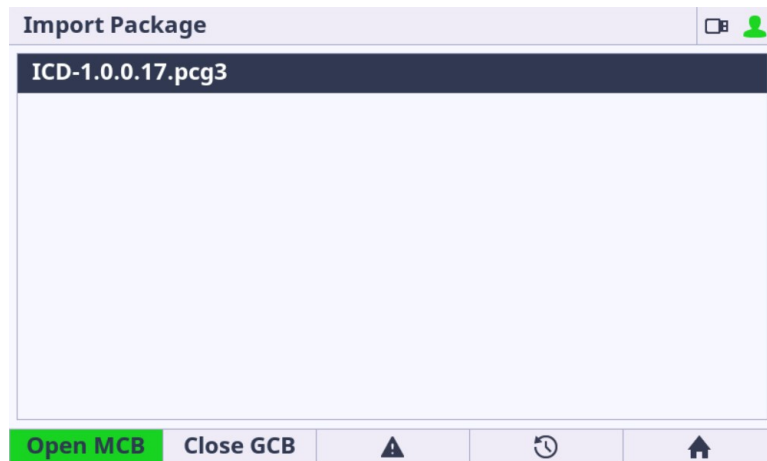


Image 5.39 : Administration Page – Export & Import – File selection

- **File selection** – is available if the conditions above (in section Import Package) is fulfilled
  - Only files with pcg3 extension is displayed.
  - Maximum 100 files (\*.pcg3) in root is displayed.
  - The message dialog (Package Incompatible) is displayed if the incompatible pcg3 file is used
  - The message dialog (Invalid File) is displayed if the pcg3 file is invalid or corrupted

## Import process

Import Package			
Name	Actual	Package	
HMI Logo	N/A	N/A	
HMI Fonts	1.0.0.0	1.0.0.0	
HMI Images	1.0.0.5	1.0.0.5	
HMI Firmware	1.0.0.900	1.0.0.17	⚠
HMI Service screen	N/A	N/A	

Image 5.40 : Administration Page – Export & Import – Import process

- **Import process** – is available if the correct and compatible file is selected conditions above (in section Import Package) is fulfilled
  - The import process is not allowed if at least one file in the package is not compatible with each other – the Import button is not displayed.
  - When the Import process is started it is not possible to interrupt it.
  - Bar Message is displayed
    - Package Import Successful (green colored) – if success
    - Package Import Failed (red colored) – if any error during the process



- » the user is informed about the actual item progress
  - » ✓ – the file has been imported correctly
  - » ... – the file import is under progress
  - » ⚠ – the file is incompatible
- » The device is rebooted after import process.

**IMPORTANT:** Integrated color display unit firmware is updated in two steps. Firstly the firmware is uploaded to the internal memory (indicated by icon ✓). The second step is the firmware update from internal memory. The firmware is updated immediately after reboot using bootloader (Indicated by progress bars and messages in limited GUI). After all the unit is automatically started with new firmware.

**IMPORTANT:** Only in some special cases the import process using USB stick must be performed twice. This situation is always described in New Feature List with more detailed information.

**IMPORTANT:** Only FAT16 and FAT32 file system on USB stick are supported.

**Note:** If the USB stick is plugged in the Import/Export page is automatically displayed.

**Note:** If the import process fails try the import process again.

**Note:** If the import process fails try to create new package file using IntelliConfig.

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

## Service QR Codes

Service QR Codes screen is dedicated for easy maintenance and technical support. Together with ComAp Smart Hint application the usage of the small display is even easier.

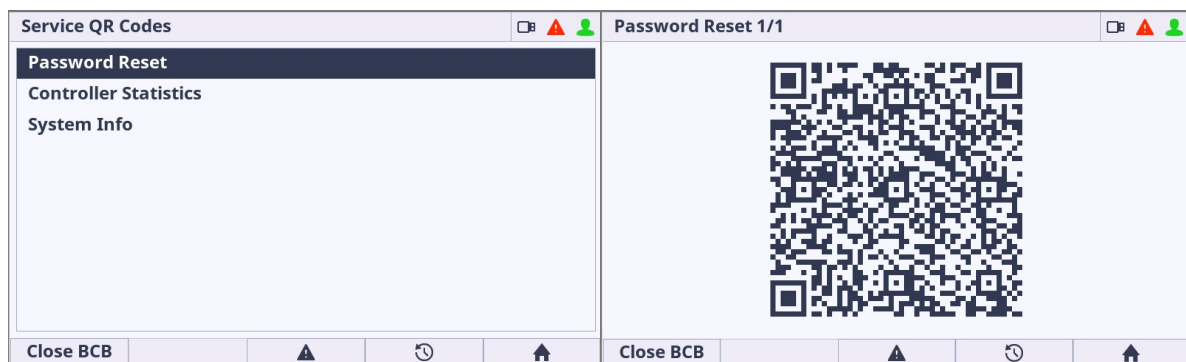


Image 5.41 : Administration Page – Service QR Codes

1. **Password Reset** – Password Reset function is dedicated for simple handling of the password reset procedure. Scan the QR code using the Smart Hint application and send the reset code to the ComAp technical support.
2. **Controller Statistics** – Controller statistics data gathered during the controller operation. Smart Hint application displays the controller statistic data in one place in a readable text form and could be further investigated.
3. **System Info** – System data info in one place in Smart Hint application.



**IMPORTANT:** Each dialog in Setpoints screen consists of the small QR code which represents the name of the setpoint. Smart Hint application gives you additional help or hint of the setpoint.

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

## Service screen

The service screen is the special screen (bitmap) defined and stored in the controller. The service screen is also accessible from administration as a last list item. The purpose of the service screen is to allow the site administrator to put into the display (resp. controller) important data for technical support. The status screen can be uploaded using the IntelliConfig. By default the service screen is predefined by ComAp.



**Need technical support ?**  
Please contact your local distributor.

Image 5.42 : Service screen overview

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

## 5.1.9 Quick help

### Logging in/off to the Controller

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.

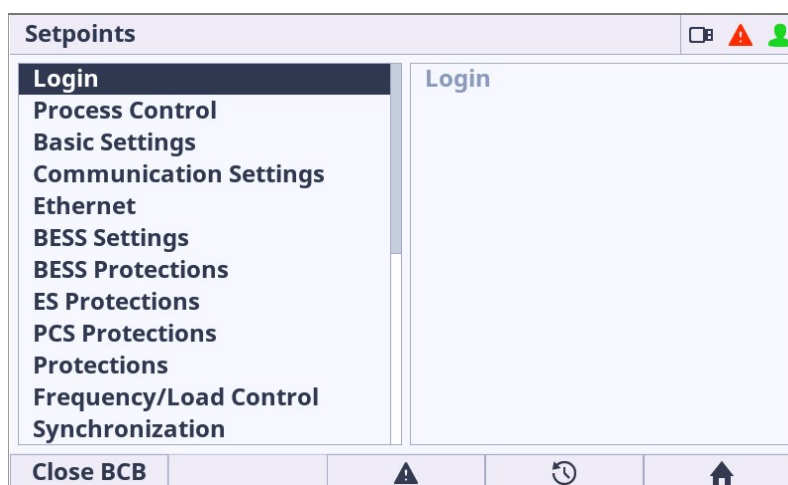


Image 5.43 : Main Setpoints Page

**Password item** – the item dedicated for the login and logout to the controller.



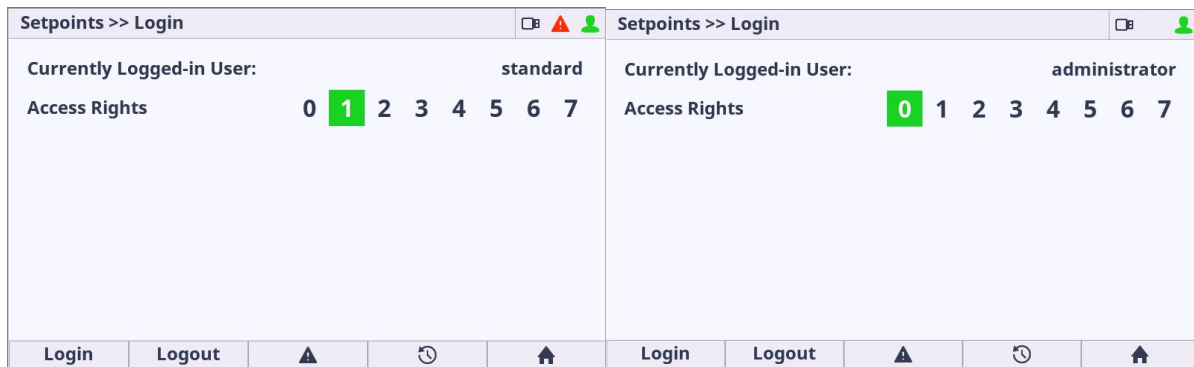


Image 5.44 : Setpoints Password Page

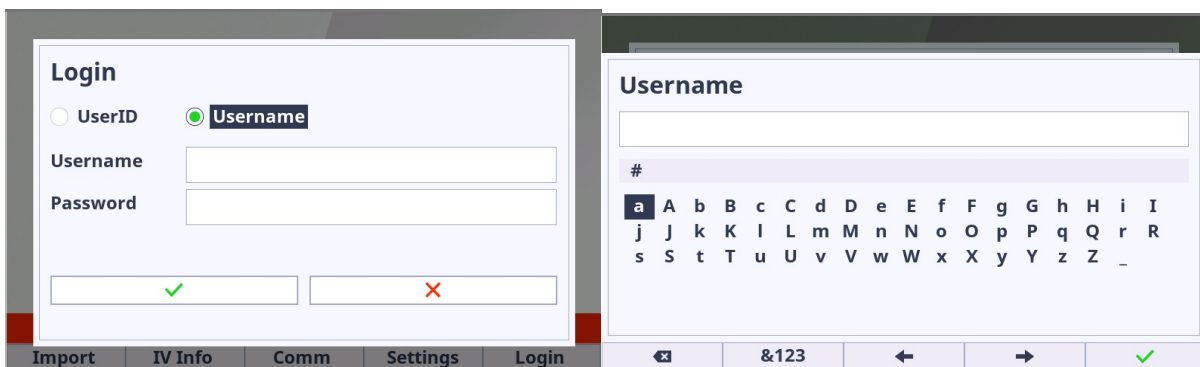


Image 5.45 : Login Dialog

**Currently Logged-in User** – the information about actually logged in user or his ID if logged 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.

**Note:** Each Access Rights password can be changed by inserting old password and new password.

**IMPORTANT:** If the setpoint is protected by password the password dialog appears when the attempt to password change is performed.

**IMPORTANT:** Be aware there is a brute force algorithm protection implemented. If the brute force protection is active then the user is informed by Invalid Password message even the password is inserted correctly.



## Important values

The important controllers values and system buttons are displayed by default and accessible from the Home, Power and Synchro metering screens. The breaker status, controller status and system timer are also displayed on the Home metering screen.

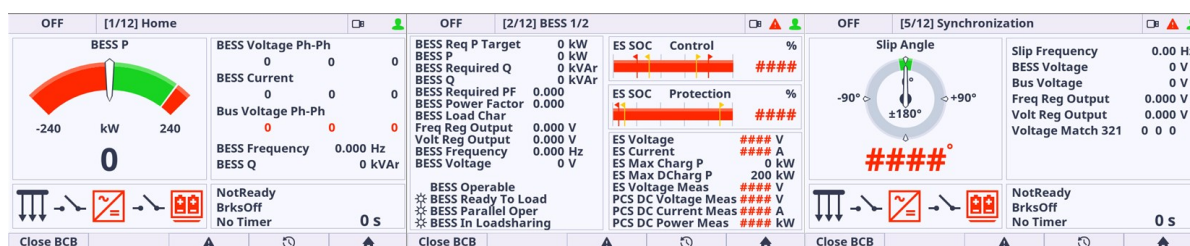


Image 5.46 : Important values

**Note:** The adjustment of the important values can be made using powerfull tool Screen Editor (in IntelliConfig).

## Gen-set mode change

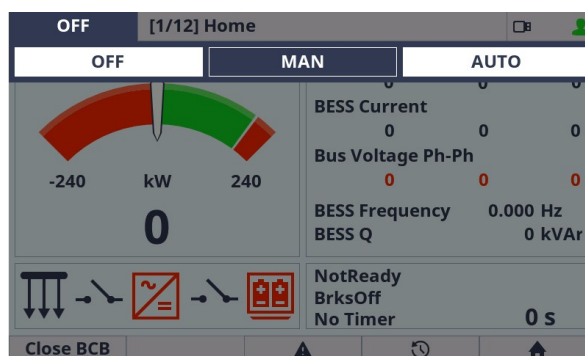


Image 5.47 : Gen-set mode change

1. Press the button arrow left or right in any metering screen
2. Change the controller mode using button arrow left or right and confirm the selection using enter button.
3. If all the controller conditions are fulfilled the Gen-set mode is changed.

**IMPORTANT:** If the controller mode setpoint is protected by password the password dialog appears when the attempt to confirm the selection is performed.

## Password change

The password change can be performed using the Password menu in Setpoint page.



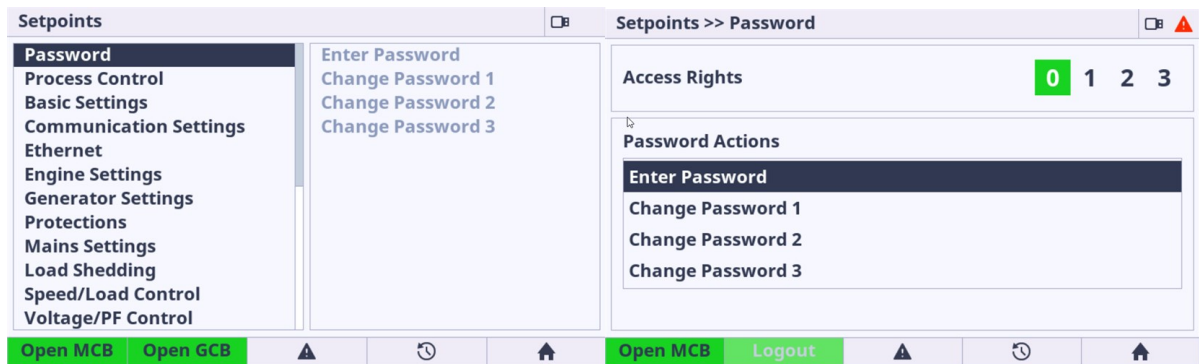


Image 5.48 : Password menu

1. Choose the item for which access right you want to change password.
2. Using password change dialog enter correct old and new requested password and confirm the choice.
3. The password for respective Access Rights level is changed.

## Display brightness settings

The display brightness setting is adjustable using the Administration Menu - IntelliVision Settings.

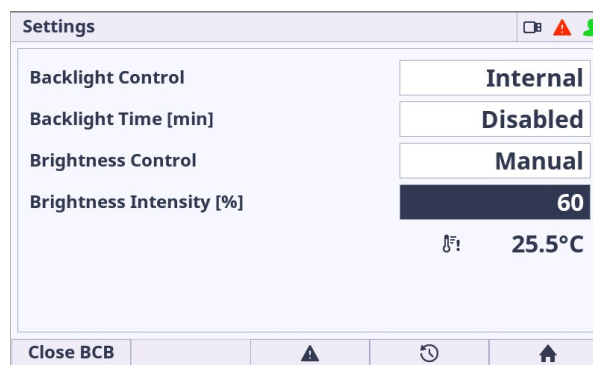


Image 5.49 : Display brightness settings

**Backlight Timeout** – can be set at a range of 1 to 254 minutes or Disabled. Disabled means the backlight never shuts down.

### Brightness control

1. If the manual mode is chosen the user is responsible for his own backlight intensity.
2. If the External mode is chosen the display unit expects the external resistor (potentiometer) on its Analog input. The type of sensor can be set in IntelliConfig.

**Brightness intensity** – The backlight intensity can be adjusted using the value dialog from 1 up to 100%. It is not possible to set 0 to avoid total shutdown of backlight intensity.

**IMPORTANT:** It is strongly recommended to use maximum backlight if it is really needed. The temperature of the LCD grows linearly with the set of LCD backlight intensity. The product lifetime is temperature dependent. In general it means higher temperature lower lifetime.

**IMPORTANT:** It is strongly recommended to set the Backlight Timeout to reasonable time (e.g 5 minutes). If the backlight is off then any button press switch on the backlight again.



## State messages

State message	Description
Running	Indication of correctly running controller.
Initialize control unit	Controller unit initialization is under progress. The message is displayed during the booting procedure.
Control unit is programmed	The controller upgrade process is under progress.
Configuration Reading	Controller configuration reading is in progress. Text disappears when controller is detected.
Detecting main CU failed	Internal communication error.
Unsupported configuration format	Configuration version is not supported
Unsupported screen format	Screens template has unsupported screen format. Screens template is missing in configuration.
Control unit firmware is corrupted	Controller unit is not in valid state.
Wrong configuration content	Content of the configuration in controller unit does not match to configuration.



## Hints

UI Position	Issue	Hint / Description
StartUp Screen	Detecting main CU failed	<ol style="list-style-type: none"> <li>1. Download the latest FW from the ComAp webpage.</li> <li>2. Import or reimport the newest ICD firmware.</li> </ol>
StartUp Screen	Not compatible application branch in CU	<ol style="list-style-type: none"> <li>1. Download the latest FW from the ComAp webpage.</li> <li>2. Import or reimport the newest ICD firmware.</li> </ol>
StartUp Screen	Firmware is corrupted	<ol style="list-style-type: none"> <li>1. Import or reimport the newest ICD firmware.</li> </ol>
StartUp Screen	Unsupported configuration format	<ol style="list-style-type: none"> <li>1. Import the newest ICD firmware.</li> <li>2. Upgrade the controller firmware to the newest version.</li> </ol>
StartUp Screen	Unsupported screen format	<ol style="list-style-type: none"> <li>1. Import the newest ICD firmware.</li> <li>2. Upgrade the controller firmware to the newest version.</li> <li>3. Check if there is at least one language in configuration using IntelliConfig.</li> </ol>
StartUp Screen	Wrong configuration content	<ol style="list-style-type: none"> <li>1. Check the controller configuration using IntelliConfig Tool.</li> <li>2. Try to rewrite the controller configuration.</li> </ol>
StartUp Screen	Controller unreachable	<ol style="list-style-type: none"> <li>1. Check if the expected controller is online</li> </ol>
StartUp Screen	Controller identification timeout	<ol style="list-style-type: none"> <li>1. Double check the wiring.</li> <li>2. Double check all the communication parameters.</li> <li>3. Double check the missing or wrong Access Code in Communication settings screen.</li> </ol>
StartUp Screen	Connecting / Connected (with IntelliGen 500)	Connecting and connected state are marked red because at that moment the user is not logged in yet. Login procedure is automatic to IntelliGen 500 controller on StartUp screen (user with access rights 0 is always logged in). Due to this fact the connecting and connected state are the transition states only on StartUp screen.
Metering Screens	Adjustment	The metering screens are adjustable using the Screen Editor (in IntelliConfig). See chapter Screen Editor for more information. The Screen Editor tool also has its own manual.
Administration	Access to administration	Administration screens is accessible using the buttons combination Enter + Menu just only from the metering screens. Enter button has to be pressed first.
Init Screen Service Screen	Adjustment	Both screens are adjustable only in Integrated Color Display unit. The feature is not available in IntelliVision 5.2 1.0.0.
Bottom Statusbar	Inactive Buttons	Inactive buttons are visually indicated as grayed button. It means that the button is not available for any reason (e.g. password protected button).
Alarmlist	Buttons Function	Alarm reset button confirms all the unconfirmed alarms stored in controller and resets the horn. Horn reset button resets only the horn.
Alarmlist	Automatic Jump	If the actual GUI position is Alarmlist page and there is at least one unconfirmed alarm in the Alarmlist the jump to the home metering screen and backlight timeout are ignored.



UI Position	Issue	Hint / Description
History	Number of Records in IntelliGen 500	The number of records is different for each controller. E.g. IntelliGen 500 supports 500 history records. Default configuration consists of 33 columns. Maximal column amount is approximately 100 columns based on the type of the observed value.
Trends	View	To get the best view of the displayed trends it is recommended to manually set the typical value range for each channel. If the channel is set the low and high limit values are automatically set based on the default value in configuration.
Trends	Communication Interruption	If the communication between display and controller is interrupted for any reason all the trends values are lost and the trending is automatically stopped. If the Trends settings option (Start option) is set to Home then the trending is automatically restarted in the moment the actual UI position becomes Home screen.
Export / Import Screen	Import process	If the import process fails try the import process again. Check if the import package is not corrupted. Try to use another USB stick.



# 5.2 Controller configuration and PC tools connection

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## ⬆ 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.

#### Connection using IntelliConfig

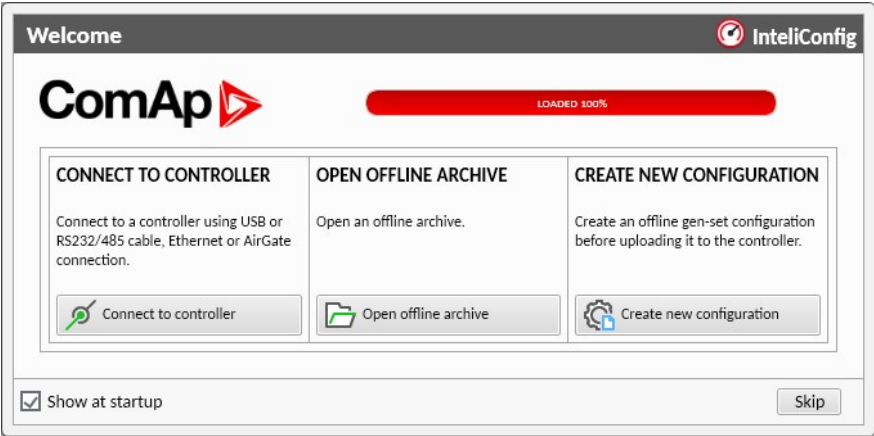


Image 5.50 First screen of IntelliConfig - select connect to controller

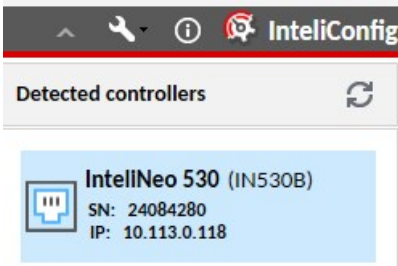


Image 5.51 Second screen of IntelliConfig - Select your controller from list of Detected controllers.

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

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



## Connection using WinScope

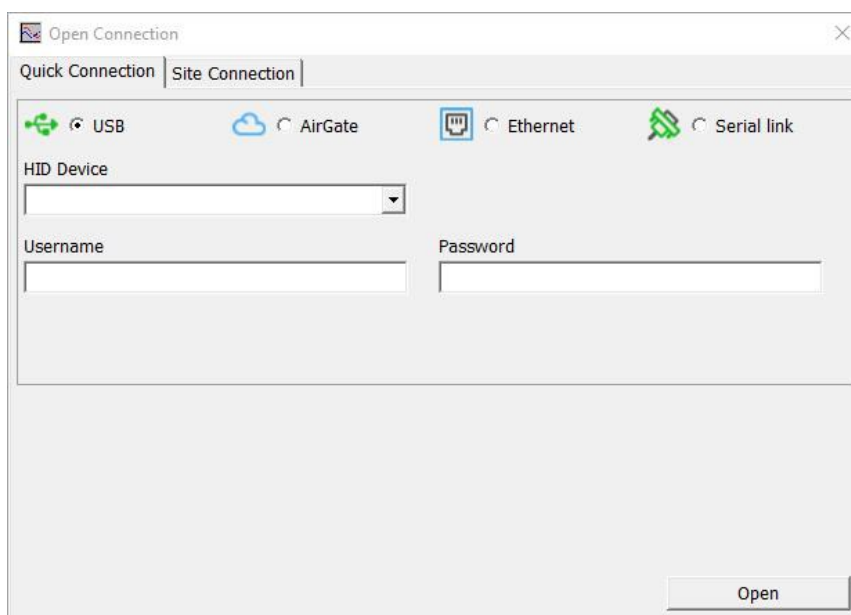


Image 5.52 WinScope 1000 screen – select USB connection

Select your controller from the HID Device drop-down list.

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

### 5.2.2 RS232/RS485

It is possible to connect to the controller using RS232 or RS485 direct connection (serial port or USB to RS232/RS485 converter may be used). The following settings should be checked in the controller:

- > **COM1 Mode** = Direct
- > **Controller Address** (page 1) must be set

## Connection using IntelliConfig

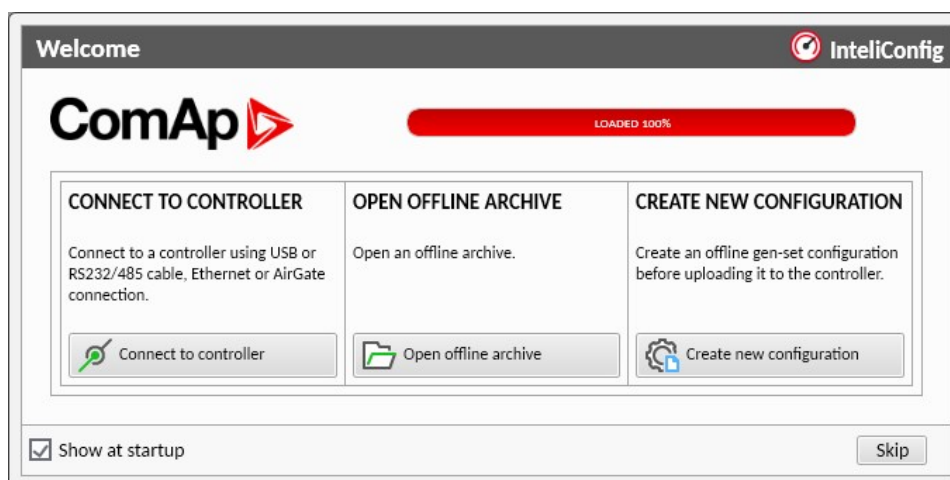


Image 5.53 First screen of IntelliConfig – select connect to controller



Online Connection    Offline Archives

☐ AirGate   
 ☐ Ethernet   
 ☒ Serial link

COM port: COM4 - USB Serial Device (COM4)   
 Controller address: 1

Username/UID:    
 Password/PIN:

**OPEN**

Image 5.54 Second screen of IntelliConfig – select Serial link

## Connection using WinScope

Quick Connection    Site Connection

☒ USB   
☐ AirGate   
☐ Ethernet   
☒ Serial link

COM Port:    
 Controller Address: 1

Username:    
 Password:

**Open**

Image 5.55 WinScope screen – select serial link

**Note:** Username and password are not mandatory.

### 5.2.3 Ethernet

It is possible to connect to the controller using Ethernet port either directly or using ComAp's AirGate service.

**Note:** Internet connection can be acquired via Onboard Ethernet, CM3-Ethernet or CM2-4G-GPS plug-in modules.

#### Direct connection

- **Controller Address (page 1)** must be set to the same value as in the PC tool
- **IP Address Mode** can be set to AUTOMATIC when there is DHCP service available. Otherwise it should 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 value
- **Gateway IP** can be set here when it is used



## Connection using IntelliConfig

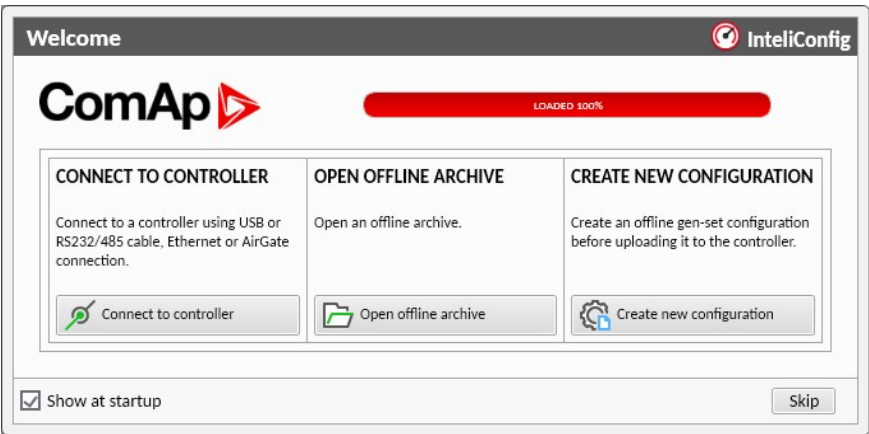


Image 5.56 First screen of IntelliConfig - select connect to controller

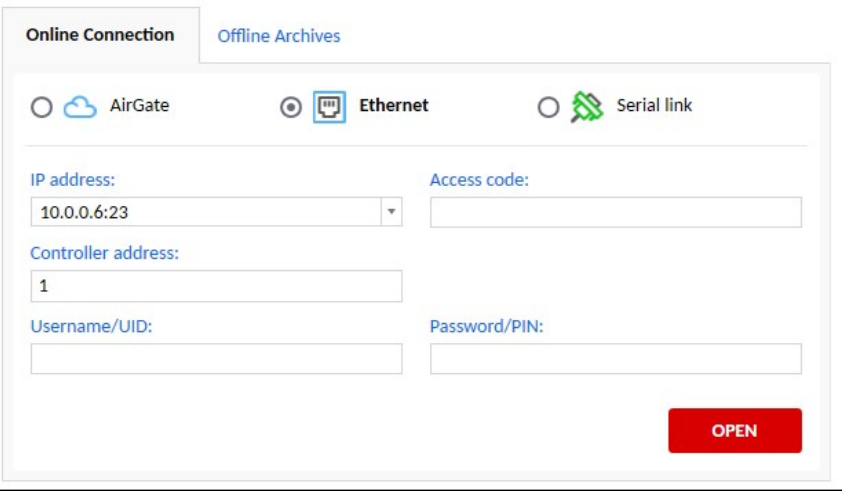


Image 5.57 Second screen of IntelliConfig - select Ethernet



## Connection using WinScope

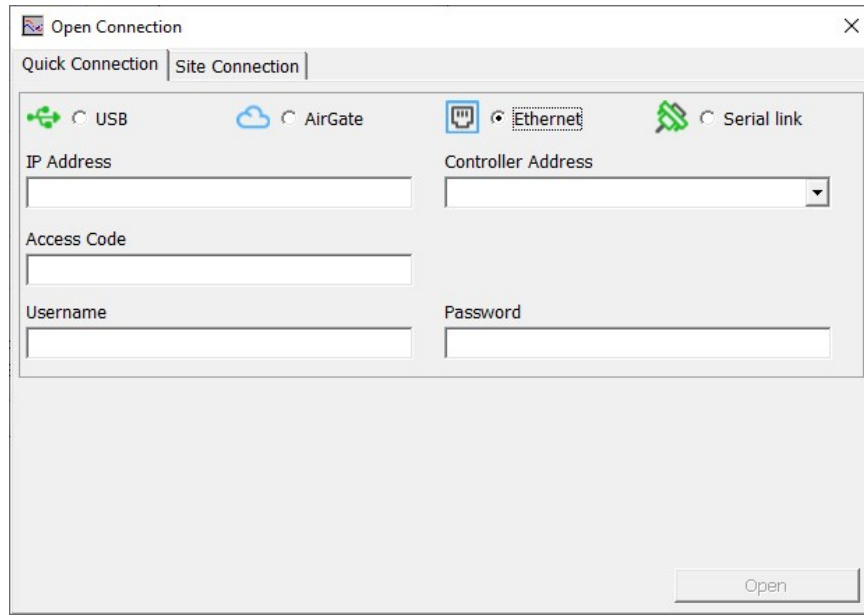


Image 5.58 WinScope screen - select Ethernet

Following information has to be filled to establish connection:

- > IP address
- > Controller address
- > User name and Password
- > Access code is required

### AirGate connection

You can use ComAp's AirGate service that allows you to connect to any controller via the internet regardless of the restrictions of the local network (as long as the controller can connect to the internet AirGate service will work). The following setpoints must be adjusted:

- > **Controller Address (page 1)** must be set to the same value as in the PC tool
- > **IP Address Mode** can be set to AUTOMATIC when there is DHCP service available. Otherwise it should 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 value
- > **Gateway IP** can be set here when it is used
- > **AirGate Address** currently there is one AirGate server running at URL [global.airgate.link](http://global.airgate.link) (enter this URL into the setpoint)

**IMPORTANT: AirGate Key has to be configured. User with administrator rights has a possibility to set up or change AirGate Key via IntelliConfig using Tools -> Access Administration -> Change AirGate Key.**



## Getting started with AirGate

1. Make sure controller has link to Internet
  - a. CM3-Ethernet is connected to LAN infrastructure, has an IP address and access to Internet
  - b. CM2-4G-GPS is connected to a mobile operator (preferably to 3G/4G network) and has an IP address
2. Connect with IntelliConfig e.g. via USB and check setpoints as follows:
  - a. *AirGate connection* = ENABLED
  - b. *AirGate port* = 54440
  - c. *AirGate address* = global.airgate.link
3. Adjust *AirGate key* in IntelliConfig – this is your "secret key" that you have to provide always when you want to connect to the controller via AirGate.



Image 5.59 Changing AirGate key

4. Wait for approx 2 – 4 minutes until the controller connects to AirGate. You can see the progress by observing the value *AirGate status* in IntelliConfig
5. When the controller is connected to AirGate it will generate *AirGate ID* for the controller. This AirGate ID is the "phone number" of the controller.

**Note:** If Onboard Ethernet, CM3-Ethernet and CM2-4G-GPS are used simultaneously the assigned AirGate ID will be different for each module, so the controller will be accessible via three different AirGate IDs.

## Connecting from IntelliConfig via AirGate 2.0

Online Connection

Offline Archives

☒ AirGate

☐ Ethernet

☐ Serial link

AirGate ID:

AirGate server:

Access code:

Controller address:

AirGate Key:

Username/UID:

Password/PIN:

OPEN



AirGate ID	controller addressing ID (see above)
Access Code	leave empty
AirGate Key	AirGate Key adjusted in controller as per description above
AirGate Server	"global.airgate.link:54441"
Username, Password	use your credentials

## AirGate operational and diagnostic information

Object	Description
<b>Not defined</b>	Indicated while the controller is actually not trying to connect to AirGate. This is initial value of the status.
<b>Wait to connect</b>	Indicated while the controller is waiting the "repetition period" before next attempt to connect to a node is performed.
<b>Resolving</b>	Indicated while the controller is resolving domain name of the node to which it is attempting to connect.
<b>Connecting</b>	Indicated while the controller is attempting to establish TCP link to the node.
<b>Creat sec chan</b>	Indicated while CCS encrypted channel is being negotiated.
<b>Registering</b>	Indicated when the CCS channel has been established until AirGate sends message "setRuntimeParams" (with any registration status).
<b>Conn inoperable</b>	Indicated when AirGate sent registration status other than "Authorized" until the status changed to "Authorized".
<b>Conn operable</b>	Indicated when AirGate sent registration status "Authorized" until the status changed to any other one.
<b>Susp AGkeyEmpty</b>	Indicated when the service is enabled but suspended due to empty AirGate key. <i><b>Note:</b> If you see this status message you have to adjust AirGate Key as per instructions above.</i>

## Connection using IntelliConfig

In order to connect to IntelliConfig following information have to be filled out:

- > AirGate Server → **AirGate Address**
- > **Controller Address (page 1)**
- > User name and Password
- > AirGate Key

**IMPORTANT: AirGate Key has to be configured. User with administrator rights has a possibility to set up or change AirGate Key via IntelliConfig using Tools -> Access Administration -> Change AirGate Key.**



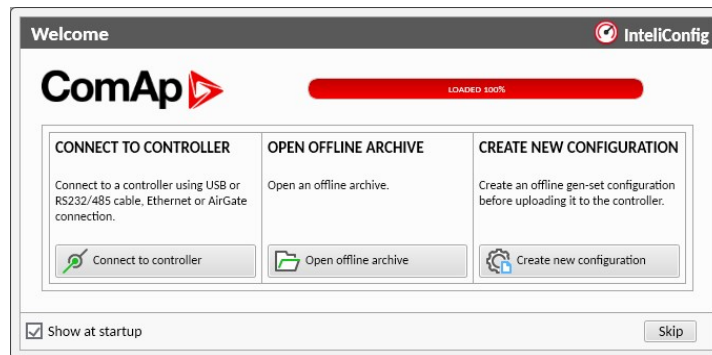


Image 5.60 First screen of IntelConfig – select connect to controller

Image 5.61 Second screen of IntelConfig – AirGate

## Connection using WinScope

In order to connect to WinScope following information have to be filled out:

- > AirGate Server → **AirGate Address**
- > **Controller Address (page 1)**
- > User name and Password
- > Device Access Key → AirGate Key
- > Access code is required

**IMPORTANT: AirGate Key has to be configured. User with administrator rights has a possibility to set up or change AirGate Key via IntelConfig using Tools -> Access Administration -> Change AirGate Key.**



Open Connection

Quick Connection | Site Connection

☒ USB ☒ AirGate ☐ Ethernet ☐ Serial link

AirGate ID

Access Code

Device Access Key

AirGate Server

Controller Address

Username

Password

Open

Image 5.62 WinScope screen – select AirGate



## 5.3 Default configuration

### 5.3.1 Binary inputs

Number	Name	Description	Configured function
<b>BIN1</b>	BCB Feedback	BESS circuit breaker feedback	<b>BCB FEEDBACK</b>
<b>BIN2</b>	CU-BIN-02	Free slot	Not Used
<b>BIN3</b>	CU-BIN-03	Free slot	Not Used
<b>BIN4</b>	CU-BIN-04	Free slot	Not Used
<b>BIN5</b>	CU-BIN-05	Free slot	Not Used
<b>BIN6</b>	CU-BIN-06	Free slot	Not Used
<b>BIN7</b>	CU-BIN-07	Free slot	Not Used
<b>BIN8</b>	CU-BIN-08	Free slot	Not Used

### 5.3.2 Binary outputs

Number	Name	Description	Configured function
<b>BOUT1</b>	BCB Close/Open	Indication of required BESS Circuit Breaker state	<b>BCB CLOSE/OPEN</b>
<b>BOUT2</b>	BCB ON Coil	Control of close coil of BCB	<b>BCB ON COIL</b>
<b>BOUT3</b>	BCB OFF Coil	Opening of BCB	<b>BCB OFF COIL</b>
<b>BOUT4</b>	BCB UV Coil	Control of undervoltage coil of BCB	<b>BCB UV COIL</b>
<b>BOUT5</b>	CU-BOUT-05	Free slot	Not Used
<b>BOUT6</b>	CU-BOUT-06	Free slot	Not Used
<b>BOUT7</b>	CU-BOUT-07	Free slot	Not Used
<b>BOUT8</b>	CU-BOUT-08	Free slot	Not Used

### 5.3.3 Analog inputs

Number	Configured sensor	Configured sensor	Configured function
<b>AIN1</b>	CU-AIN-01	Not configured	Not Used
<b>AIN2</b>	CU-AIN-02	Not configured	Not Used
<b>AIN3</b>	CU-AIN-03	Not configured	Not Used
<b>AIN4</b>	CU-AIN-04	Not configured	Not Used

### 5.3.4 Analog Outputs

Number	Name	Output HW type	Configured function
<b>AOUT1</b>	CU-AOUT-01	N/A	Free slot
<b>AOUT2</b>	CU-AOUT-02	N/A	Free slot



## 5.4 General functions

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

 **back to Controller setup**

### 5.4.1 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 (page 1)** with **Fixed Protection States**.
- Each alarm is written to the **Alarmlist (page 1)**.
- 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

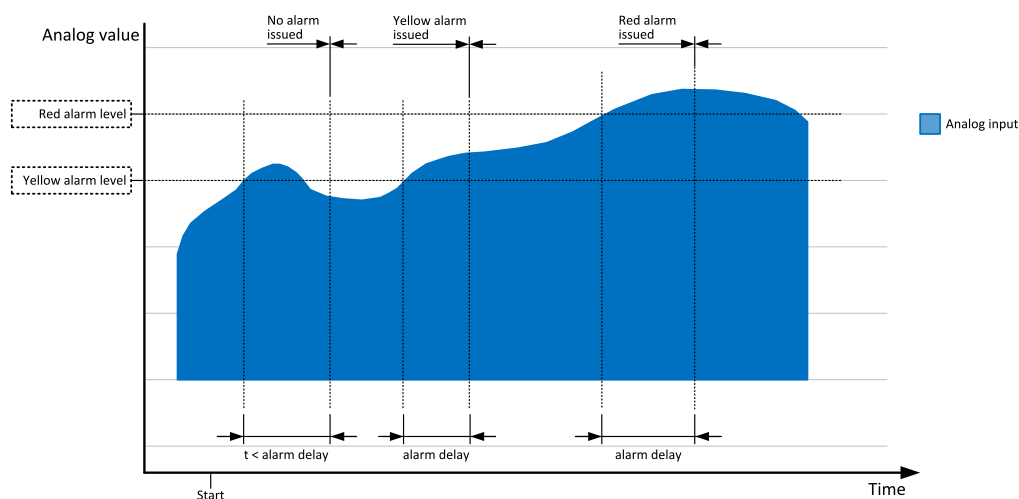


Image 5.63 Analog input alarm evaluation principle

## Alarm handling

There are different alarm categories regarding the period when the alarms are evaluated. The category is selectable for alarms assigned to binary/analog inputs and fixed for built-in alarms. The categories are the following:

- The alarm is evaluated all the time when the controller is switched on.
- The alarm is evaluated only when the BESS is loaded. These alarms begin to be evaluated after the BESS has been started with the delay given by the setpoint **Run Only Block Delay 1**
- The alarm is evaluated only when the BESS is Energized. These alarms begin to be evaluated after the BESS has been started and **Maximal Stabilization Time** has elapsed or the BCB has been closed. They remain evaluated until the BESS has inactive **LBO PCS RUN REQUEST**. Only BESS under/overvoltage, BESS voltage unbalance and BESS under/overfrequency belong to this category. This category is not configurable to binary and analog input alarms.
- The alarm is evaluated only when the PCS is indicating that it is ready to start. The indication is by having **LBI PCS READY TO START** active and having **LBI ESCB FEEDBACK** also active. These alarms begin to be evaluated after the BESS has been started and the BESS reaches to BESS state = Ready To Start. The evaluation continues to be present until a stop command is received (LBO PCS Run Request = 0). Only



ES under/overvoltage and PCS under/overvoltage belong to this category. This category is not configurable to binary and analog input alarms.

- The alarm is evaluated only when **LB1 PROTECTION FORCE DISABLE BLOCK 1** is not active.

If an alarm is being evaluated and the appropriate alarm condition is fulfilled, the delay of evaluation will start to run. The delay is adjustable by a setpoint (in the case of built-in alarms, analog input alarms) or is adjusted via configuration window in IntelliConfig (in the case of binary input alarms). If the conditions persist, the alarm will activate. The alarm will not activate if the condition is dismissed while the delay is still running.

After pressing the Fault reset button or activating the binary input **FAULT RESET BUTTON**, all active alarms change to confirmed state. Confirmed alarms will disappear from the Alarm list as soon as the respective condition dismisses. If the condition is dismissed before acknowledging the alarm, the alarm will remain in the Alarm list as Inactive.

**Note:** The input **Sd OVERRIDE** can be used for temporary disabling of red alarms to shutdown the BESS. This input may be used in situations where providing the power is extremely important – e.g. if the BESS drives pumps for fire extinguishers (sprinklers).

## 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.

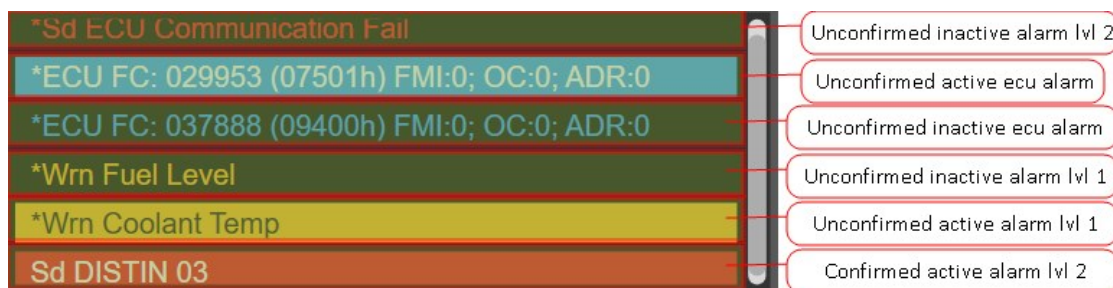


Image 5.64 Alarm List

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

### Alarm types – 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 gen-set control.



## Alarm Types Level 1

<b>Warning (Wrn)</b>	The alarm appears in the Alarm list and is recorded into the history log. Activates the output <b>COMMON WARNING</b> as well as the standard alarm outputs ( <b>HORN</b> and <b>ALARM</b> ).
<b>Alarm only</b>	The alarm appears in the Alarm list. Standard alarm outputs ( <b>HORN</b> and <b>ALARM</b> ) are activated.
<b>Alarm list indication + History record (AHI)</b>	The alarm appears in the Alarm list and is recorded into the history log.
<b>Alarm list indication (ALI)</b>	The event is only indicated in the Alarmlist. It disappears for the alarmist automatically as soon as the cause disappears. Standard alarm outputs ( <b>HORN</b> and <b>ALARM</b> ) are not activated.
<b>History record only (Hst)</b>	The event is recorded into the history. Standard alarm outputs ( <b>HORN</b> and <b>ALARM</b> ) are not activated.

### Alarm types – Level 2

The level 2 alarm indicates that a critical level of the respective value or parameter has been reached.

**Note:** *It is not possible to start the engine 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 or TEST mode!

## Alarm Types Level 2

<b>Shutdown (Sd)</b>	The alarm appears in the Alarm list and is recorded into the history log. It causes immediate stop of the BESS without unloading and cooling phase. Also BCB breaker will open. The BESS cannot be started again while there is a shutdown alarm in the Alarm list. Activates the output <b>COMMON SHUTDOWN</b> as well as the standard alarm outputs ( <b>HORN</b> and <b>ALARM</b> ).
<b>Shutdown override</b>	The alarm appears in the Alarm list. Standard alarm outputs ( <b>HORN</b> and <b>ALARM</b> ) are activated.
<b>Slow stop (Stp))</b>	The event is only indicated in the Alarmlist. It disappears for the alarmist automatically as soon as the cause disappears. Standard alarm outputs ( <b>HORN</b> and <b>ALARM</b> ) are not activated.
<b>Bus Protection (BP)</b>	The alarm appears in the Alarm list and is recorded into the history log. With the activation of this event can provide information that the AC BUS is not healthy and actions such as synchronization or opening of the BCB breaker will occur.

## 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 (page 1)**. The valid range is defined by the most-left (RL) and most-right (RH) points of the sensor characteristic  $\pm 12.5\%$  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.*



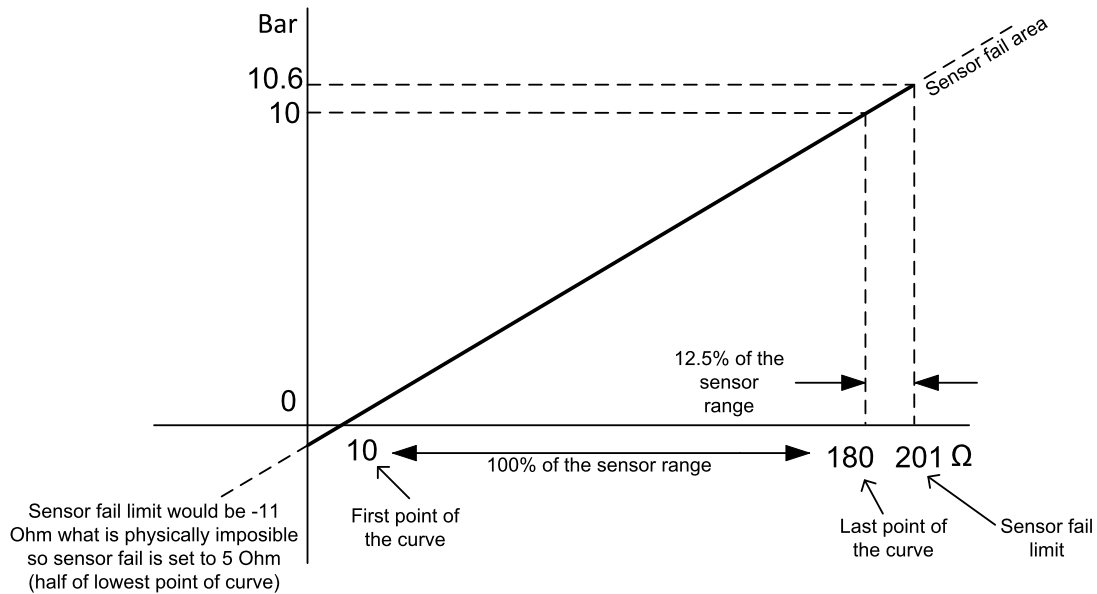


Image 5.65 Sensor fail detection principle

## Remote alarm messaging

If the communication plug-in module is connected to the controller, the controller can send SMS messages (CM-4G-GPS module) and emails (onboard ethernet, CM-4G-GPS or CM-Ethernet modules) at the moment when a new alarm appears in the **Alarmlist (page 1)** or new event is written in the **Event History**. The message will contain a copy of the **Alarmlist (page 1)** or reasons from the **Event History**. To enable this function first to check the controller internet connection (**Subgroup: TCP/IP Settings** for onboard ethernet or **Subgroup: TCP/IP Settings/Subgroup: Cellular Interface** for CM-4G-GPS). Then adjust setpoints **Wrn Message** and **Sd Message** to ON. Also enter a valid GSM phone number or email address to the setpoints **Telephone Number 1, Telephone Number 2, Telephone Number 3, Telephone Number 4, E-mail Address 1, E-mail Address 2, E-mail Address 3, and E-mail Address 4**.

The list of all supported terminals shows the table below:

Terminal	Event SMS	Warning SMS	BOC SMS	Shutdown SMS	Event email	Warning email	BOC email	Shutdown email
CM-RS232-485	no	no	no	no	no	no	no	no
CM-Ethernet	no	no	no	no	yes	yes	yes	yes
CM-4G-GPS	yes	yes	yes	yes	yes*	yes*	yes*	yes*

**Note:** \* Only with enabled Internet Connection.



## 5.4.2 Breaker Control

The following power switches are controlled by the controller:

- The BESS Circuit Breaker or contactor – BCB
- The Neutral Contactor Breaker - NCB (see the chapter **Neutral Contactor Breaker**)

Amount of attempts to close the breaker can be selected by Setpoint **Attempts To Close Breaker**. Each attempt lasts time selected within Setpoint **Waiting For Breaker Feedback**. For this time LBO **BCB CLOSE/OPEN** and LBO **BCB ON COIL** are activated. In case that LBI **BCB FEEDBACK** does not come within that time, LBO **BCB CLOSE/OPEN** and LBO **BCB ON COIL** is deactivated. LBO **BCB OFF COIL** is activated for Setpoint **Waiting For Breaker Feedback** time and delay Setpoints **Delay Between Closing Attempts**. After Setpoints **Delay Between Closing Attempts** +1 second elapses, another attempt may follow (if more attempts are requested).

Breaker opening is changed to last Setpoint **Waiting For Breaker Feedback**, between each pulse is 1 second pause. Alarm is issued after second unsuccessful attempt to open the breaker and LBO **BCB OFF COIL** keeps pulsing.

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 an 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

The following description of the LBO is applied to both the BCB and ESCB. The command to close and open the breakers can be commanded by the following LBOs.

<b>Close/Open</b>	An output for control of a contactor. Its state represents the breaker position requested by the controller. The breaker must react within 2 secondstime defined by setpoint <b>Waiting For Breaker Feedback</b> to a close or open command, otherwise an alarm is issued. ( <b>BCB CLOSE/OPEN</b> and <b>ESCB CLOSE/OPEN</b> )
<b>ON coil</b>	An output giving a 2 second pulse (given by setpoint <b>Waiting For Breaker Feedback</b> ) in the moment the breaker has to be closed. The output is intended for control of close coils of circuit breakers. ( <b>BCB ON COIL</b> and <b>ESCB ON COIL</b> )
<b>OFF coil</b>	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 secondstime given by setpoint <b>Waiting For Breaker Feedback</b> . The output is intended for control of open coils of circuit breakers. ( <b>BCB OFF COIL</b> and <b>ESCB OFF COIL</b> )
<b>UV coil</b>	The BCB UV coil or ESCB UV Coil output is active the whole time once the BESS is energized (not in idle or cooling). The LBO ESCB UV coil 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 control of undervoltage coils of circuit breakers. ( <b>BCB UV COIL</b> and <b>ESCB UV COIL</b> )

**Note:** The BCB breaker can be controlled using not just one set of LBOs but also by a secondary set LBOs. There activation takes place at the same time as the primary LBOs. (**BCB CLOSE/OPEN SECONDARY**, **BCB OFF COIL SECONDARY**, **BCB ON COIL SECONDARY** and **BCB UV COIL SECONDARY**)

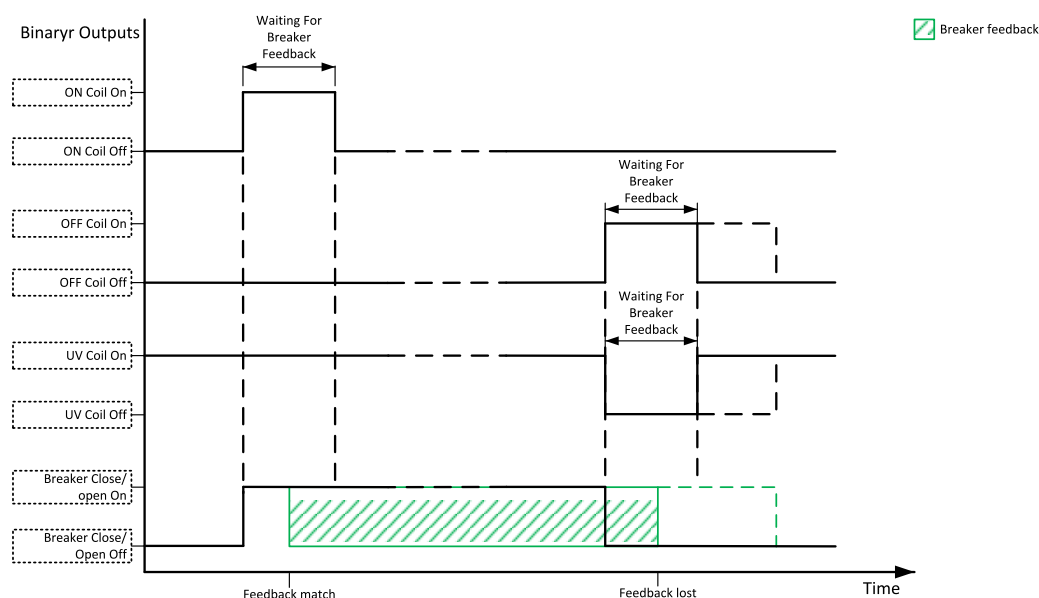


Image 5.66 Breaker control outputs

## ESCB Breaker

ESCB is a breaker between Energy Storage and inverter (PCS). It can be realized as a manual disconnect with fuse or classic breaker. You can choose the type of ESCB via setpoint **ESCB Type**. In case that **ESCB**



**Type** is fuse, BESS only monitor **ESCB FEEDBACK** . In another case, BESS fully control the ESCB in the same way, as a standard breaker.

## 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** ..

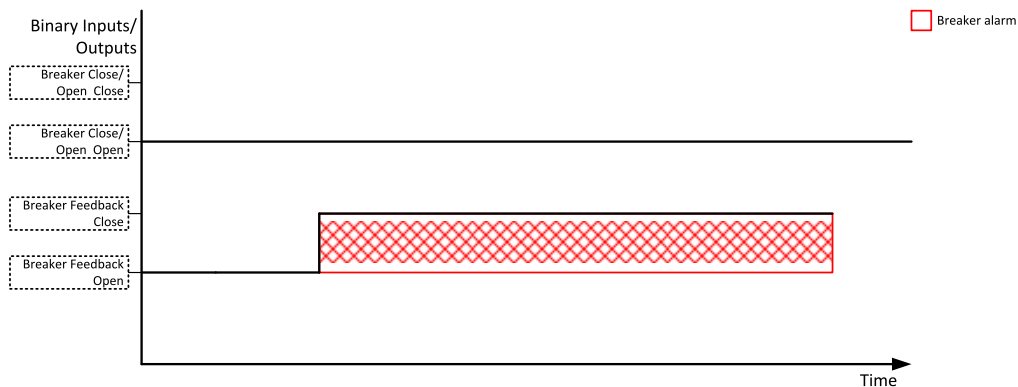


Image 5.67 Breaker fail - breaker close/open in steady position - open

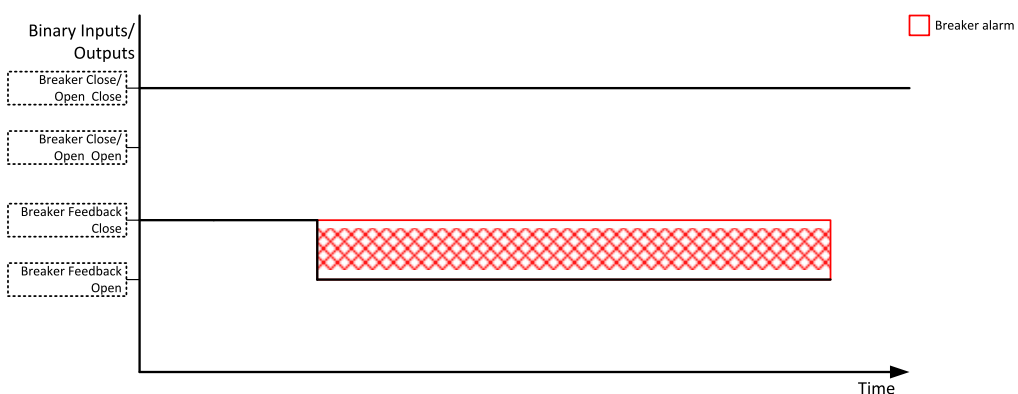


Image 5.68 Breaker fail - breaker close/open in steady position - close

- When binary output breaker close/open is opened, there is 2 seconds waiting time for feedback defined by setpoint **Waiting For Breaker Feedback**. If feedback doesn't match, the alarm **Sd BCB Fail To Openis** issued.



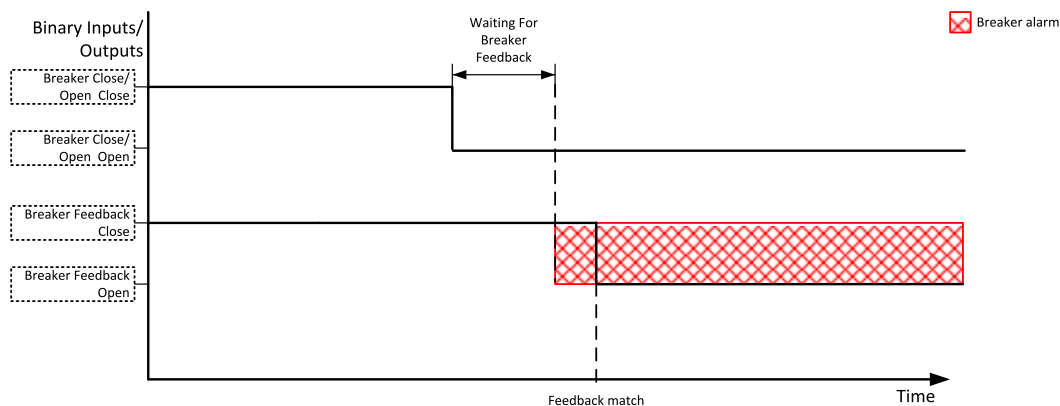


Image 5.69 Breaker fail - breaker close/open opens

- When binary output breaker close/open is closed there is 2 seconds waiting time for feedback defined by setpoint **Waiting For Breaker 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 number of tries defined by setpoint **Attempts To Close Breaker** and **Waiting For Breaker Feedback** delay elapsed, the alarm **Sd BCB Fail To Close** is issued.

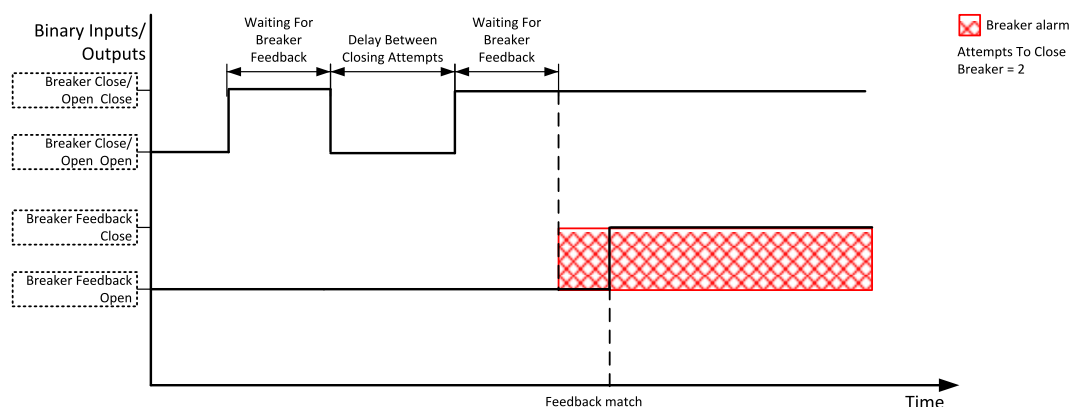


Image 5.70 Breaker fail - breaker close/open closes

**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** BESSunit in the system, the second option is having one **common** NCB for all BESSunits in the system. The setpoint **#Neutral Contactor Control** is used to choose if **EACH** or **COMMON** behavior of the NCB will be used.



**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 available 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 BESS are not running.
- The output is always opened while the MCB + MGCB (only for MGCB application) + BCB are closed (BESS is running parallel to Mains).
- The output is closed while the 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.

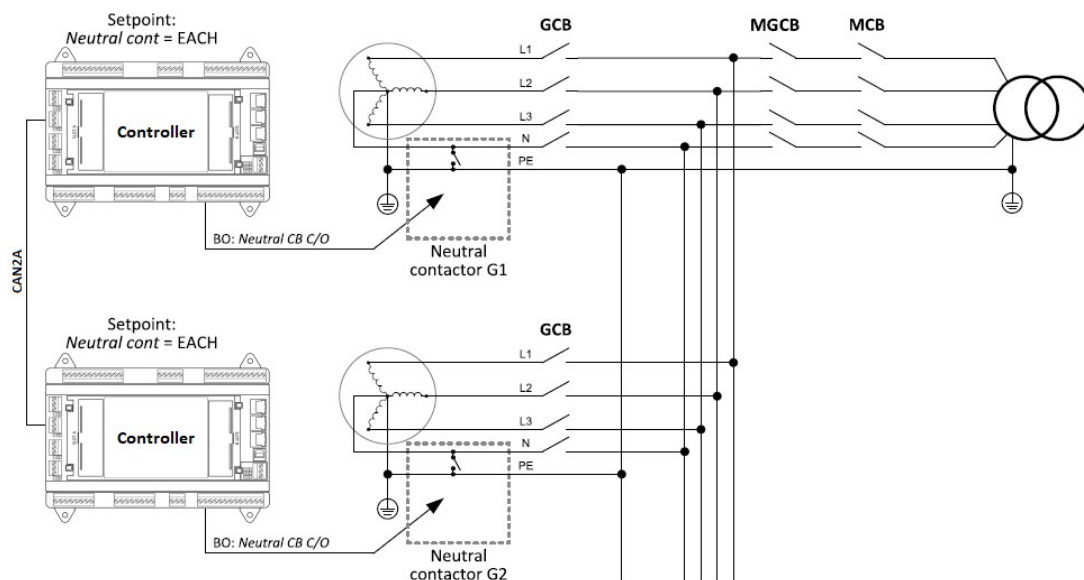


Image 5.71 NCB wired for each Gen-set

## 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 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 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 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.

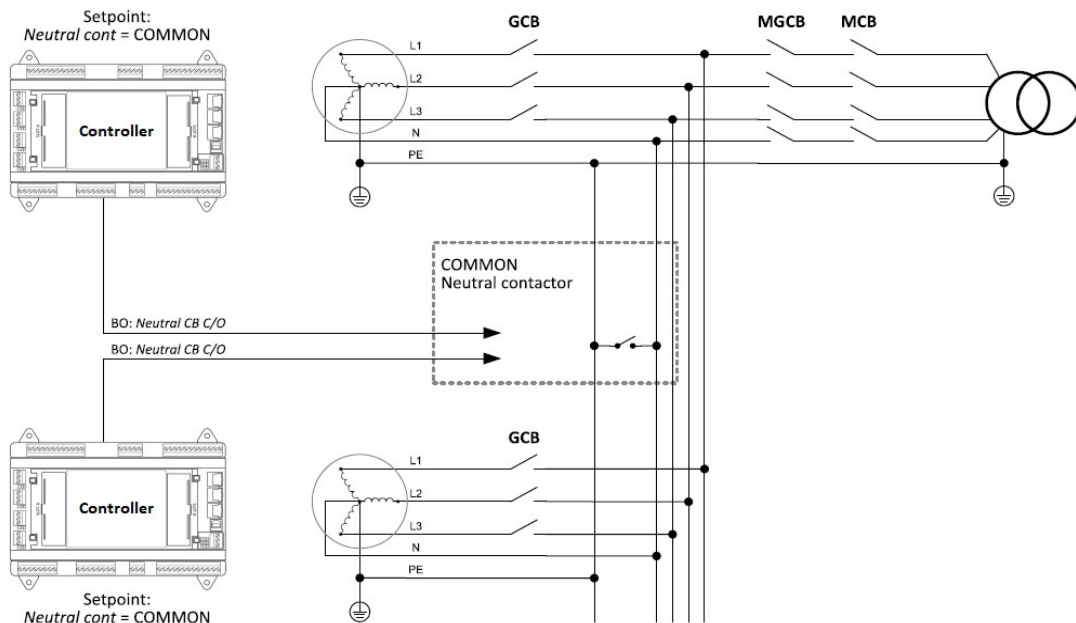


Image 5.72 One common NCB wired for all Gen-sets (or BESS)

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

### 5.4.3 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 physically connected to the observed CAN. The **Communication peripherals** will work 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 IntelliConfig 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.



## 5.4.4 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 IntelliConfig 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.

**WARNING: The password being set for locking a configuration cannot be recovered by any means.**

## 5.4.5 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 CAN2.

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 ICC Mode**. In case that there is a mismatch between the setpoint and the value, alarm **ALI ICC Mode Inconsistency** is activated. Restart the controller to change the communication mode to the selected mode and to get rid of the alarm.

**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
  - >> ICC Address
  - >> CAN ICC Mode
- > Usage
  - >> Power Management
  - >> CAN Intercontroller Communication Redundancy
  - >> Distributed Power Management Signals
  - >> Virtual modules
  - >> MINT - Load Sharing, Var Sharing, and Shared signals

## 5.4.6 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 IntelliNeo 530 BESS 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 IntelliNeo 530 BESS
- Enable the DIP switch
- Restart the controller
- Connect to the controller via IntelliConfig
- Log-in as administrator user
- Go to the Control and Import new configuration (button Configuration Import)
- Disable the DIP switch
- Restart the controller



Image 5.73 Location of the DIP switch for Configuration override

### 5.4.7 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 **CAN2 (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 redundant 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.

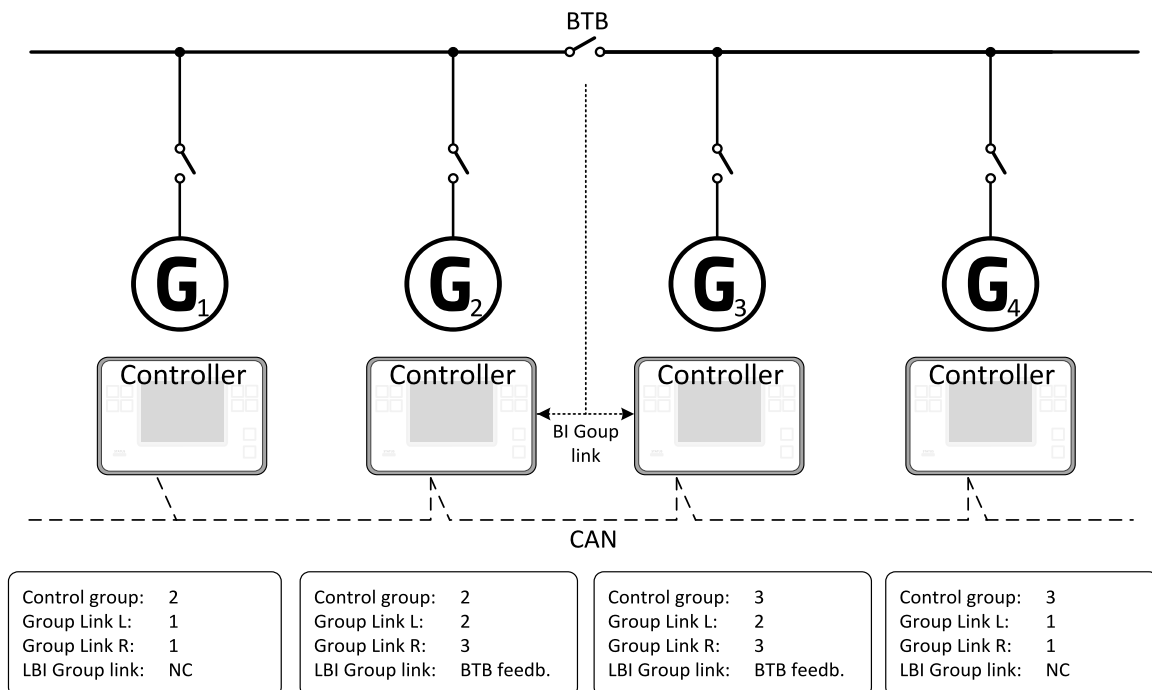


Image 5.74 Example of control groups

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.

## 5.4.8 Distributed Power Management Signals

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

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.

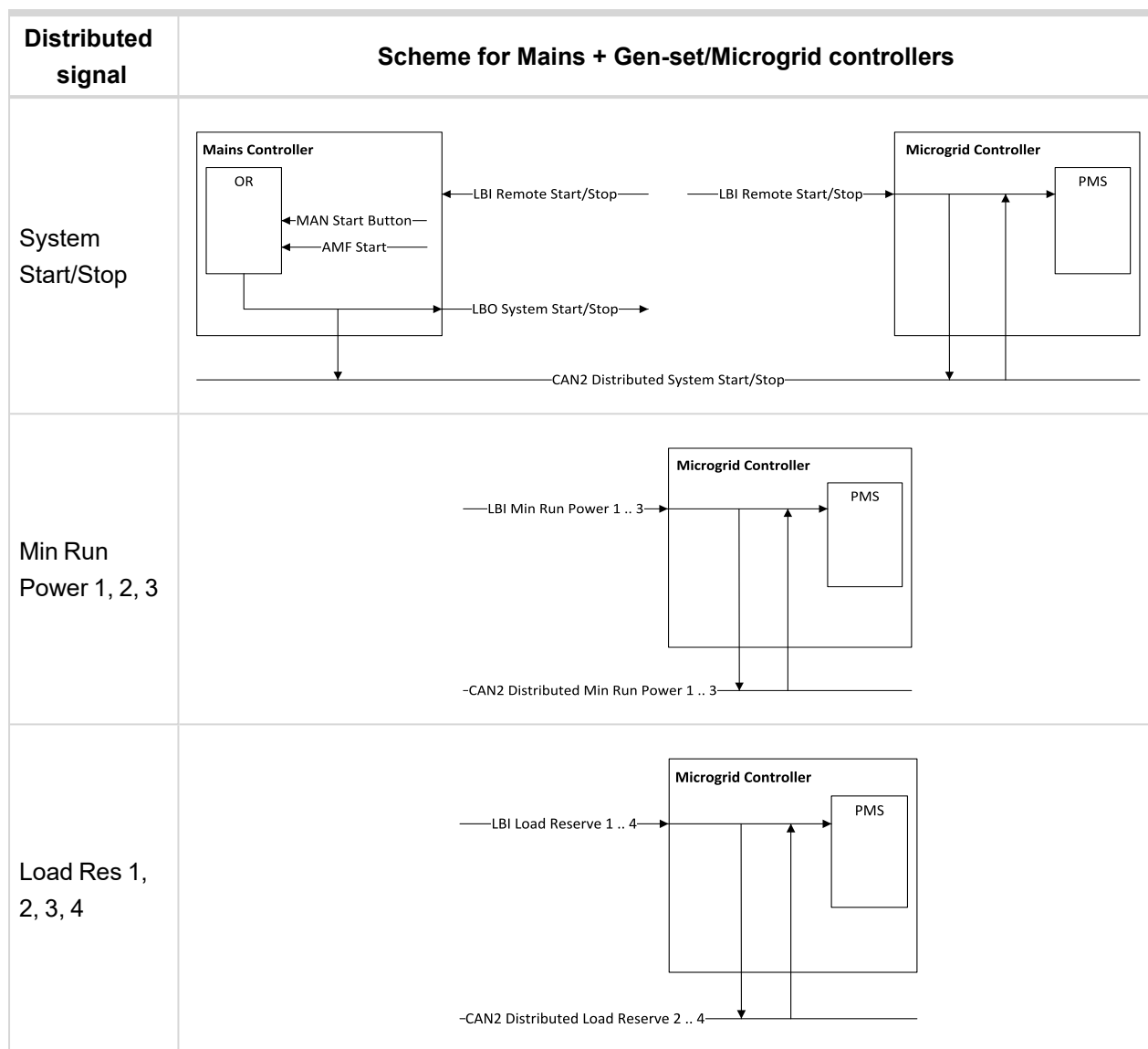
**Basic principle:**



- 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 controller (MINT application)
System Start/Stop	<ul style="list-style-type: none"><li>➤ LBI <b>REMOTE START/STOP</b> is the request to start the group (part of the system). It is shared to LBO System Start/Stop and distributed through <b>CAN2</b> or <b>Communication peripherals</b> to the controllers in the same group.</li></ul>	<ul style="list-style-type: none"><li>➤ Accepted only in controllers belonging to the same logical group.</li><li>➤ Accepted only in controllers where the Distributed signal is not configured.</li><li>➤ If the Distributed signal is configured to any binary input (physical or virtual), the signal is automatically shared to other controllers via <b>CAN2</b> or <b>Communication peripherals</b> as CAN Distributed signal.</li><li>➤ If distributed signal is shared on <b>CAN2</b> or <b>Communication peripherals</b> by more sources, it is accepted from any of them.</li></ul>
Min Run Power 1, 2, 3	N/A	
Load Reserve 1, 2, 3, 4		
MCB Feedback	<ul style="list-style-type: none"><li>➤ The Mains controller set this signal on whenever there is a closed path between the Mains and the Load side.</li><li>➤ The signal is shared only inside the logical group (or interconnected logical groups).</li></ul>	<ul style="list-style-type: none"><li>➤ Accepted only in controllers belonging to the same logical group as the source Mains Controller only.</li><li>➤ Accepted only in controllers where the Distributed signal is not configured.</li></ul>





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 **CAN2 (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 **CAN2 (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 **CAN2 (Communication peripherals)** bus as System Start/Stop.

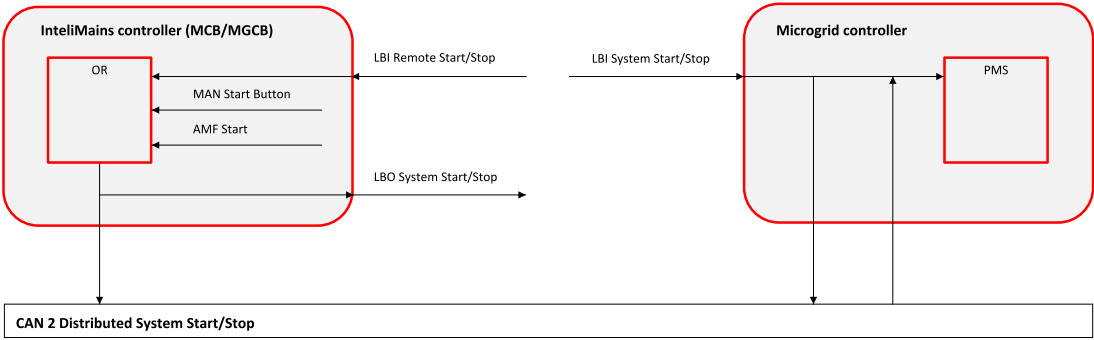


Image 5.75 Distributed signals case 1

2. LBI state received from **CAN2 (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 **CAN2 (Communication peripherals)** bus. Controller follows state of the shared LBI signal then.

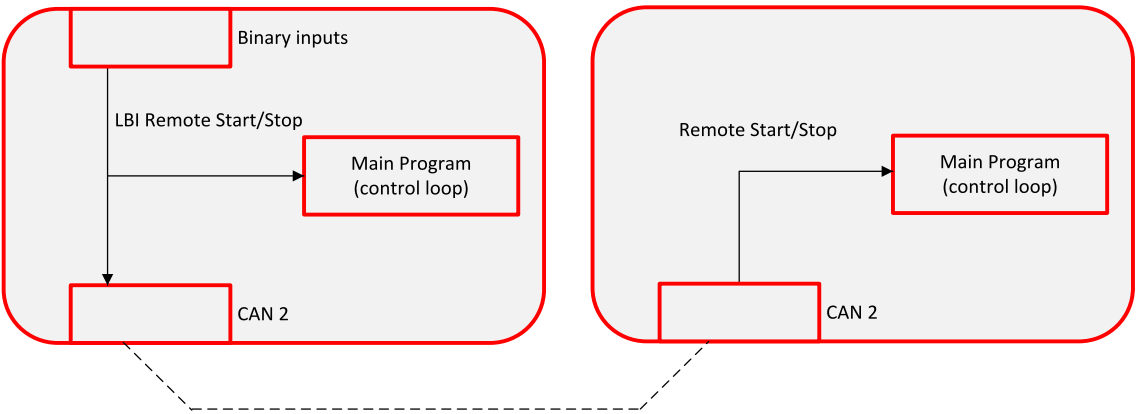


Image 5.76 Distributed signals case 1&2



3. LBI state received from **CAN2 (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.

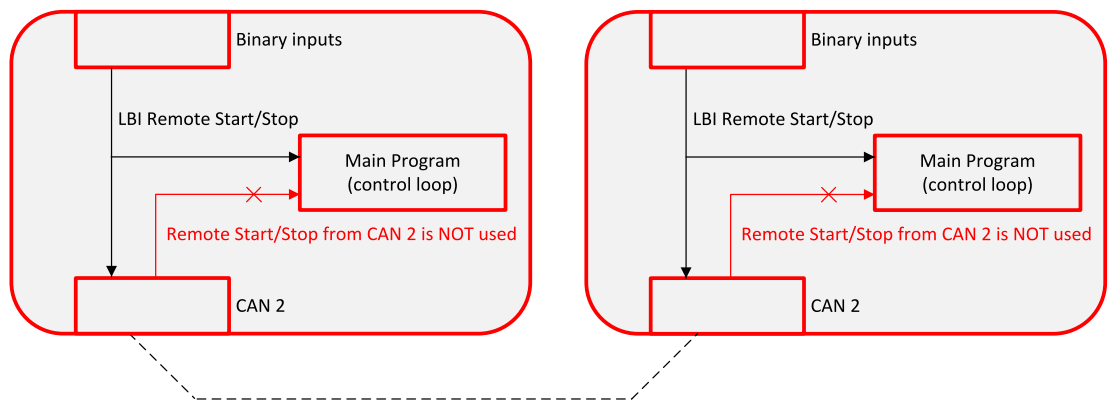


Image 5.77 Distributed signals case 3



4. LBI function state transmitted via **CAN2 (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.

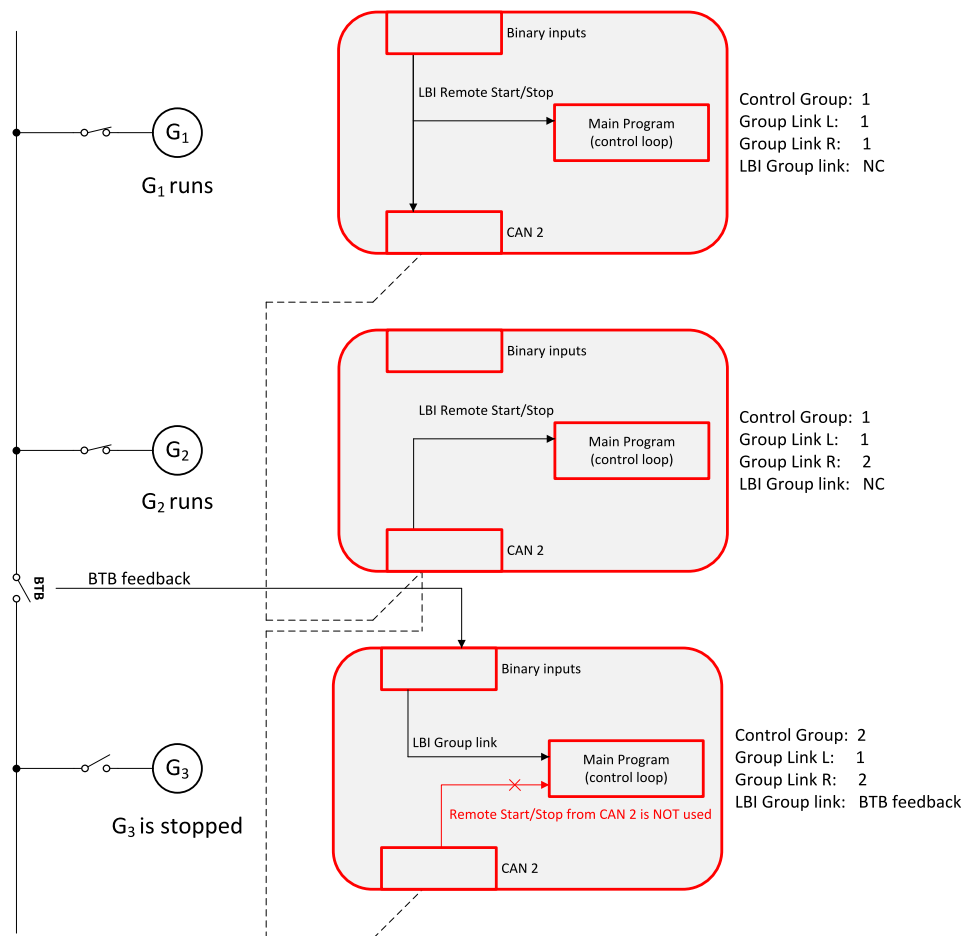


Image 5.78 Distributed signals case 4

5. LBI function can be configured with multiple controllers, which transmit through **CAN2 (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).

## 5.4.9 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 (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 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 outputs 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.

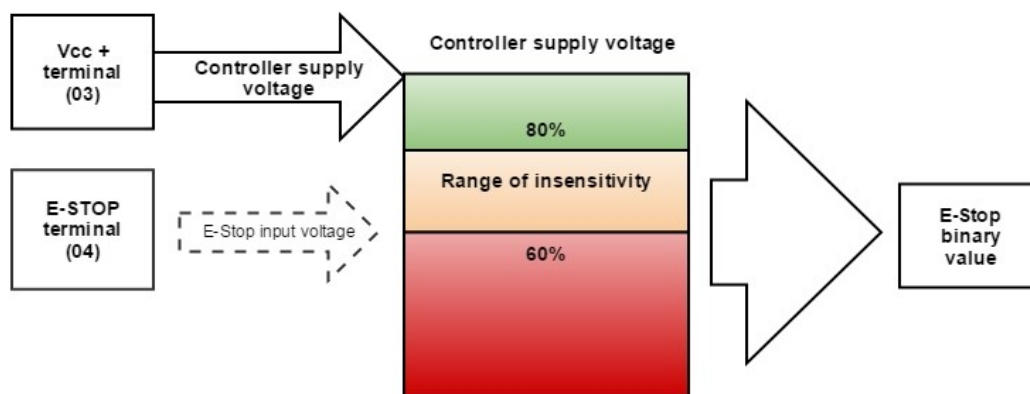


Image 5.79 SW principle of E-STOP

- 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 67.



## 5.4.10 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.

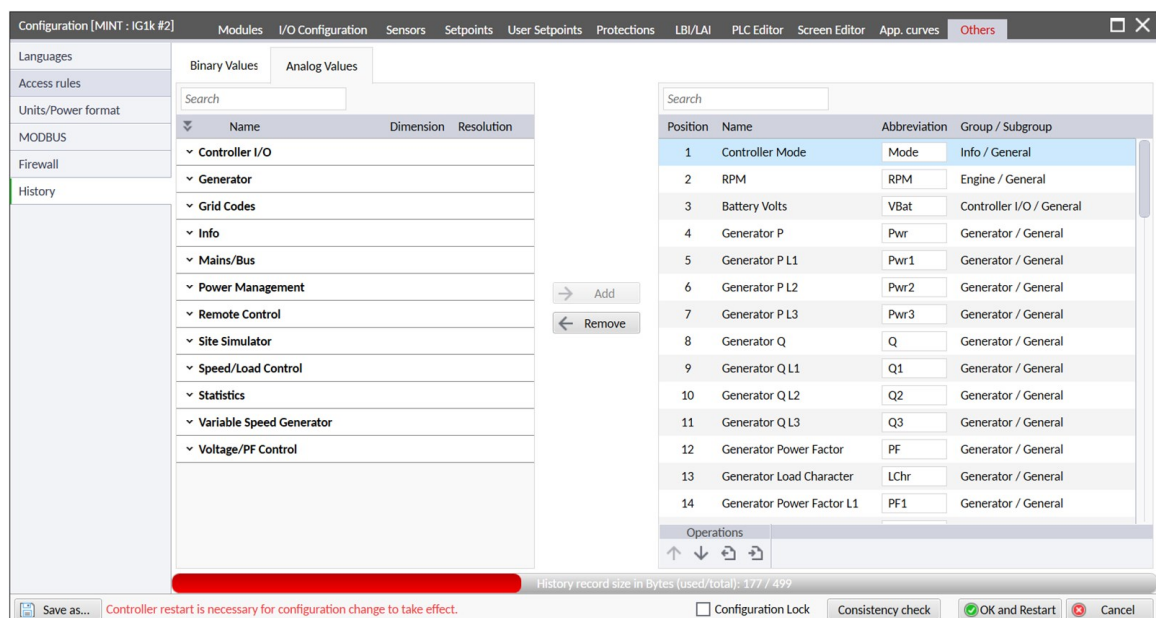


Image 5.80 Configurable history

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.

## 5.4.11 Exercise Timers

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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 specific 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:	Related setpoints for the timer setup:
> <b>Timer 1 Function</b>	> <b>Timer 1 Setup</b>
> <b>Timer 2 Function</b>	> <b>Timer 2 Setup</b>
> <b>Timer 3 Function</b>	> <b>Timer 3 Setup</b>
> <b>Timer 4 Function</b>	> <b>Timer 4 Setup</b>
> <b>Timer 5 Function</b>	> <b>Timer 5 Setup</b>
> <b>Timer 6 Function</b>	> <b>Timer 6 Setup</b>



Related LBOs:

- > Exercise Timer 1
- > Exercise Timer 2
- > Exercise Timer 3
- > Exercise Timer 4
- > Exercise Timer 5
- > Exercise Timer 6

Related Values:

- > Exercise Timer 1
- > Exercise Timer 2
- > Exercise Timer 3
- > Exercise Timer 4
- > Exercise Timer 5
- > Exercise Timer 6
- > Exercise Timer 7 (page 1)
- > Exercise Timer 8 (page 1)
- > Exercise Timer 9 (page 1)
- > Exercise Timer 10 (page 1)
- > Exercise Timer 11 (page 1)
- > Exercise Timer 12 (page 1)
- > .. 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:

<b>Once</b>	This is a single shot mode. The timer will be activated only once at preset date/time for preset duration.
<b>Daily</b>	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.
<b>Weekly</b>	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.
<b>Monthly</b>	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.
<b>Short period</b>	The timer is repeated with adjusted period (hh:mm). The timer duration is included in the period.

## Mode Once

### Set-up via IntelliConfig

To set-up timer via IntelliConfig 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.



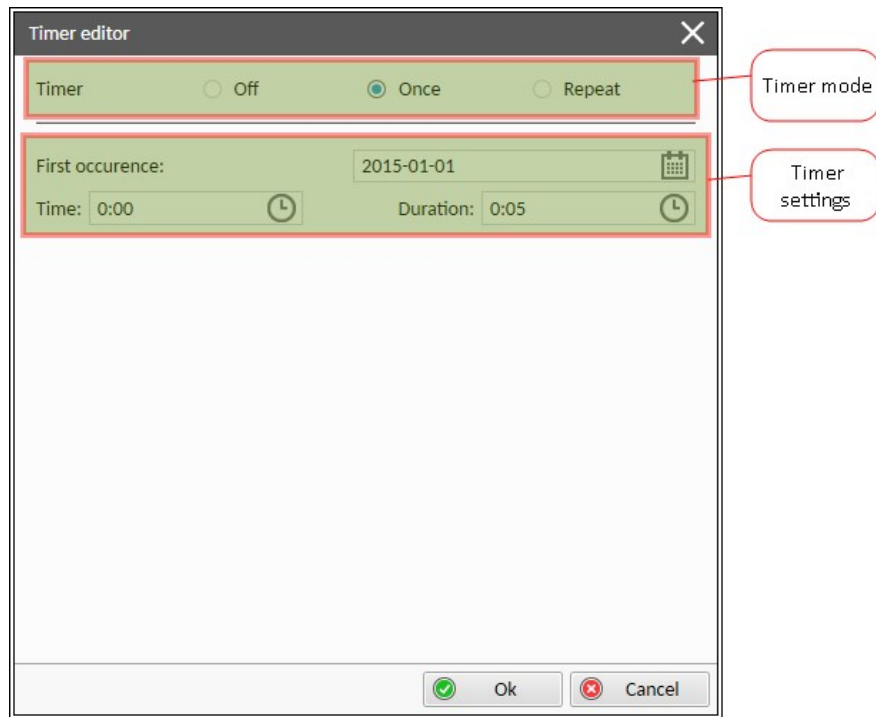


Image 5.81 Mode Once - IntelliConfig

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 IntelliConfig

To set-up timer via IntelliConfig 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.



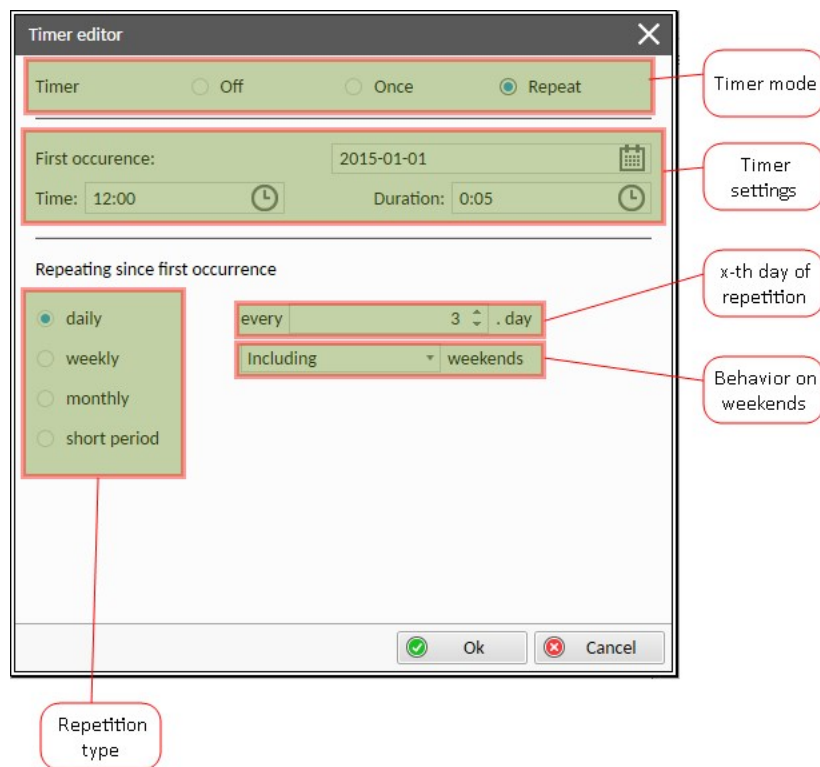


Image 5.82 Daily mode - IntelliConfig

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 IntelliConfig

To set-up timer via IntelliConfig 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.



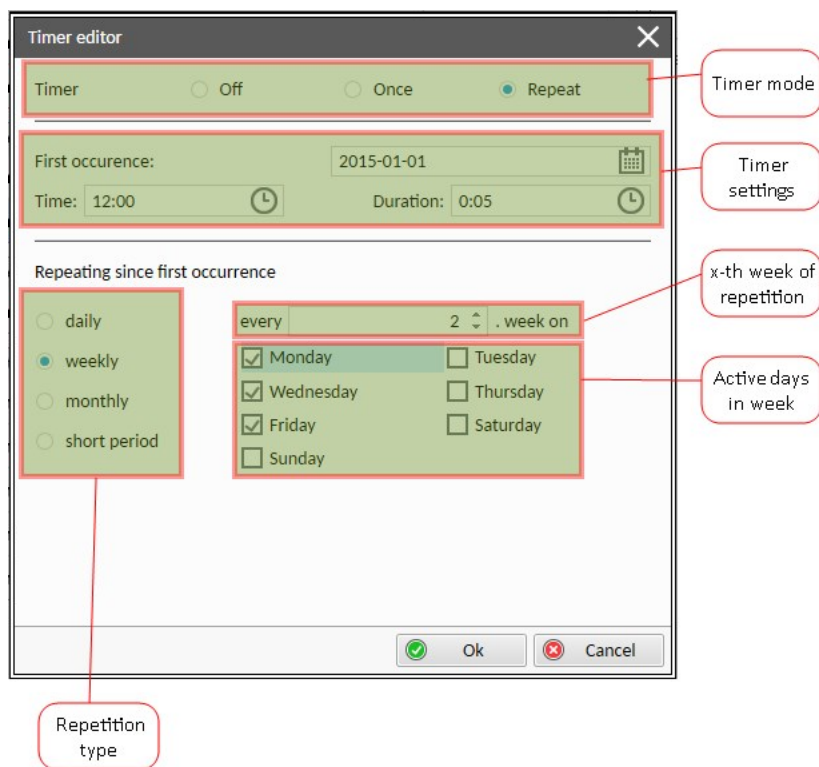


Image 5.83 Mode Weekly - Intelliconfig

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 Intelliconfig

To set-up timer via Intelliconfig 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.

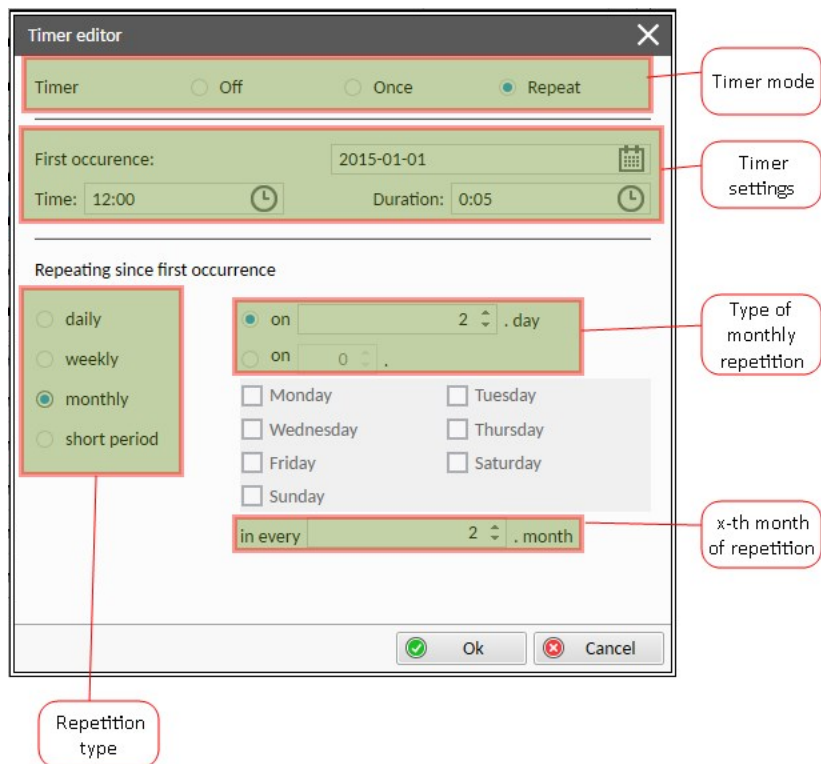


Image 5.84 Mode Monthly - IntelliJConfig

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.

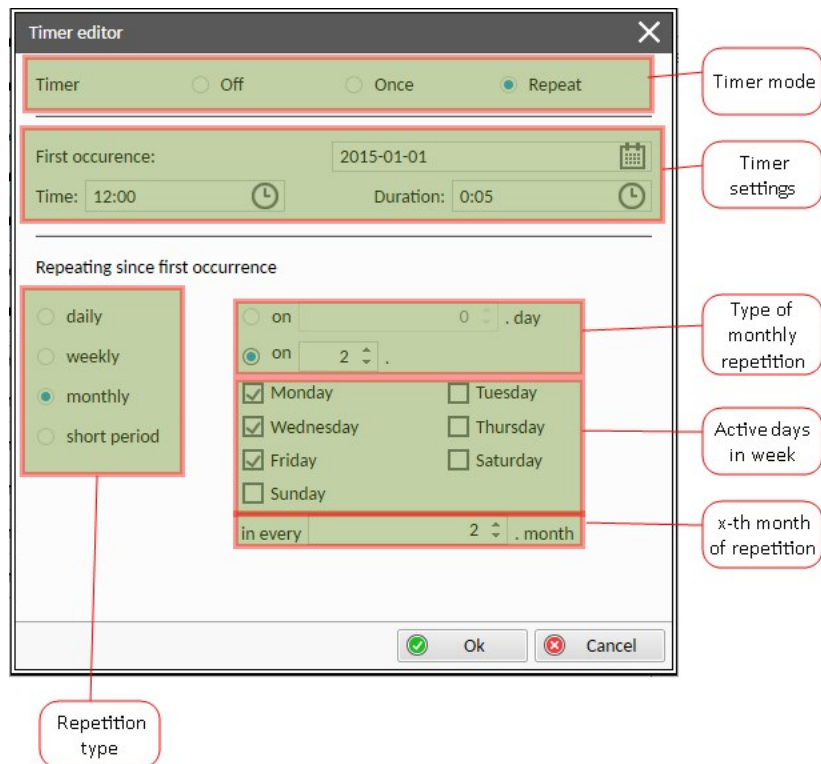


Image 5.85 Mode Monthly - Intelliconfig

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 IntelliConfig

To set-up timer via IntelliConfig 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.

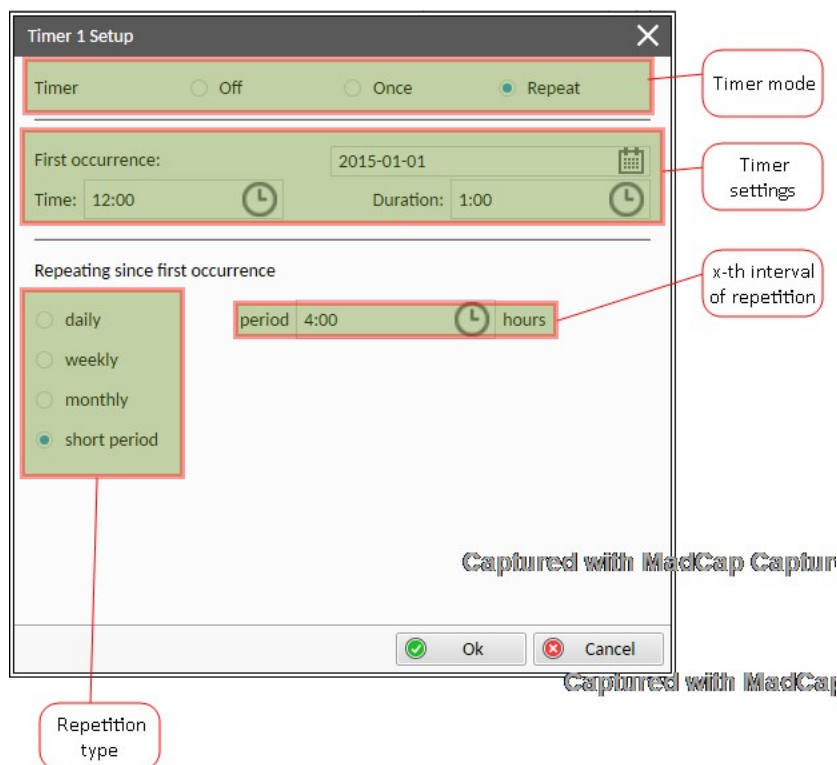


Image 5.86 Mode Short period - IntelliConfig

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



## 5.4.12 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 **Ethernet** port. The firewall can be enabled by the setpoint IP Firewall in the **Group: Ethernet**. The firewall settings is made in the IntelliConfig: Control → Controller Configuration → Others → Firewall.

**Example:**

**Address:** 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 IntelliConfig via Ethernet).

**Example:**

**Address:** 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.



# 5.4.13 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 24 LBIs - **FORCED VALUE INPUT 01** ... . 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 IntelliConfig 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

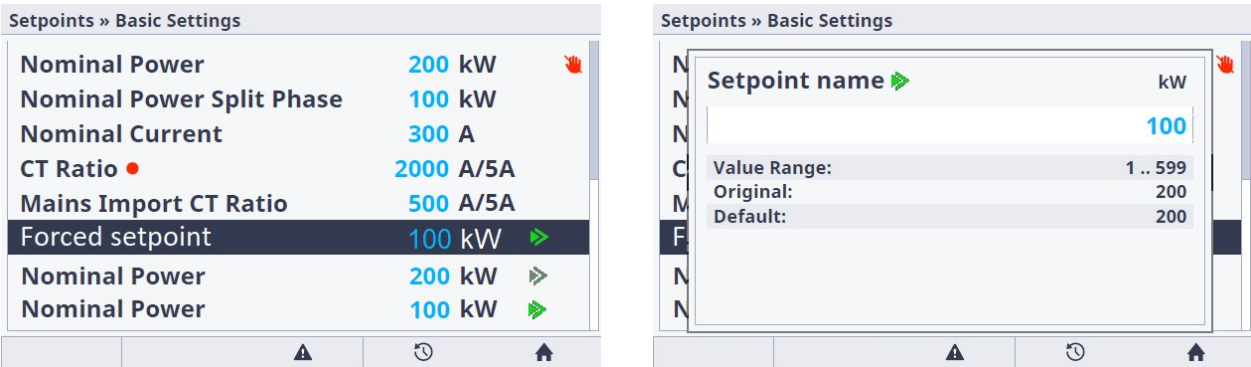


Image 5.87 : Force Value and Protected Setpoint Indication

### InteliConfig

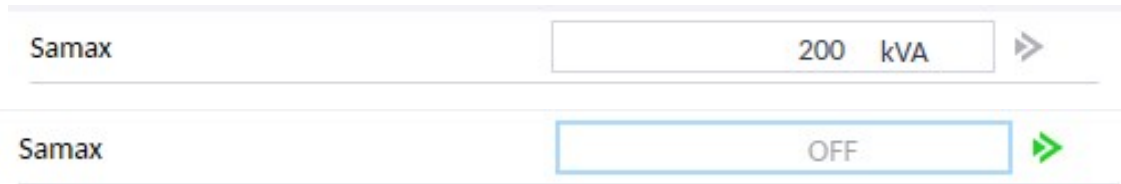


Image 5.88 : Force Value Indication in IntelliConfig

**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 its 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

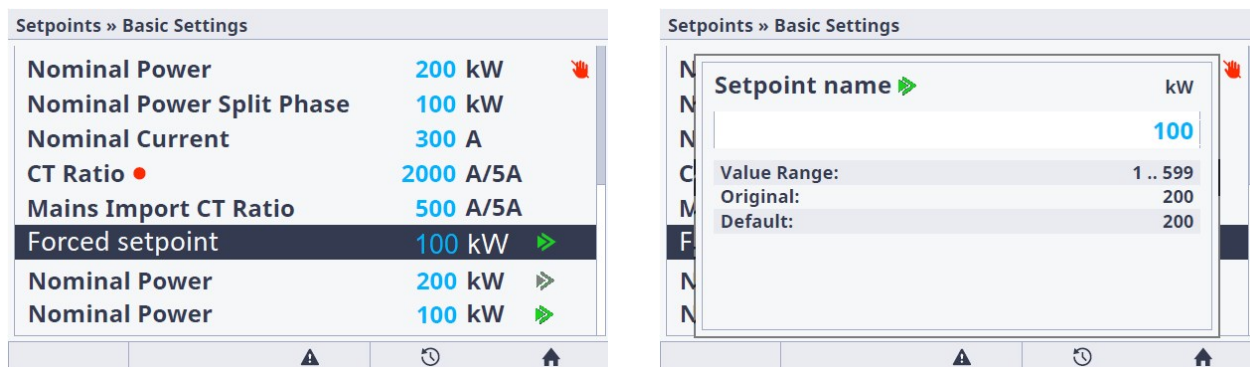


Image 5.89 : Force Value and Protected Setpoint Indication in IV 5.2

## InteliConfig



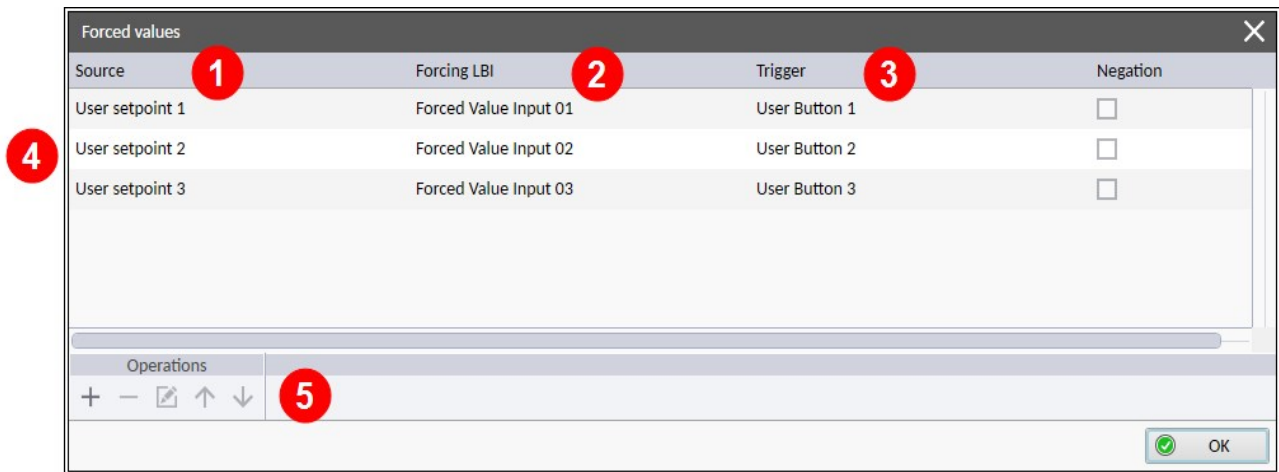
Image 5.90 : Force Value Indication in Inteli Config

**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 <b>Note:</b> 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.



## 5.4.14 Formats of Power Factor

In IntelliNeo 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 (page 1)**.

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

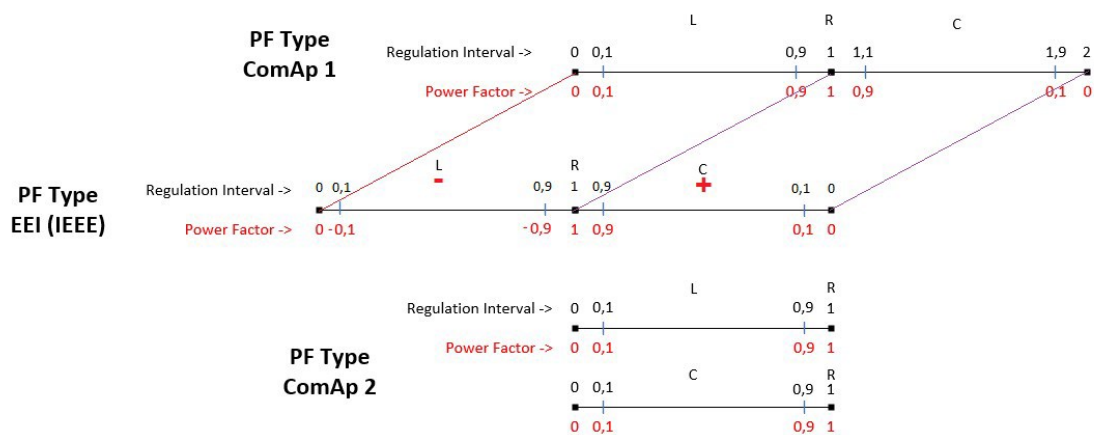


Image 5.91 Power factor formats ranges

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



# 5.4.15 I/O Configuration

Binary Inputs .....	160
Binary Outputs .....	161
Analog Inputs .....	161
Analog Outputs .....	162
Functions Configuration .....	163
Protections Configuration .....	163
Transfer I/O Configuration .....	163
Remove I/O Configuration .....	164

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

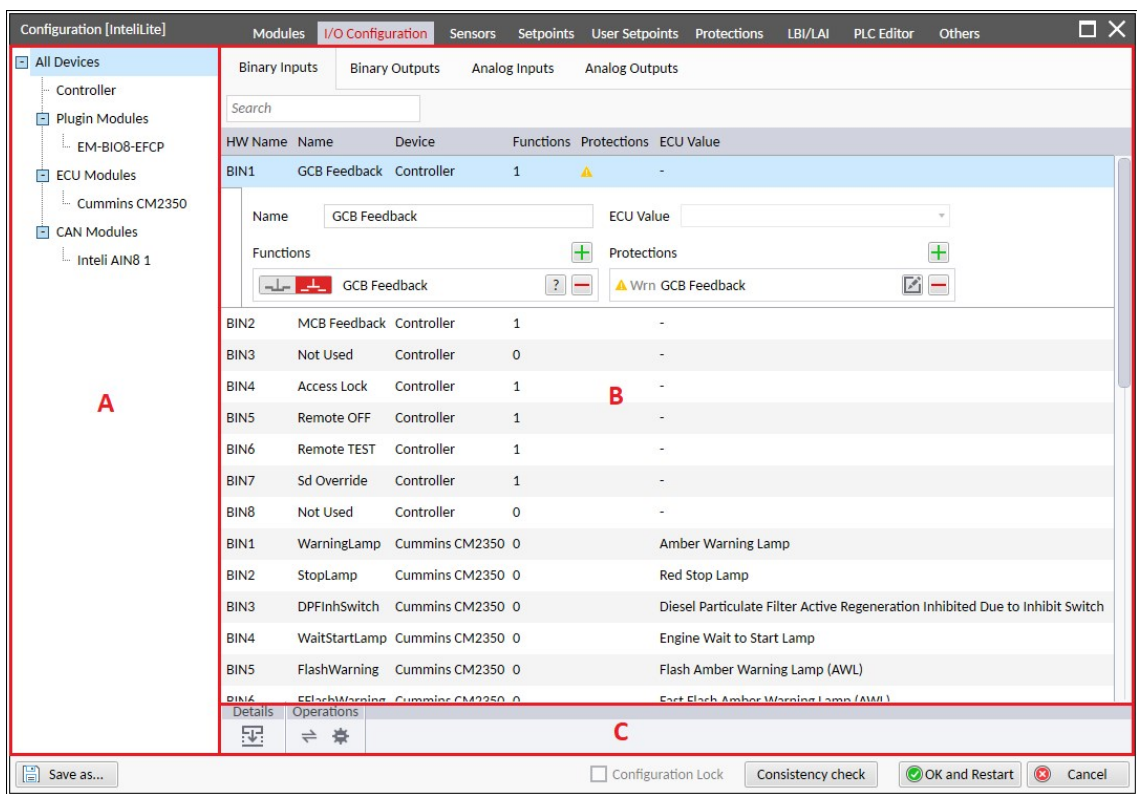


Image 5.92 I/O Configuration window

- 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 163
  - > **Remove IO Configuration** - see Remove I/O Configuration on page 164

## 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 163**
4. **Protections** - the set of protections **see Protections Configuration on page 163**

HW Name	Name	Device	Functions	Protections	ECU Value
BIN1	GCB Feedback	Controller 1			-

Name:

ECU Value:

Functions:

Protections:

Image 5.93 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 163**

HW Name	Name	Device	Source	Contact Type	Protections	ECU Value
BOU1	Starter 1	Controller	Starter 1	Normally Closed		-

Name:

Source:

Contact Type: ☒ Normally Closed

ECU Value:

Protections:

Image 5.94 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 192**
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 163**
12. **Protections** - the collection of protections **see Protections Configuration on page 163**



HW Name	Name	Device	Functions	Protections	Sensor	Dimension	Input HW Type	Resolution	Bargraph 0%	Bargraph 100%	ECU Value	History Abbreviation
Intel AIN8 5	AIN1	Input 1	-		0-250ohm	ohm		0,1	250,0	0,0	0,0	

Name	Input 1	Sensor	0-250ohm
Dimension	ohm	Resolution	0.1
Sensor Range	250,0	Offset	0,0
Bargraph 0%	0,0	Bargraph 100%	250,0
History Abbreviation		5AI1	
Functions	Click + to add item		
Protections	Click + to add item		

Image 5.95 Analog input configuration using linear sensor

HW Name	Name	Device	Functions	Protections	Sensor	Dimension	Input HW Type	Resolution	Bargraph 0%	Bargraph 100%	ECU Value	History Abbreviation
AIN1	Oil Pressure	Controller 1			VDO 10 Bar	Bar	0-15k ohm	0,1	0,0	10,0	-	OilP

Name	Oil Pressure	Sensor	VDO 10 Bar
Dimension	Bar	Resolution	0,1
Bargraph 0%	0,0	Bargraph 100%	10,0
ECU Value		History Abbreviation	OilP
Functions	Click + to add item		
Protections	Click + to add item		
Oil Pressure	<div> <div>Warn Oil Pressure</div> <div>Sd. Oil Pressure</div> </div>		

Image 5.96 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)

HW Name	Device	Source	Output Curve	No Conversion	PWM Frequency	ECU Value
AOUT1	IGS-PTM 1	RPM	U [0..10V]	<input type="checkbox"/>	200	-

Source	RPM	Output Curve	U [0..10V]
No Conversion	<input type="checkbox"/>	PWM Frequency	200
ECU Value			






Image 5.97 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

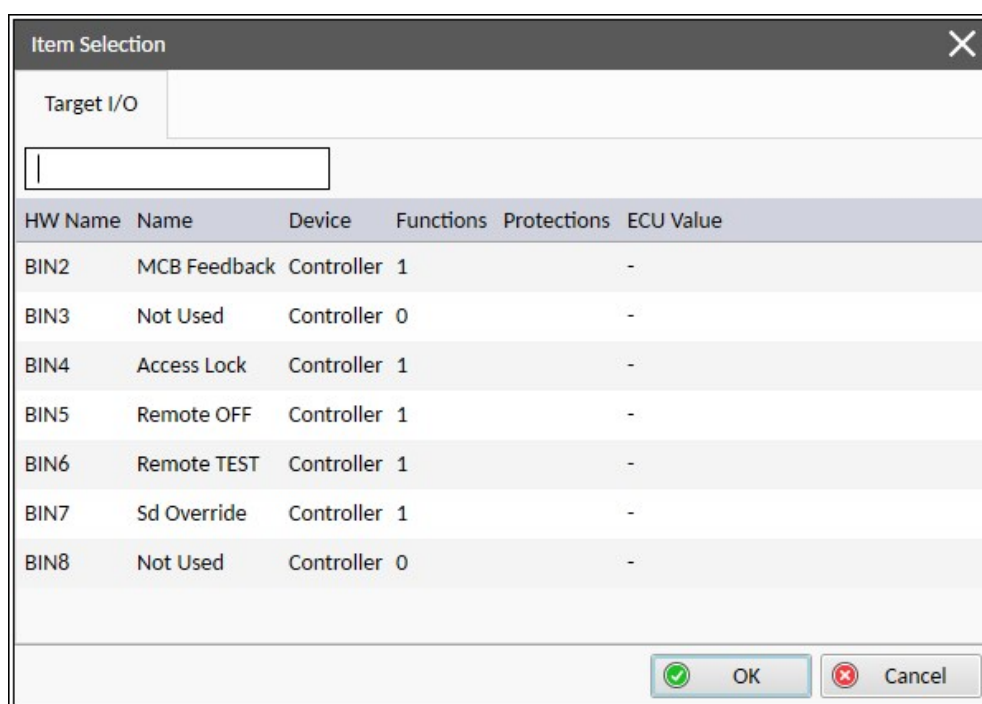
For more information about protections see **Protections on page 179**

## 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.





## 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.

## 5.4.16 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 1x active power based Load shedding, 1x apparent power based Load shedding, 1x frequency based load shedding and 3x for SOC based load shedding. The number of load shedding stages that can be utilized is 5. They are numbered 1-5 and depending on the amount of configured LBO to binary output source will the amount of stages activate. This is true only for the function of active power based Load shedding, apparent power based Load shedding and frequency based load shedding. The SOC based load shedding is only capable to activate 3 of the stages from 1 to 3. Stage is considered as configured when respective Load Shedding Output (LBO **LOAD SHEDDING STAGE N (PAGE 1)**) is configured to a binary output source.

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.

Highest activated load shedding stage is stored in value **Load Shedding Status**.

### Load shedding outputs

Stage	LBO
Stage 1	<b>LOAD SHEDDING STAGE 1</b>
Stage 2	<b>LOAD SHEDDING STAGE 2</b>
Stage 3	<b>LOAD SHEDDING STAGE 3</b>
Stage 4	<b>LOAD SHEDDING STAGE 4</b>
Stage 5	<b>LOAD SHEDDING STAGE 5</b>

### 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** = IsIOper/MultIsIOp - Setpoint **Number Of Tripped Stages** adjusts number of Load Shedding Outputs which are disconnected at once.
- Change from **Breaker state** = ParalOper/MultParOp to **Breaker state** = IsIOper/MultIsIOp - setpoint **Number Of Tripped Stages** adjusts number of Load Shedding Outputs which are disconnected at once.
- During **Breaker state** = IsIOper/MultIsIOp - only one stage is disconnected/reconnected at a moment



Decisive level for disconnecting of load (activation of **LBO LOAD SHEDDING STAGE N (PAGE 1)**) is adjusted via setpoint **Power P Load Shedding Level** and the minimal delay between two disconnections is adjusted via setpoint **Power P Load Shedding Delay**. When relative **BESS P** exceeds **Power P Load Shedding Level** and delay **Power P Load Shedding Delay** elapsed from last disconnection of stage, another stage is disconnected.

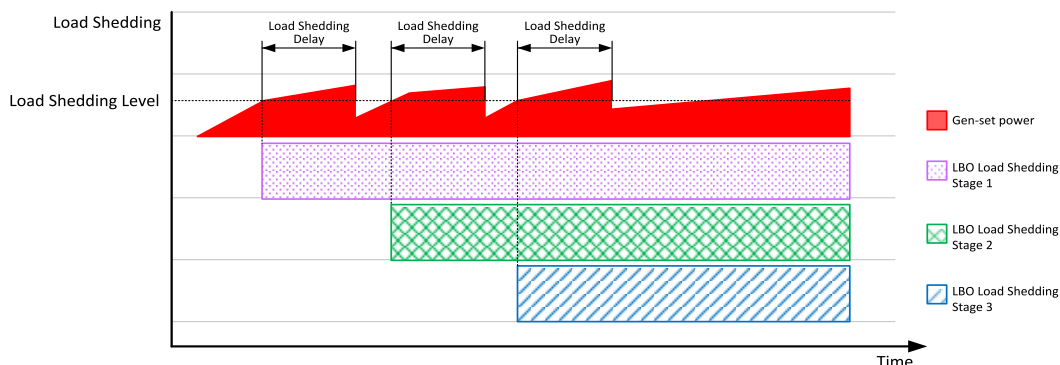


Image 5.99 Load shedding

**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., **ES 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 P Load Reconnection Level** and **Load Reconnection Delay**.

### Manual reconnection

#### Conditions:

- **LBI MANUAL LOAD RECONNECTION** has to be configured and activated

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

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

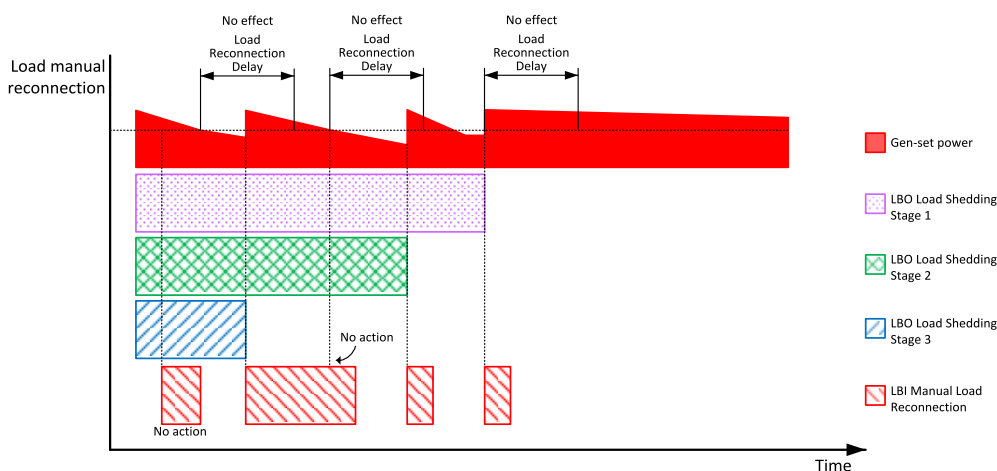


Image 5.100 Manual Load reconnection



## Auto reconnection

### Conditions:

- Setpoint **Auto Load Reconnection** = Auto

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

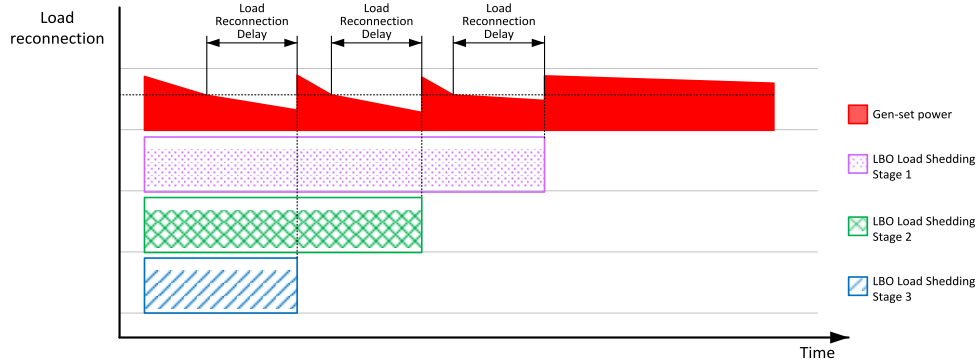


Image 5.101 Auto Load reconnection

Apparent Power based and Frequency based Load shedding 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 **Power S Load Shedding**, **Power S Load Shedding Level**, **Power S Load Shedding Delay**, and **Power 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 (page 1)**, **Frequency Load Shedding Level (page 1)**, **Frequency Load Shedding Delay (page 1)**, and **Frequency Load Reconnection Level (page 1)**.

## Battery SOC Load Shedding

The function is based on monitoring the value of **ES 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 **ES 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 **ES 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 **ES 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 **ES 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**.

## 5.4.17 Loss of Mains (Decoupling) Protections

### 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 divided to 2 kinds.

#### Common behavior

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

### Vector shift

The vector shift function is the fast protection for Mains decoupling (loss of Mains). It monitors the Load angle of the BESS and 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. 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).

## 5.4.18 Modbus Client (Master)

The Controller IntelliNeo 530 BESS is equipped by the function of Modbus Client (Master). It means that the controller can play the role of the device which initiates 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.

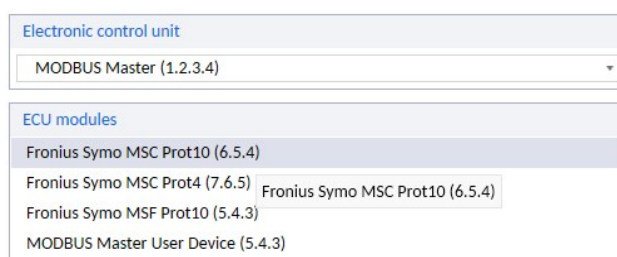


## Modbus Client (Master) configuration step by step

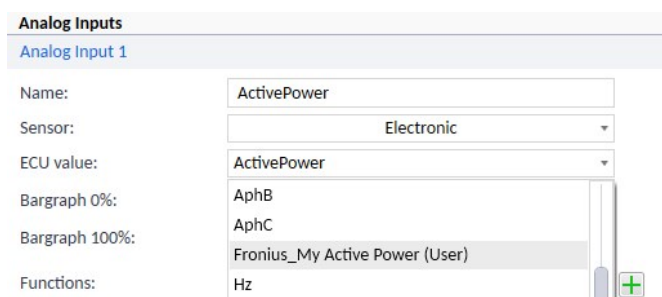
Controller is able with up to 9 modbus devices on RTU and TCP supported. The modbus server device is configured like the ECU module, it is part of Multi ECU configuration. Modbus server devices uses the same pool (resources) for the inputs and outputs as standard ECUs. All modbus server devices share the common pool of inputs and outputs which is limited on 256 Binary Inputs, 256 Binary Outputs, 400 Analog Inputs and 128 Analog Outputs

### Modbus Server Devices Predefined by ComAp

ComAp offers predefined Modbus Server Devices. These devices can be found in Standard ECU list (i.e.in category **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.

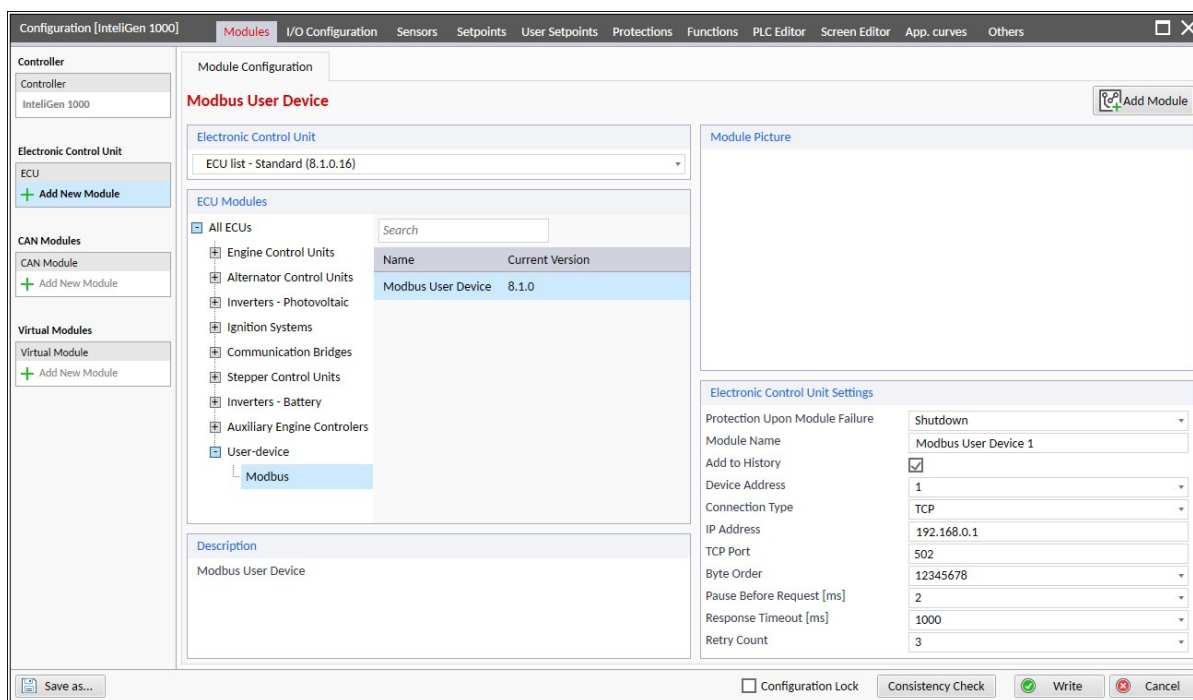


### User defined Modbus Server Devices

#### 1. Adding Modbus Server Device

Open the Controller Configuration in IntelliConfig, 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, Connection Type TCP/RTU, etc.

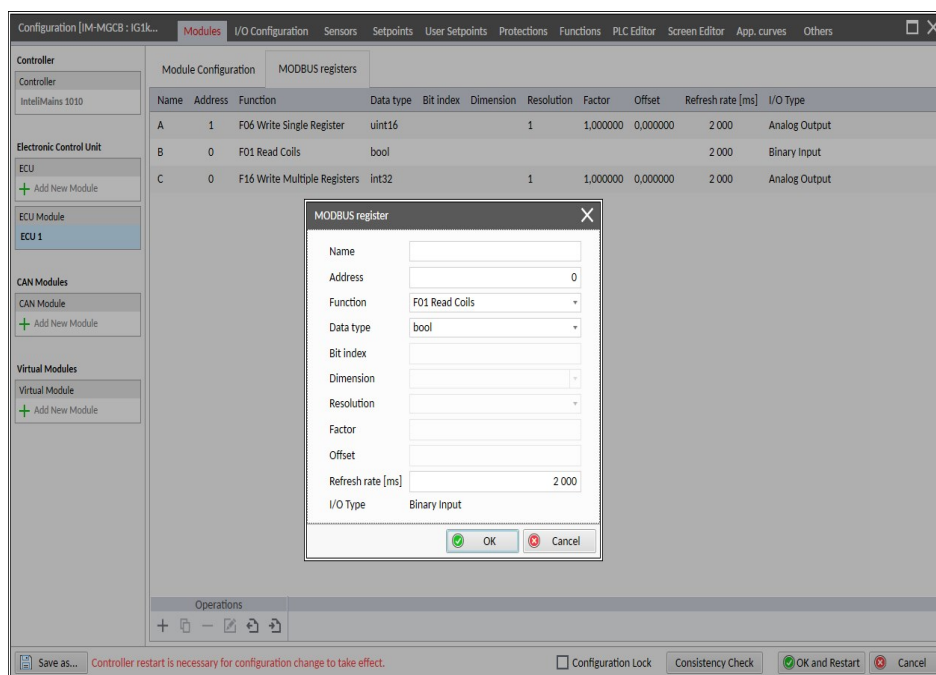
Number of inputs and outputs are not a part of the definition of the device. Inputs and outputs for each device can be defined in menu I/O Configuration.

Module Settings	
Protection Upon Module Failure	Warning
Module Name	ECU 1
Add to History	<input checked="" type="checkbox"/>
Device Address	1
Connection Type	TCP
IP Address	192.168.0.1
TCP Port	502
Byte Order	12345678
Pause Before Request [ms]	2
Response Timeout [ms]	1000
Retry Count	3

## 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 decrease the numbers of polls in modbus communication. The block reading is a matter of the configuration in IntelliConfig. 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 constructs the modbus poll operation based on the range of register addresses 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.



MODBUS register

Name

PV P Limit

Register Definition

Address

40000

Function

F06 Write Single Register

Group

Unassigned

Value Definition

Data Type

int16

Dimension

%

Resolution

0.01

Factor

0.010000

Offset

0.000000

I/O Type

Analog Output

Value Update

Refresh Type

Periodically

Refresh Rate [ms]

Periodically

On Change

On Change & Periodically

## 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.

Binary Inputs

Binary Input 1

Name:

Inverter\_1 Status OK

ECU value:

Inverter\_1 Status OK (User)

Functions:

Click "+" button to add function

Protections:

Click "+" button to add protection

Binary Outputs

Binary Output 1

Name:

Inverter\_1 Shutdown

ECU value:

Inverter\_1 Shutdown (User)

Function:

Inverter\_1 ShutDown

Contact type:

Normally open

Protections:

Click "+" button to add protection

Analog Inputs

Analog Input 1

Name:

Inverter\_1 Active Power

History abbreviation:

EA1

Sensor:

Electronic

ECU value:

Inverter\_1 Active Power (User)

Bargraph 0%:

0

Bargraph 100%:

250

Functions:

Click "+" button to add function

Protections:

Click "+" button to add protection

Analog Outputs

Analog Output 1

ECU value:

Inverter\_1 Required P (User)

Function:

Required P

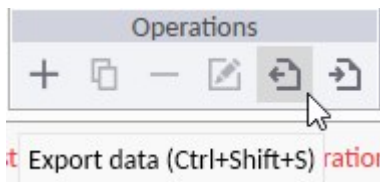
No conversion:

☒



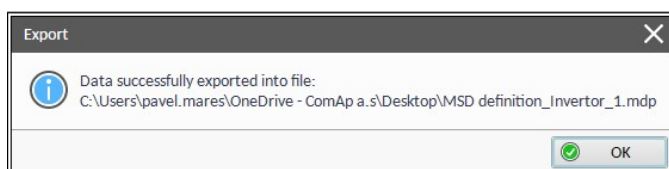
## 5. Cloning of The Modbus Server Device

When using more than 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.

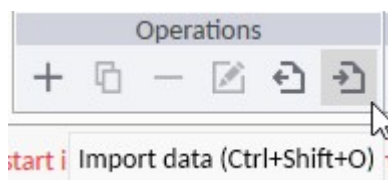


The option to export data is between .mdp or .xlsx (excel). When exporting the data to .xlsx file the option to modify/add or remove the registers is available using adequate application.

Once chosen what file will the data be exported to insert the name and select the target folder for exporting data. You will be informed about successful exporting of your device definition.



In order to import file select the icon for importing data in a new configuration. Two options are available to choose from on what data is to be imported. When importing files from .xlsx file it is important the structure of the sheets and cells is compatible (similar to when data are exported from the 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...). ComAp controllers for processing the information need binary values rather than analog. Therefore the analog value must be converted.

The function of State Decoder provides the option to convert the analog value to specific individual bits. The user using the controller configuration window in IntelliConfig can define the conversion rules of analog values to particular individual bits. State Decoder can be configured only via IntelliConfig (Control → Controller Configuration → I/O Configuration → State Decoders)

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 used in the configuration and it is necessary to perform conversion for all of these inverters).

When using more than one instance of a specific State Decoder in one configuration, or when needed for configuration of another controller, there is an option to Export and Import the set definitions.



## Principle

Each created State Decoder can have its own specific setting definition based on the State Definition template. There can be multiple templates each utilizing different configuration. The State Definition template allows to specify what bits are going to be active when the Input Value of the state decoded incoming analog value is present.

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 Module value (it is important that the analog value has no decimal places). By selecting the decoder for a given ECU Module value, a new value with the same name is created in the ECU module value group and its bits are linked to the relevant states. The controller has only a set of new values available, each being able to be only 16 bits. If more than 16 bits are defined in the definition, more new values are created. If more new values are used, a numerical suffix is added behind the name.

## 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.

State Decoder

Name: My Decoder

State for Invalid Value: Log0

**States Definition**

Bit	Input Value	Bit Name	Invalid Value	Undefined Value
1	10	Not Ready	<input type="checkbox"/>	<input type="checkbox"/>
2	15	Ready	<input type="checkbox"/>	<input type="checkbox"/>
3	20	Online	<input type="checkbox"/>	<input type="checkbox"/>

**Invalid Value** - You can select only when State for Invalid Value = Log1  
- Only one state can be selected

**Undefined Value** - Not Mandatory  
- Input Value must be empty

Operations: + -

OK Cancel

**Bit** - The bit number used for the given incoming value. When the Input value of the incoming value is equal the corresponding bit will activate in the newly defined value in the ECU module device. The number of the Bit cell must be unique within the definition of one State Definition Template. Filling the numbers 1 to 16 in the bit cells will generate a new value with identification 1 when configured. Filling the numbers 17 to 32 in the bit



cells will generate a new value with identification 2 when configured. It is advisable to avoid a situation where some bits are not defined.

**Example:** Configuring only 3 bits in a State Definition template, with the first Bit number being 1, the second Bit number is 17 and the third Bit number is 33, will generate 3 new values when configured in the ECU Module value group. More suitable approach is to configure 3 bits with the first Bit number being 1, the second Bit number is 2 and the third Bit number is 3, which will generate only 1 new value when configured in the ECU Module value group.

The decoders will still work correctly, it is just that more resources will be used.

**Input Value** - This is the incoming value to be converted to the appropriate bit. The value must be unique compared to the other defined Input Values in the States Definition template.

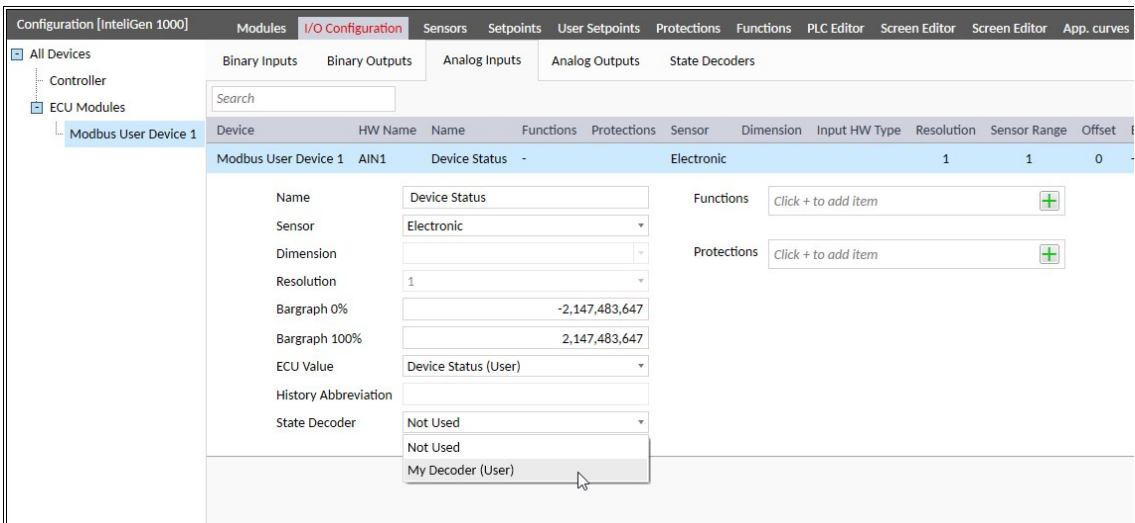
**Bit Name** - Name of the corresponding bit in the resulting new value. The Bit Name must be unique compared to the other defined Bit Names in the States Definition template.

**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 defined State 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 value with the same name of the configured analog input will be added to the group of the given ECU and will contain the bits defined in the State Decoder definition.



Values [InteliGen 1000]			
Groups	Value Name	Value	In
User Buttons			
Controller I/O	Device Status	0	
Statistics	Device Status	▲	
Info	01. Not Ready	0	
Log Bout	02. Ready	0	
Fixed Protections States	03. Online	0	
Sources Alarms States			
Scheduler			
Ethernet			
Modbus User Device 1			
Remote Control			
Search	View		

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 given State Decoder is used.

## 5.4.19 Multiple ECU

InteliNeo 530 BESS 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 9 ECU slots available, each slot can contain one ECU Module which settings can be separately configured. ECU can be configured via InteliConfig (Control → Controller 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. 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	ECU 1 Comm Fail
2	ECU 2 COMM FAIL	ECU 2 Comm Fail
3	ECU 3 COMM FAIL	ECU 3 Comm Fail
4	ECU 4 COMM FAIL	ECU 4 Comm Fail
5	ECU 5 COMM FAIL	ECU 5 Comm Fail
6	ECU 6 COMM FAIL	ECU 6 Comm Fail
7	ECU 7 COMM FAIL	ECU 7 Comm Fail
8	ECU 8 COMM FAIL	ECU 8 Comm Fail
9	ECU 9 COMM FAIL	ECU 9 Comm Fail

For each ECU there is LBO which gets activated when communication issue with respective ECU is detected. 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 prevent showing of invalid protections in the Alarm list.

### 5.4.20 Communication with subordinated devices

The IntelliNeo application requires cooperation with subordinate systems. 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). This communication is most often mediated via Modbus TCP or Modbus RTU links. IntelliNeo 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**.

In this case, IntelliNeo 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**.

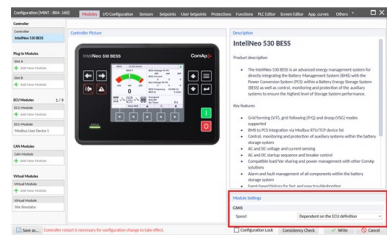
All subordinate units draw from common resources reserved for ECU support. IntelliNeo 530 BESS supports up to 9 ECU units. These units share common resources in total according to the following table:

<b>Analog Inputs</b>	400
<b>Analog Outputs</b>	128
<b>Binary Inputs</b>	256
<b>Binary Outputs</b>	256

**Note:** All Analog Inputs are defined as data type INT32.

### 5.4.21 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 IntelliConfig 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.
- 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	<b>250</b> kbit/s
User ECU	ComAp ECU - <b>500</b> kbit/s	x	<b>500</b> kbit/s
User ECU	ComAp ECU - 250 kbit/s	ComAp ECU - <b>500</b> kbit/s	<b>500</b> 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 ComAp ECU definition.

## 5.4.22 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 MAN 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 1**.

### 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 IntelliConfig, IntelliSCADA 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 MAN**



**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.

No Power management function will be performed. The buttons **BCB ON/OFF** , **START** , and **STOP**  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.

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 Power management function will be performed.

## AUTO

BESS is controlled based on external signal (**REMOTE START/STOP**) or by conditions (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**, and **BCB ON/OFF**.

**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.



## 5.4.23 Power Formats And Units

InteliNeo 530 BESS 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

<b>Metric</b>	20 °C	10.0 bar	11.4 l/h
<b>US</b>	68 °F	145 psi	3.01 gph

### Power Format

<b>Small</b>	0.1 kW / kVA / kVA <sub>r</sub>	1 V
<b>Standard</b>	1 kW / kVA / kVA <sub>r</sub>	1 V
<b>Large HV</b>	0.01 MW / MVA / MVA <sub>r</sub>	0.01 kV
<b>Large LV</b>	0.01 MW / MVA / MVA <sub>r</sub>	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.

## 5.4.24 Protections

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InteliNeo 530 BESS 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 128. 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
Abbreviation	Sd	Sd	Stp
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	AL COMMON SHUTDOWN OVERRIDE	COMMON SLOW STOP PROTECTION

[⬅ back to Protections](#)



## 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.

 [back to Protections](#)

## Protection blocking

It is possible to configure one Protection Blocking function 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. Blocking/ Disabling of some fixed protections can cause disabling of certain controller functions. The list of general protections that can be blocked are adjustable by the setpoints in the setpoint **Group: Protections**.

### 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 run only protections are evaluated as soon as the BESS voltage or frequency are within limits within the **Maximal Stabilization Time** period and the BESS is considered Energized or in cases of start with closed BCB in Loaded state.

 [back to Protections](#)

## 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 PROTECTION FORCE DISABLE BLOCK 3	Disabling of the protection can be forced by LBI

## 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 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 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 Voltage 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	<b>Sd Short Circuit</b>	FIXED PROTECTIONS STATES 4
BESS IDMT >A Protection	<b>Sd IDMT BESS &gt;A</b>	FIXED PROTECTIONS STATES 4
BESS Current Unbalance Protection	<b>Sd BESS Current Unbalance</b>	FIXED PROTECTIONS STATES 2
BESS IDMT Overload Protection	<b>Sd IDMT Overload</b>	FIXED PROTECTIONS STATES 4
Voltage Controlled Time Overcurrent Protection	<b>Sd I&gt;V Time Overcurrent</b>	FIXED PROTECTIONS STATES 7
Voltage Restrained Time Overcurrent Protection	<b>Sd I&gt;V Time Overcurrent</b>	FIXED PROTECTIONS STATES 7

## BESS Other Protections

Protection	Alarms / Protection name	Fixed Protection States
BESS Anti Islanding Protection	<b>BESS Anti Islanding</b>	FIXED PROTECTIONS STATES 5
Earth Fault Current Protection	<b>Sd IDMT Earth Fault Current</b>	FIXED PROTECTIONS STATES 4
<b>Phase Rotation</b> <i><b>Note:</b> This protection monitors phases rotation and compares it with <b>Phase Rotation</b>, in case of inconsistency, proper alarm is activated</i>  <i><b>Note:</b> This protection can't be disabled.</i>	<b>ALI BESS Ph Rotation Opposite</b>	-
<b>Inverted Phase</b> <i><b>Note:</b> This protection monitors phases inversion and in case of inconsistency of all phases, proper alarm is activated</i>  <i><b>Note:</b> This protection can not be disabled.</i>	<b>ALI BESS Ph L1 Inverted</b> <b>ALI BESS Ph L2 Inverted</b> <b>ALI BESS Ph L3 Inverted</b>	-



**Note:** BESS Anti Islanding Protection is only in use if the selected method of controlling 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 RELAY** inactive (causes History Record DC Bus Deenergized).

## Bus Voltage Protections

Protection	Alarms / Protection name	Fixed Protection State
<b>Bus V Unbalance Protection</b> <ul style="list-style-type: none"> <li>&gt; Behavior of protection is adjusted via setpoints <b>BESS V Unbalance</b> and <b>BESS V Unbalance Delay</b> When relative difference between bus voltages is over setpoint <b>BESS V Unbalance</b> for time longer than <b>BESS V Unbalance Delay</b> history record "<b>Bus V Unbalance Ph-N</b>" or/and "<b>Bus V Unbalance Ph-Ph</b>" is written to the history.</li> </ul> <p><b>IMPORTANT:</b> Behavior of this protection is influenced by setpoint Connection type.</p> <p><b>Note:</b> This protection can not be disabled.</p>	<b>Mains/Bus V Unbalance Ph-N</b> <b>Mains/BusV Unbalance Ph-Ph</b>	<b>FIXED PROTECTIONS STATES</b> <b>3</b>

## Bus Other Protections

Protection	Alarms / Protection name	Fixed Protection State
<b>Bus Meas Error</b>	<b>Bus Meas Error</b>	<b>FIXED PROTECTIONS STATES</b> <b>4</b>



## User protections

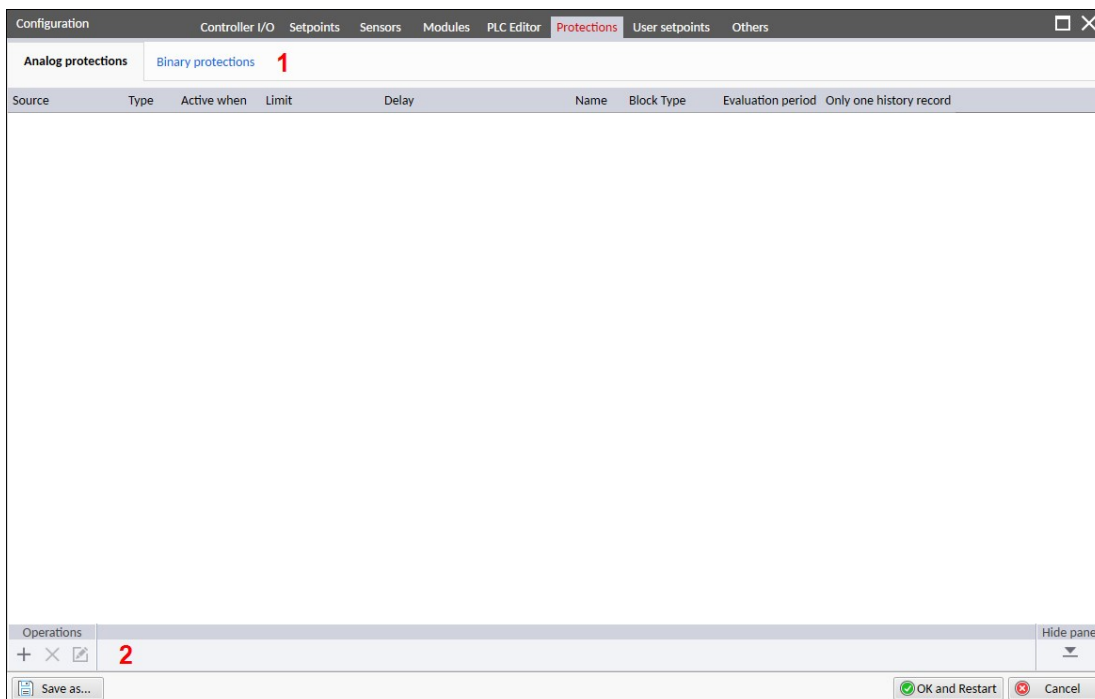
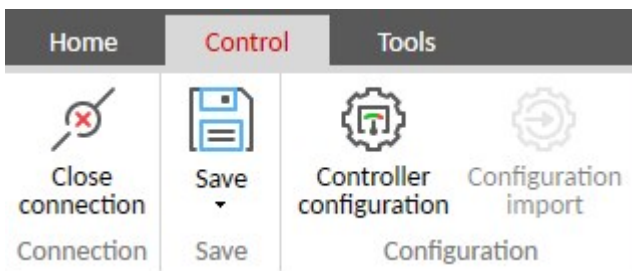
User protection can be applied to various Analog or binary values. Source upon which the protection is configured can be selected in the controller configuration window in IntelliConfig.

### Source




Analog values	Binary states
<ul style="list-style-type: none"><li>&gt; Analog inputs<ul style="list-style-type: none"><li>» Controller, Modules</li></ul></li><li>&gt; Values<ul style="list-style-type: none"><li>» ECU, Measured values, Application, PLC, Shared I/O</li><li>» Modbus server, Modbus Master</li></ul></li><li>&gt; Statistics</li></ul>	<ul style="list-style-type: none"><li>&gt; Binary inputs<ul style="list-style-type: none"><li>» Controller, Modules, ECU, Shared I/O</li><li>» Modbus server, Modbus Master</li></ul></li><li>&gt; Binary outputs<ul style="list-style-type: none"><li>» PLC</li></ul></li><li>&gt; Protection states</li><li>&gt; LBOs</li></ul>

### Configuration of protections in IntelliConfig

Control tab → Controller configuration → Protections tab → Analog / Binary protections





1	Select the desired protections to be configured (Analog protections / Binary protections).
2	<p><b>Add</b> protection by clicking on the  icon</p> <p><b>Delete</b> selected protection by clicking on the  icon.</p> <p><b>Edit</b> selected protection by clicking on the  icon.</p>



## Adding analog protection

The screenshot shows the 'Analog Protection' dialog box with the following fields and annotations:

- Source Value:** A text input field containing '1' (annotated with a red circle 1).
- Type / Level:** A dropdown menu showing 'Warning' with a yellow triangle icon (annotated with a red circle 2).
- Custom Name:** A text input field containing 'Wrn' (annotated with a red circle 3).
- Active When:** A dropdown menu showing 'Over Limit' (annotated with a red circle 4).
- Block Type:** A dropdown menu showing 'All the time' (annotated with a red circle 5).
- History Record:** A dropdown menu showing 'Always' (annotated with a red circle 6).
- Evaluation Period:** A dropdown menu showing 'Standard (0.1 s)' (annotated with a red circle 7).
- Protection State:** A checkbox that is currently unchecked (annotated with a red circle 8).
- Limit:** A section header.
- Limit Source:** A text input field containing '9' (annotated with a red circle 9).
- Delay:** A section header.
- Delay Source:** A text input field containing '10' (annotated with a red circle 10).

At the bottom of the dialog are 'OK' and 'Cancel' buttons.

1	Selecting the input source <b>see User protections on page 186</b>
2	Selecting the protection type <b>see Protection types on page 180</b>
3	Text input for Alarm / History message
4	Selecting the protection activation <b>see Protection activation on page 182</b>
5	Selecting the block type <b>see Protection blocking on page 182</b>
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 <b>Protection State</b> is checked the protection is then shown in the <b>Values</b> in the group <b>User Protection States</b> .
9	<p>Selecting the input for limit.</p> <p>Setpoints must have the correct resolution and dimension as protection source value.</p> <ul style="list-style-type: none"> <li>&gt; Existing setpoint</li> <li>&gt; New user setpoint</li> <li>&gt; Existing user setpoint</li> </ul> <p>Prefix is added to the name based on protection type / level</p>
10	<p>Selecting the input for delay.</p> <p>Setpoints must have the correct resolution <b>0.1</b> and dimension <b>[s]</b></p> <ul style="list-style-type: none"> <li>&gt; Existing setpoint</li> <li>&gt; New user setpoint</li> <li>&gt; Existing user setpoint</li> </ul> <p>Prefix is added to the name based on protection type / leve</p>



## Adding binary protection

**Binary Protection**

Source Value  ... ?

Type / Level ⚠ Warning 2 ▾

Custom Name  3

Active When True 4 ▾

Block Type All the time 5 ▾

History Record Always 6 ▾

Protection State ☐ 7

**Delay**

Source  ... ↗ ↶ ?

OK Cancel

1	Selecting the input source <b>see User protections on page 186</b>
2	Selecting the protection type <b>see Protection types on page 180</b>
3	Text input for Alarm / History message
4	Selecting the protection activation <b>see Protection activation on page 182</b>
5	Selecting the block type <b>see Protection blocking on page 182</b>



6	Selecting if the occurrence of a protection is recorded every time or only once after a Fault Reset.
7	If <b>Protection State</b> is checked the protection is then shown in setpoints under the group <b>User setpoints</b> .
8	<p>Selecting the input for delay.</p> <p>Setpoints must have the correct resolution <b>0.1</b> and dimension <b>[s]</b></p> <ul style="list-style-type: none"> <li>&gt; Existing setpoint</li> <li>&gt; New user setpoint</li> <li>&gt; Existing user setpoint</li> </ul>

 **back to Protections**

## Protection states

Protection states is a feature, which helps with better management of alarms. Protection states work in similar way, like any other LBO. The difference is, that protection state gets active only when there is a 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 values are in a group of up to 32 bit states.

#### > 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 (PAGE 1)
- >> FIXED PROTECTIONS STATES 7 (PAGE 1)

### User protections states

During the **Configuration of protections in IntelliConfig**, 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 a new user protection state is created, its binary status is recorded within the **User Protection States**. The system prioritizes the first available slot in the Actual List; if the list is full, the status is placed to the end of the list. 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.

 **back to Protections**



# 5.4.25 Sensor Curves

## Default sensor curves

The total of 16 default sensor curves is available in the controller. From which 3 are default VDO sensor curves and 13 a General Line sensor curves. The information on minimum/maximum values of respective sensors is visible in the Controller Configuration -> Sensors tab. Each sensors curve can be modified to meet the needed requirement. Especially of temperature curves may differ.

**Note:** Curves can be modified via IntelliConfig. In IntelliConfig are also prepared some standard curves.

## Sensor curve HW configuration

InteliNeo 530 BESS analog inputs allows you to select Input HW type. Many HW configuration options are available but to summarize they can be divided in to 3 group ranges:

- > 0-15 kΩ
- > 0-10 V
- > 0-20 mA passive

**Note:** Other Sensor HW configuration options are related to the **CAN Extension Modules**.

Setup controller physical analog input based on the chosen HW configuration choice if any other than the default HW configuration (0-15 kΩ) is wanted. Here is a description of setting up an analog input with a dedicated HW configuration:

1. Start with a sensor configuration and select requested HW configuration

The screenshot shows the 'Sensors' tab in the IntelliConfig software. On the left, a list of sensors includes 'StarterKit OilPress', 'StarterKit CoolTemp', 'StarterKit FuelLev', and five 'General line' entries. The 'StarterKit OilPress' sensor is selected. To the right, the 'HW configuration' dropdown menu is open and highlighted with a red box, showing '0-10 V' as the selected option. Below this, the 'Sensor Name' is 'StarterKit OilPress'. The 'Resolution' is set to '0,1' and the 'Dim' is 'Bar'. At the bottom, a table shows the mapping for the '0-10 V' configuration:

	0-10 V	Bar
0	0,000	0,0
1	1,000	10,0

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.



Configuration	Setpoints	Controller I/O	Sensors	Modules	PLC Editor	Others
Binary Inputs						
Binary Outputs						
Analog Inputs						
Analog Input 1						
Function:		Oil Pressure				
History abbreviation:		OilP				
Sensor:		StarterKit OilPress				
Bargraph 0%:		0,0				
Bargraph 100%:		10,0				
Input HW type:		0-10 V				
Protection type:		Wrn+Sd				
Oil Pressure Delay		3 s				
Oil Pressure Sd		1,0 Bar				
Oil Pressure Wrn		2,0 Bar				
Protection active:		Under Limit				
Engine running only:		<input checked="" type="checkbox"/>				

## 5.4.26 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



## 5.4.27 System Start/Stop

On sites with one controller the LBI **REMOTE START/STOP** is used for BESS start and stopping in **Controller Mode= AUTO** mode.

The starting of the assets via activation of the individual LBI **REMOTE START/STOP** on each controller in a large site is applicable but it is recommended to utilize the System Start/Stop function.

On sites with multiple ComAp controllers the starting of the assets can be managed from one controller that has LBI **REMOTE START/STOP** activated. The signal is then automatically shared over the inter controller communication (CAN bus) to all connected controllers. The shared signal is then considered as a System Start/Stop signal. This automatically share signal has lower priority then the local LBI **REMOTE START/STOP** on each individual controller. Therefore the controllers that has the LBI **REMOTE START/STOP** linked to any binary input will ignore the System Start/Stop signal being sent via the inter controller communication.

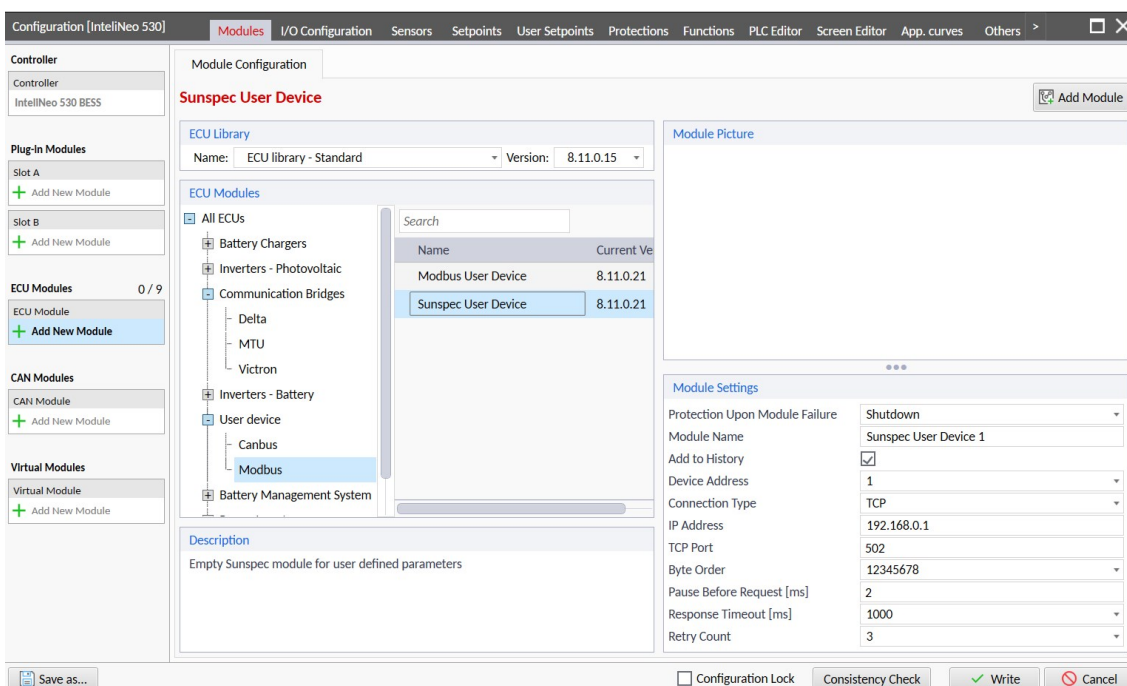
## 5.4.28 Sunspec

SunSpec is an application-layer communications protocol designed to achieve interoperability between Distributed Energy Resource (DER) components by layering these standardized Information Models over existing communication protocol - Modbus. By assigning specific data to fixed register locations, it allows monitoring systems and software to "plug and play" with any compliant hardware. This standardization is critical for modern grid requirements, as it simplifies data collection and enables safety features like standardized Rapid Shutdown for emergency responders.

### Steps to configuring a Sunspec device

Using the IntelliConfig, a Sunspec User Device can be configured or a specific compatible Sunspec device can be chosen from the ECU library - Standard or any imported ecu library. The following steps show how to configure and add a Sunspec User Device module.

Control -> Controller Configuration -> Modules -> ECU Modules (Add New Module) -> User device -> Modbus -> Sunspec User Device -> Add Module (click button)





## 5.4.29 User Buttons

User Buttons can be used to assign function of user's choice to button on the **External display** or for instance a remote switch. There are 16 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 corresponding User Button is controlled by command from <b>External display</b> .
MAN OFF	The corresponding User Button is controlled manually via the setpoint. Value of the user button is still 0.
MAN ON	<div>The corresponding User Button is controlled manually via the setpoint. Value of the user button is still 1.</div> <div><b>Note:</b> 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.</div>

### Commands

If corresponding 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:

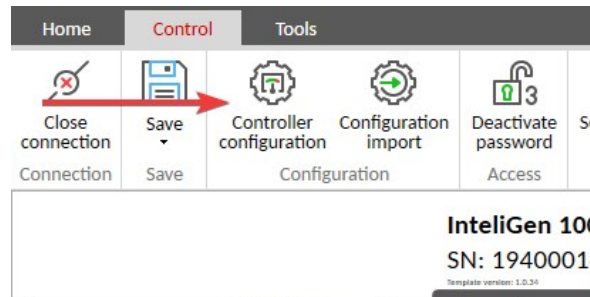
Command	Description
ON/OFF	While this command is selected, pressing the button negate the actual value of the user button
ON	<div>While this command is selected, pressing the button sets the actual value of the user button to 1.</div> <div><b>Note:</b> Will not have any effect if the value is already 1.</div>
OFF	<div>While this command is selected, pressing the button sets the actual value of the user button to 0.</div> <div><b>Note:</b> Will not have any effect if the value is already 0.</div>
Pulse ON	<div>While this command is selected, pressing the button sets the actual value of the user button to 1 for 200 ms.</div> <div><b>Note:</b> The command reacts only to rising edge of the button.</div>

See list of MODBUS comands in chapter **List of commands and arguments**.

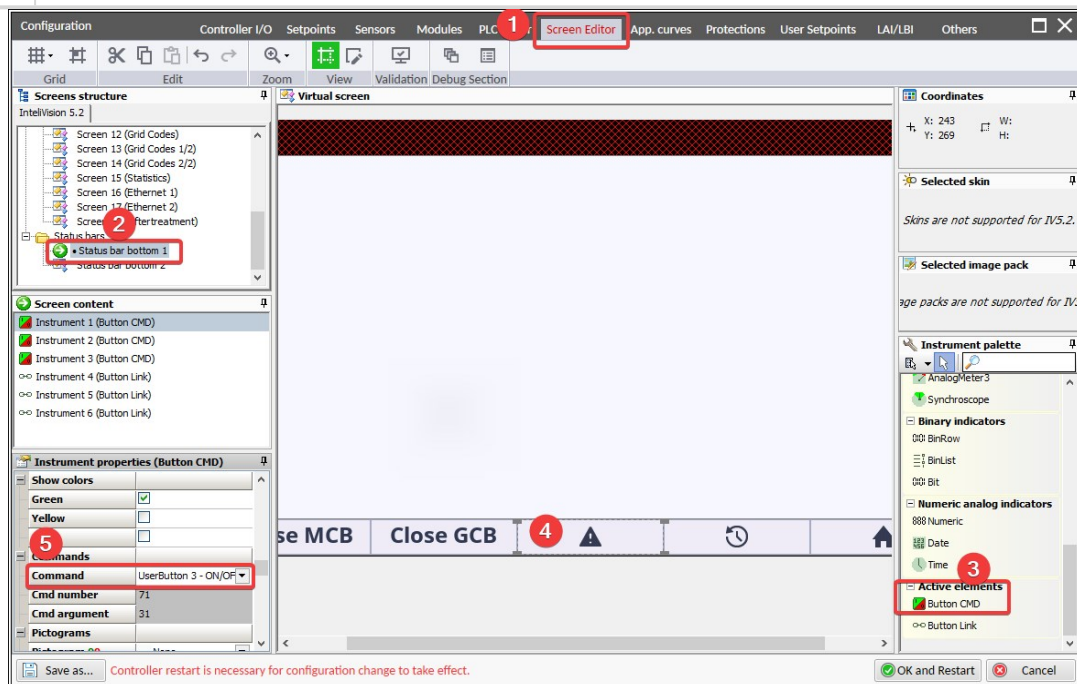
### Configuration of user button command

To configure Command on User Button, navigate to Configuration in IntelliConfig





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





# 5.4.30 User Management And Data Access Control

Types of interfaces .....	197
User accounts .....	198
Managing accounts .....	200
Account break protection .....	206
Access to controller data .....	207
Cybernetic security .....	207

- 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 other users can log in.

**Note:** For trusted interfaces there is an "implicit user"(see **Implicit account on page 198**) automatically logged in always while no other explicit user is logged in.

## Types of interfaces

The controller communication interfaces are split into two categories according to what kind of environment the interface is exposed to.

- **Trusted**
  - Trusted 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 the nature of this interface less strict cybersecurity rules may be applied.
  - Trusted interfaces provide **Implicit account** function which allows the performance of certain operations without requiring an explicit user to log in.
  - Trusted interfaces are USB, RS232, RS485.
- **Untrusted**
  - General-purpose interfaces, which may be exposed to public networks, such as the Internet, are untrusted. The communication is running through networks which are not under control of the entity who operates the controller. Thus, strict cybersecurity rules must apply for this type of interface.
  - Untrusted interface are Ethernet and cellular module.

### 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
Untrusted	5	3

🔍 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:** *If there is a need to create the same accounts on several controllers use cloning.*

User account must have following properties:

<b>Username</b>	Consists of 6-15 alphanumeric characters, must contain at least 1 letter. This is the main identifier of the particular user account.
<b>Password</b>	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).
<b>User identifier (UID)</b>	Optional 4-digit identification string which can be used for simplified login at trusted interfaces (e.g. from IntelliVision display when connected via <b>Communication peripherals</b> ).
<b>PIN</b>	4-digit "password" to be used together with UID.
<b>Role mask</b>	Determines <b>Access to controller data</b>

### 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. IntelliVision).

**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

At trusted interfaces there is an *implicit user* automatically logged-in at any time if no other explicit user is logged-in at the respective interface. This allows terminal devices (e.g. internal display) to show controller values even without the need for a specific person to be logged-in.

- The implicit account is defined in the firmware.
- The implicit account has fixed role 1
- Implicit user is logged in any time no other user is logged in at the respective interface.

### Production mode

Production mode is used to simplify working with the controller while manufacturing, putting into operation or service works.

In production mode the **Implicit account** has role adjusted to **administrator role**. Thus, in production mode at trusted interfaces (like USB) the operator is allowed to perform any operation which normally requires administrator to log in without the need of logging in.



**IMPORTANT: Production mode is intended only for the manufacturing and/or service purposes while the controller is in the respective facility and must be turned off before the controller is put into regular operation.**

There is active alarm **Wrn Production Mode** in the alarm list any time production mode is active. To turn off the Production mode go to User management and uncheck the checkbox Production mode or go to Production Mode display screen and select disable.

## 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>

**Example:** 12345678

**User ID:** "0001"

**User PIN:** "0000"

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 can be deleted.

**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.**

**Note:** *There must always remain at least one administrator account in the system. The controller will not allow deleting last administrator account.*

**Wrn Default Password** appears in Alarm list when the default administrator password is set. The purpose of alarm is to inform that the controller might be or is connected to an untrusted interface and cybersecurity rules are not fulfilled because there is default administrator password.

## 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.

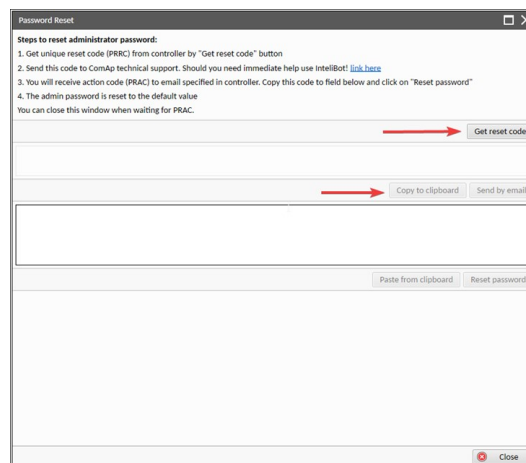
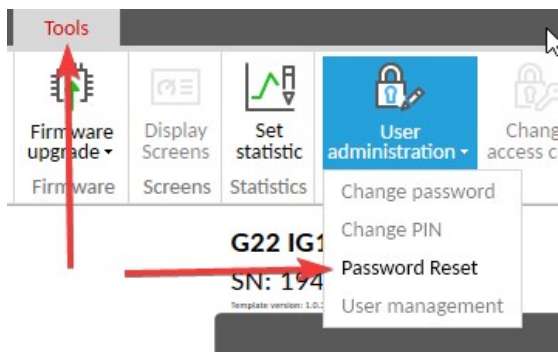
**Note:** *there must always remain at least one administrator account in the system. The controller will not allow deleting last administrator account.*

## Reset accounts to factory default

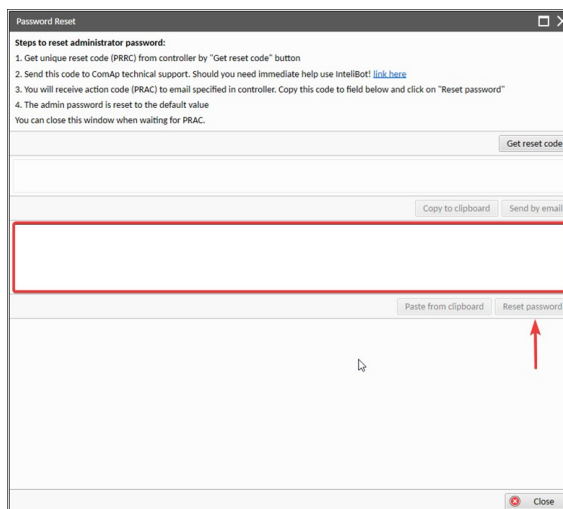
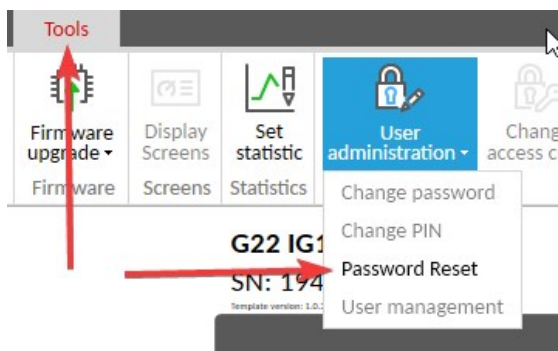
If credentials (username and/or password) for administrator account are lost, it is possible to reset all user accounts to the factory default state.

1. Connect to the controller through a IntelliConfig 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 IntelliConfig now
4. Put the PRRC code into the “IntelliBot” application at [https://www.comap-control.com/support](\"https://www.comap-control.com/support\") or e-mail the code to [support@comap-control.com](\"mailto: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 IntelliConfig tool again
7. Enter the Password Reset Action Code into the appropriate form



8. Now the user accounts are in factory default state
- If credentials (username and/or password) for administrator account are lost, it is possible to reset all user accounts to the factory default state. For more information **see Resetting the administrator password on page 208**.

After reset procedure user accounts are in factory default state.

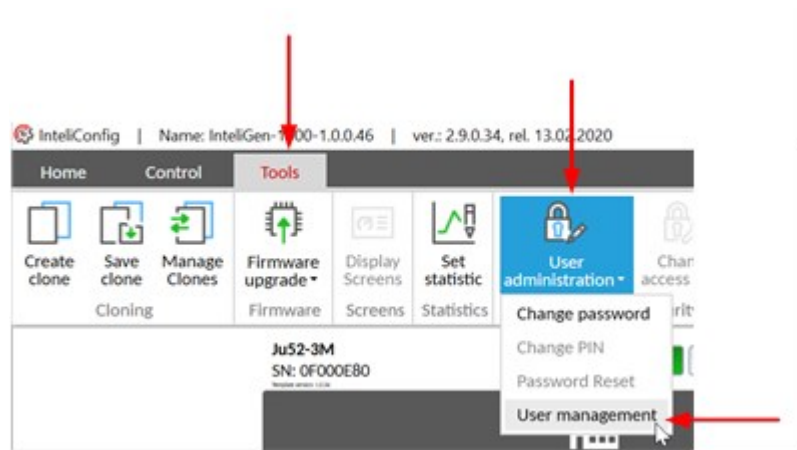
**back to User Management And Data Access Control**

## Managing accounts

User accounts can be managed from IntelliConfig 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 10.**

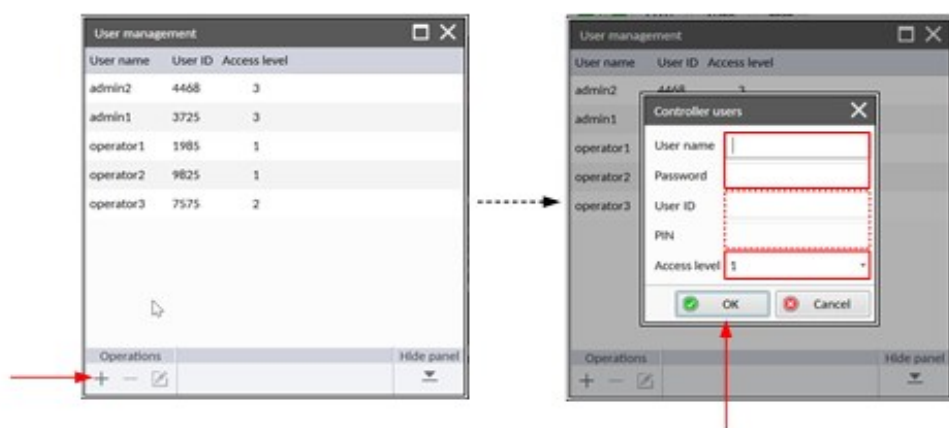




## Adding account

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.

## Cloning accounts

Cloning feature allows user to clone user accounts together with controller firmware and configuration.

**Note:** If the archive where the save of the clone is made is configured with the plug-in module, it's firmware can also be a part of the clone.



## Save the clone

To prepare the clone you need to click on the Save Icon. The following window appears.

Save clone

General

Plug-in Modules FW

User Management

Init screen

Service screen

Package protection

General

Name: IG500-Standard GC-1.0.0.29-clone

Description: IG500 Standard GC version 1.0.0.29

FW version: 1.0.0.29

Type: Parallel

Archive: IG500-Standard GC-1.0.0.29

Display FW version: 1.0.0.27

Fill in Clone name

Fill in Clone clone description

Save clone Close

Image 5.102 Save the clone

### > Plug-in Module FW bookmark

- » If is required to clone firmware of connected plug-in modules, click to checkbox "Include Plug-in Modules FW"

### > User Management bookmark

- » User has to create accounts in this section. These newly created accounts are stored in the clone
- » At least one user with administrator role must be defined. Recovery Email address has to be set.
- »

If the AirGate key in the Access Administration is empty the controller will not connect to the AirGate despite the function is enabled.



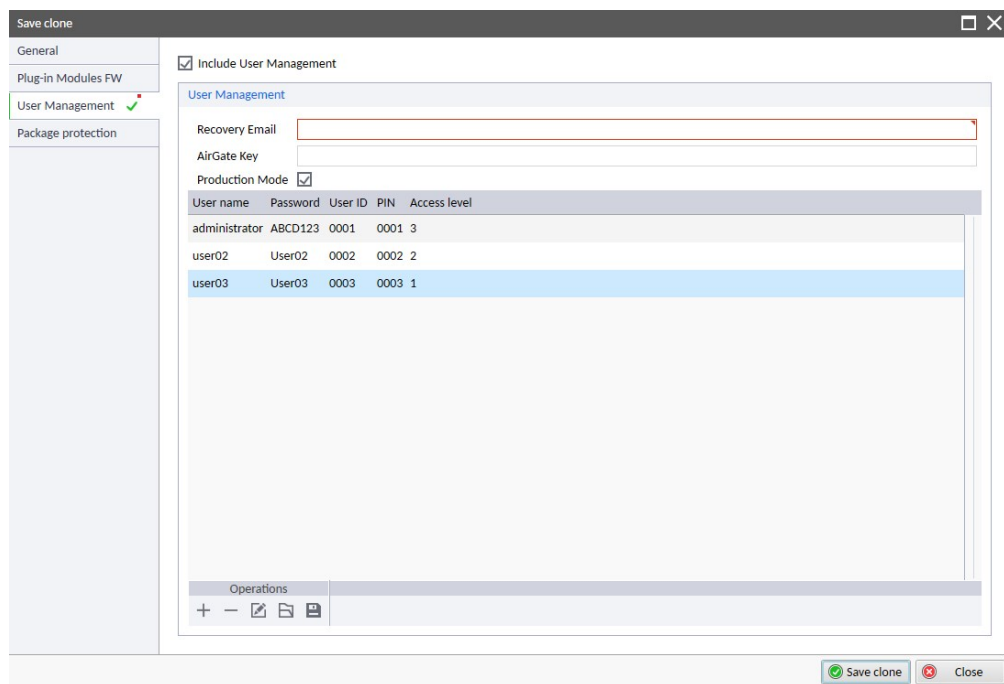


Image 5.103 Create accounts

- > Package protection
  - >> Set up password for clone file

## Create clone

To load the clone to the controller click on the Create Clone icon.

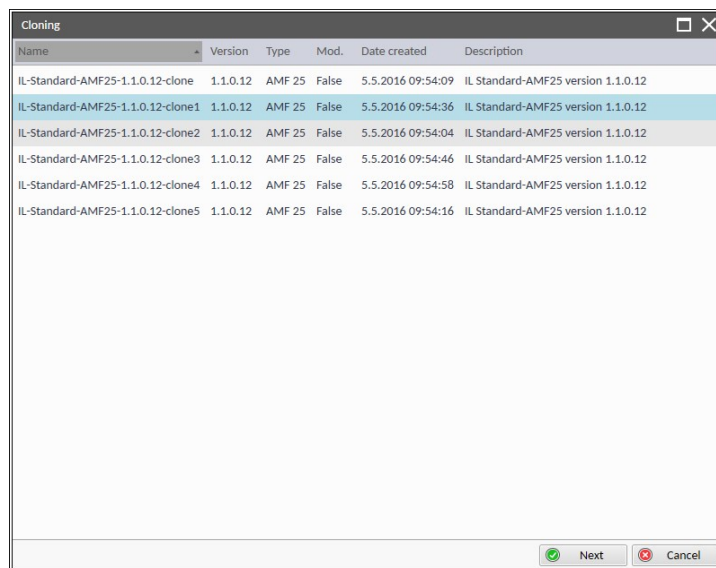


Image 5.104 Create clone

1. Select required clone and click on Next button
2. Following window appears



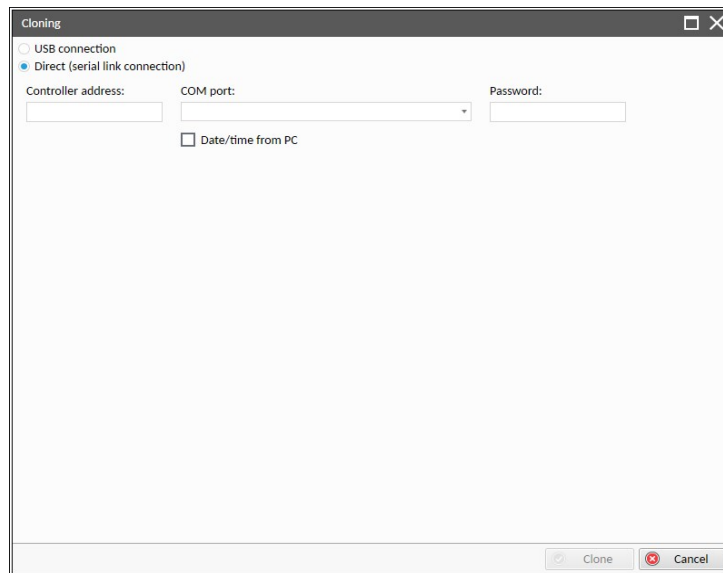


Image 5.105 Create clone

3. Select required connection type
4. Fill in the password in case the clone was saved by selected Package protection option
5. Click on Clone button

## Manage clones

Click on the ImEx clone icon for managing clones. Following window appears.

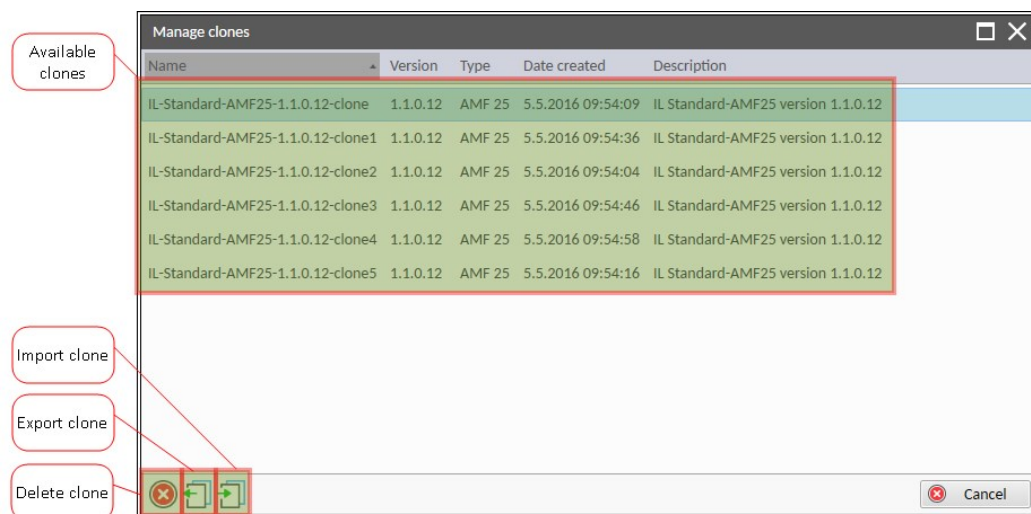


Image 5.106 ImEx Clone



## Exporting clone

It is possible to export clone from IntelConfig software into any location. To export the clone click on the Export clone icon. Following window appears.

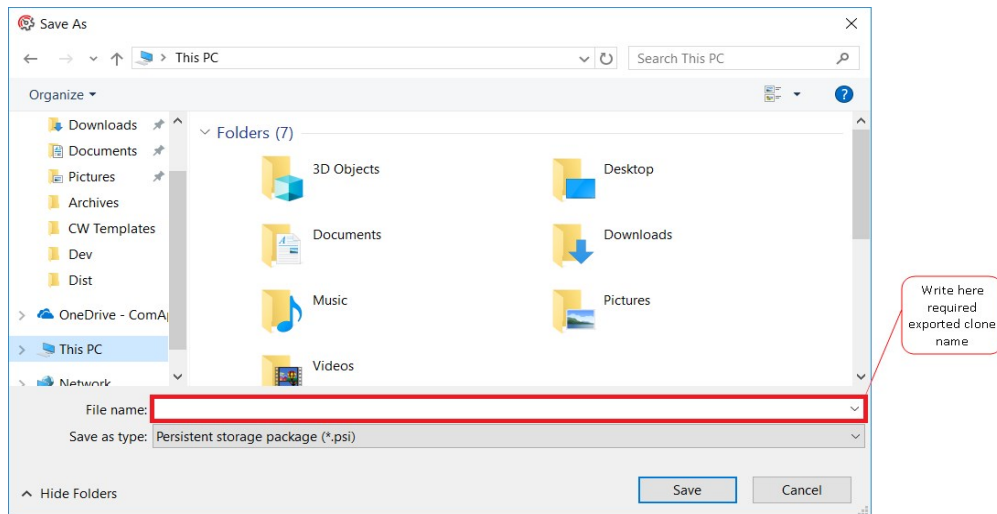


Image 5.107 Save as clone

1. Type required clone name into File name bar
2. Choose required folder
3. Click on Save button

## Importing clone

It is possible to import clone from any location. For importing the clone click on the Import clone icon. Following window appears.

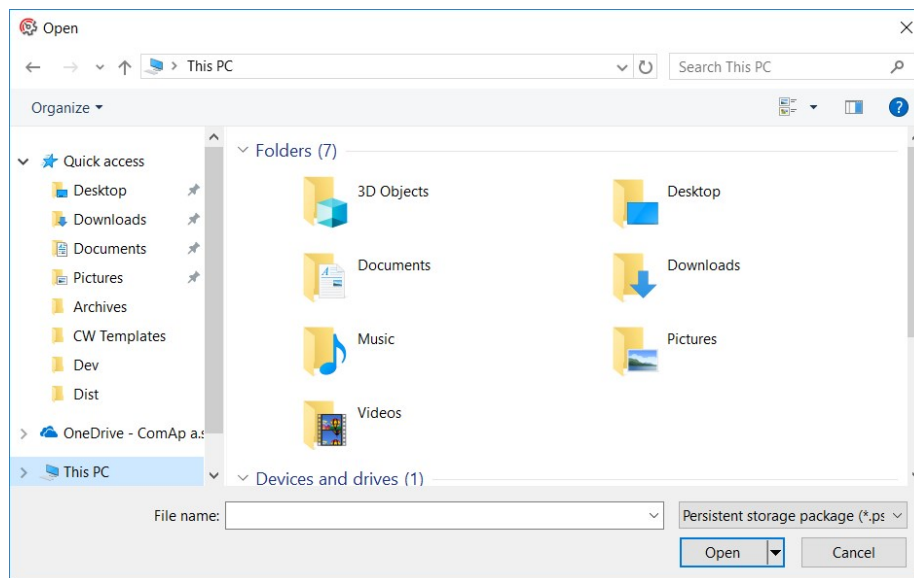


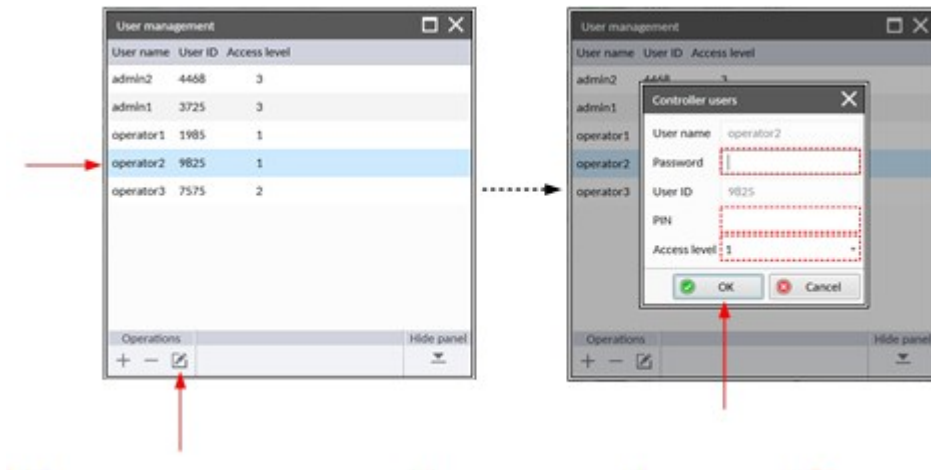
Image 5.108 Open clone

1. Go to location where is required clone saved
2. Select the clone
3. Click on Open button



## 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.

## Cybernetic security

The cybernetic security is formed by:

- Protection against a brute-force attack to the password
- Secure method to reset the password



- A new technology of encryption of the remote communication
- Web interface can be disabled

**Note:** Cybernetic security was designed according to ISA 62443, level 2.

## Protection against the brute force attack

Protection against a brute force attack will take place when an invalid password is entered repeatedly.

- If the invalid password is entered 5 times, the controller gets blocked from entering the password for a predetermined amount of time.
- Each further entering of the invalid password cause the consequent blocking time is to be increased.
- If the invalid password is entered repeatedly the controller gets blocked for entering the password permanently and the password must be reset to a default value as described below.

**Note:** Blocking of the controller for entering the password has no influence on controller / BESS operation

**Note:** Permanent blocking cannot occur accidentally, just by user mistake. It can be practically triggered only by a focused activity.

## Resetting the administrator password

If the **administrator password is lost or controller is permanently locked** due to brute-force attack protection, proceed according to a procedure described below:

**IMPORTANT:** There is a backup e-mail address defined in the controller to which and only which ComAp will send the "password reset action code". Please be sure, that you have adjusted this e-mail address correctly. Use IntelliConfig to adjust the backup e-mail address

Change password

Username administrator

Current password

New password

Repeat new password

Email address

john.unknown@company.com

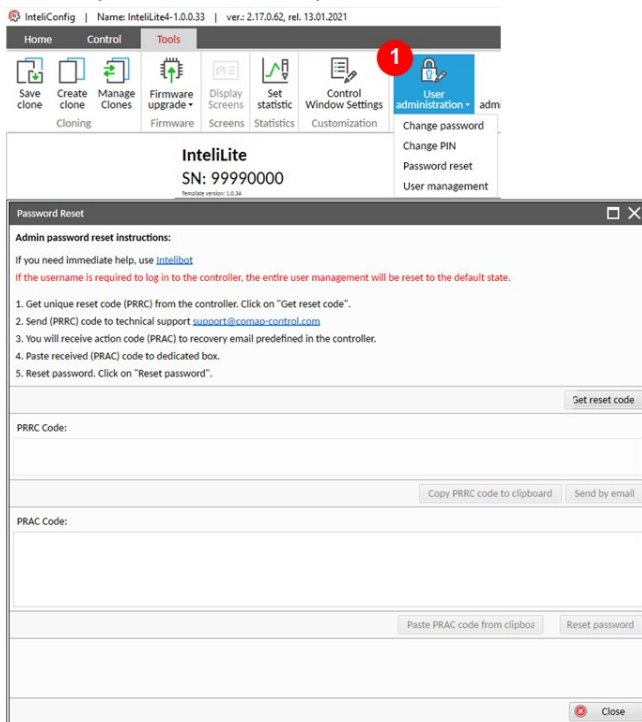
This is the email address for administrator password reset. If you forget your administrator password and valid email address is not entered you will not be able to reset administrator password!

OK Close



## Reset password procedure

1. Connect IntelliConfig.
2. Get the password reset request code and send it via e-mail to [support@comap-control.com](mailto:support@comap-control.com)



## Encryption of the communication

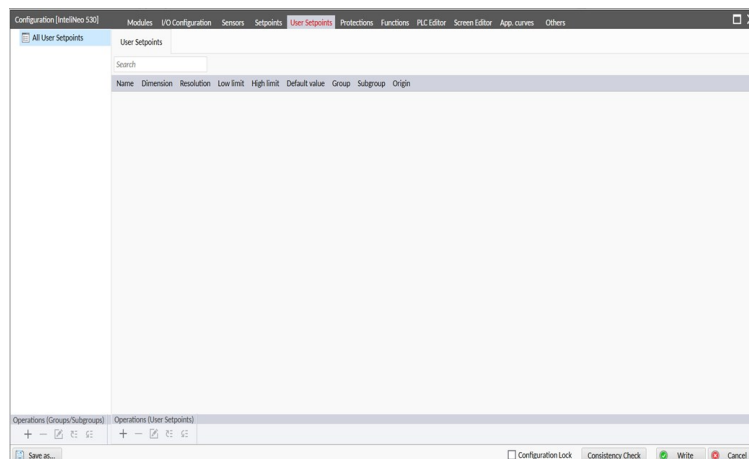
New technology CCSv2 is used for an authentication and an encryption of the ComAp protocol via Internet/ethernet/AirGate. This technology is based on strong and proven cryptographic algorithms and has successfully passed penetration tests and cybersecurity audit.

🔍 back to User Management And Data Access Control

### 5.4.31 User Setpoints

Controller allows user to create their own setpoints, groups and subgroups. 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 IntelliConfig (Tools tab → Generate Cfg image (COM)). User setpoints can be used to manage User protections and PLC.





**Add** Groups/Subgroups or User setpoint



1

**Delete** selected Groups/Subgroups or User setpoint



**Edit** selected Groups/Subgroups or User setpoint



Image 5.109 User setpoints tab in InteligoConfig

Group/subgroup details

Name

Type

Group

Parent Group

OK

Cancel

Image 5.110 Setting parameters of Group/Subgroup



The image shows a 'User setpoint' dialog box with the following fields and values:

- Name:** (empty text box)
- Dimension:** %
- Resolution:** 1
- Low Limit:** -2 147 483 647
- High Limit:** 2 147 483 647
- Default Value:** 0
- Group:** User Setpoints
- Subgroup:** User Setpoints

Buttons: OK, Cancel

Image 5.111 Setting parameters of an user setpoint

### Contents of the user Group/subgroup

<b>Name</b>	Max. 32 characters <b>Note:</b> Does not consider duplicities (It is possible to have groups/subgroups with the same name, but it is not recommended.)
<b>Type</b>	Group type can be Group or Subgroup.
<b>Parent group</b>	If you are creating a subgroup, parent group must be selected from created groups, except for exceptions.

### Contents of the user setpoint

<b>Name</b>	Max. 32 characters <b>Note:</b> Does not consider duplicities (It is possible to have setpoints with the same name, but it is not recommended.)
<b>Dimension</b>	Can be chosen from a list or User can create their own with a limit of 32 characters.
<b>Resolution</b>	Max. 4 decimal places
<b>Low Limit</b>	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.
<b>High Limit</b>	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.
<b>Default value</b>	Must be in range between Low and High Limit (restricted by resolution).
<b>Group</b>	Group in which setpoint will be shown.
<b>Subgroup</b>	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
Grid Codes	User setpoints
Power Management	User setpoints
User setpoints	User setpoints

### 5.4.32 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



## 5.5 Application related functions

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Functions directly related to the Microgrid application are described in this chapter.



## 5.5.1 Application modes MINT

### Application mode MINT

The MINT application is intended for the integration of BESS source using IntelliNeo into a system where the cooperation of several sources is required, while each of these sources is integrated by its own controller (IntelliNeo, IntelliGen). 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.

## 5.5.2 IntelliNeo integration in MINT application

In the MINT application each IntelliNeo controller can integrate the following sources in any combination:

### BESS Integration in MINT

The IntelliNeo BESS 530 is primarily intended for the seamless integration of the BMS, PCS, and auxiliary systems such as HVAC into a single, controllable unit. Much like an IntelliGen 1000 is intended for integration between generator and combustion engine into a single genset unit, the IntelliNeo serves as the master controller for the BESS, handling AC measurement, BESS Circuit Breaker (BCB) control, and the operational state machine.

To fulfill this integration, the IntelliNeo 530 utilizes a Multiple ECU architecture to communicate with the various components of the BESS. It serves as the central hub that aggregates information about energy storage from the BMS, electrical parameters, protection, control statuses from the PCS, and environmental data from the HVAC and other support systems. This allows the IntelliNeo to coordinate these independent subsystems into a cohesive energy storage solution, managed via a unified interface for complex control logic, monitoring and protection

### 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.



## 5.5.3 BESS starting sequence and BESS states

The method of putting 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 (Grid Forming Mode) or the ability to operate only in parallel with another source (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
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 <b>Starting Sequence BCB Control</b> = 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 <b>Starting Sequence BCB Control</b> = Start With Closed BCB and <b>Start To Dead Bus</b> = 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 <b>Starting Sequence BCB Control</b> = Start With Closed BCB and <b>Start To Dead Bus</b> = 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 value **BESS state** is in the Ready state. In order for the value to be in Ready state the setpoint **Controller Mode** can not be set to OFF and no red alarm protection indications are present in the alarm list. Other conditions are also applicable see more in table in **BESS states for start with opened BCB**.
- If the necessary conditions for starting are temporarily not met from the BESS perspective, the BESS start can be blocked using LBI **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 state to Not Ready state using user protection type Sd.
- The start command is issued either in MAN mode by pressing the START button or in AUTO mode upon receiving the **REMOTE START/STOP** signal.
- For the successful start of the BESS the (PCS) voltage output must be detected as inactive. The determination PCS 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 InteliNeo can be in charge of the Precharge sequence. It all depends on the setup of the precharge and its configuration. There can be a selection for internal precharge (setting setpoint **Precharge Sequence** = Internal) in which the controller activates signal LBO **PRECHARGE RELAY** to command the



beginning of the precharge. Activation of LBI **PRECHARGE FINISHED** confirms that the precharge process is complete. With the precharge process complete the values **ES Voltage Meas** and **PCS Voltage Meas** should be in a voltage window defined by the setting of setpoint **DC Voltage Window**. With correct precharge and voltages of the ES and PCS in defined voltage range will the activation of the lbo take **ESCB CLOSE/OPEN** place. Expected LBI **ESCB Feedback** is required in order to have the DC setup connected. There can also be an external precharge setup in which the controller is only waiting of LBI **ESCB Feedback** activation. For more information about precharging see **BESS Precharge Types on page 226**

- After closing the DC link (LBI **ESCB Feedback** =1), the controller issues a command to start the PCS using the LBO **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 **PCS READY TO LOAD**. This confirmation is expected within the interval defined by the setpoint **PCS Ready To Load TO**. If the controller does not receive confirmation within this timeout, it transitions to the error **Start Fail**.
- 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 not evaluated, the evaluation of the protections start 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. 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
<b>Ready</b>	<p>Conditions for the value BESS state be in this state:</p> <ul style="list-style-type: none"> <li>➤ There is no 2nd level alarm or alarm that sets the value BESS state to NotReady (for instance <b>Wrn Energy Storage Not Ready</b>) in the alarm list.</li> <li>➤ The setting of setpoint <b>Controller Mode</b> is set to MAN or AUTO mode.</li> <li>➤ The configured LBI <b>PCS READY TO LOAD</b> = 0 must be deactivated at the beginning.</li> <li>➤ Having values BESS Voltage and BESS Frequency be 0.</li> </ul>
<b>DC String Coupling</b>	<p>Having the setup ready for Multi BMS this state will appear. Important for this state is to have active SW Key and setpoint <b>Multi BMS</b> = Enabled. More information can be read in <b>DC String Coupling</b> or <b>Energy storage with Multiple BMS control</b></p>
<b>ES Starting</b>	<p>Depending on the setting of setpoint <b>Precharge Sequence</b> will this state be requiring certain actions.</p> <ul style="list-style-type: none"> <li>➤ Precharge Sequence = Internal</li> </ul>



State	Description
	<ul style="list-style-type: none"> <li>» Controller activates LBO <b>ES RUN REQUEST</b></li> <li>» Controller is waiting from the BMS for information that ES is ready to load via LBI <b>ES READY TO LOAD</b>.</li> <li>&gt; Precharge Sequence = External <ul style="list-style-type: none"> <li>» Controller activates LBO <b>ES RUN REQUEST</b> after LBI <b>ESCB Feedback</b> is closed</li> <li>» Controller is waiting from the BMS for information that ES is ready to load via LBI <b>ES READY TO LOAD</b>.</li> </ul> </li> </ul>
<b>Precharge</b>	<p>Having the setpoint <b>Precharge Sequence</b>= Internal activates this state. During this state the LBO <b>PRECHARGE RELAY</b> is active. This state is present until the difference between <b>ES Voltage Meas</b> and <b>PCS Voltage Meas</b> is inside of the range calculated as a percentage (set by setpoint <b>DC Voltage Window</b>) of <b>ES Nominal Voltage</b>. If voltage difference is not within the range longer then time set in setpoint <b>Precharging TO</b>, then the controller interrupts starting sequence and Sd <b>Start Fail</b> will appear. Having the setpoint <b>Precharge Sequence</b>= External will skip this state and continue next to BESS State = Ready To Start.</p>
<b>ESCB Closing</b>	<p>Depending on the setting of setpoint <b>ESCB Type</b>, difference actions will be executed</p> <ul style="list-style-type: none"> <li>&gt; <b>ESCB Type</b> = Breaker <ul style="list-style-type: none"> <li>» Controller starts doing ESCB control by activating the corresponding LBOs. For more information on the control of ESCB read <b>Breaker control outputs</b></li> <li>» Controller commands via LBOs to have a closed DC connection via LBI <b>ESCB Feedback</b>.</li> </ul> </li> <li>&gt; <b>ESCB Type</b> = Fuse/Disc. <ul style="list-style-type: none"> <li>» Controller commands to have a closed DC connection via LBI <b>ESCB Feedback</b> at the beginning of the start of the system.</li> </ul> </li> </ul>
<b>Ready To Start</b>	<p>During this BESS state the controller needs data via LBI <b>PCS READY TO START</b> that the PCS is capable of starting. It is important to have the LBI <b>PCS READY TO START</b> active before the countdown of setpoint <b>PCS Ready To Start TO</b> elapses.</p> <p>After the LBI <b>PCS READY TO START</b> is received by the controller, the system activates signal LBO <b>PCS RUN REQUEST</b> and countdown via setpoint <b>PCS Ready To Load TO</b> is started to be counted down. During this second countdown the controller is requesting from the PCS information that it is capable of converting voltage. This information is important to provide to the LBI <b>PCS READY TO LOAD</b> before the countdown elapses.</p>
<b>Energized</b>	<p>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 continues to the state Loaded directly).</p>
<b>Soft Load</b>	<p>Once the LBI <b>BCB FEEDBACK</b> is confirmed to be active will the BESS load be ramped according to <b>Soft Load Ramp</b> if it is able to (single island operation), otherwise this step is skipped and goes to Loaded immediately. Once the BESS power reaches the required value but before the load ramp has elapsed, the state machine continues to the state Loaded.</p>



State	Description
<b>Loaded</b>	The BESS is loaded and it follows the selected strategy. See <b>BESS P and Q control strategies</b> . The active power of the BESS is being ramped to the actual request <b>BESS Required P Target</b> according to the ramp <b>Load Ramp PTM</b> or <b>Load Ramp Island</b> .
<b>Soft Unload</b>	Soft unload is available only if there is another source in a system that can take the load from the unloading BESS. When the BESS stopping request or BCB opening request received the BESS initiates the soft unloading process. The BESS power output regulation is ramped down to zero. BCB opens and the state machine steps to the state Energized or Stop. During the unloading process the <b>Soft Unload Ramp</b> is used.
<b>Stop</b>	<p>The BESS is being stopped. The <b>LBO PCS RUN REQUEST</b> is deactivated and BESS is expected to not produce any voltage on its Output, see <b>Bus Dead Level</b>. Once evidence of BESS no longer running is detected, the BESS goes to the state Ready. In other case the alarm <b>Wrn Stop Fail</b> is issued if the BESS stopping is not correctly executed and the BESS running signals are detected after <b>Stop Time</b> elapsed.</p> <p>Evidence that the BESS is correctly stopped is that both of the breakers BCB and ESCB are opened having the LBI <b>ESCB Feedback</b> and LBI <b>BCB FEEDBACK</b> deactivated (this is only true if the breaker ESCB is set as Breaker options via the setpoint <b>ESCB Type</b>). Another evidence that the controller needs from the BESS is an indication that the BESS is no longer partaking in providing Load, this is done by having the LBI <b>PCS READY TO LOAD</b> being deactivated.</p>

**Note:** Losing **PRECHARGE FINISHED** unexpectedly anytime when the BESS is in Ready To Start, Energized, or Loaded state causes the alarm **SD Unexpected Source State**. Losing **PRECHARGE FINISHED** unexpectedly anytime when the BESS is in Ready To Start, Energized, or Loaded state causes the alarm **SD Unexpected PCS State**.

## Start with closed BCB to energized bus

This sequence is appropriate if the BESS supports only Grid Following Mode or VSG 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 **START BLOCKING** (Starting of the BESS still starts but it will not get the controller into energized). 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 mode by pressing the START button or in AUTO mode upon receiving the **REMOTE START/STOP** signal.
- For the successful start of the BESS the (PCS) voltage output must be detected as inactive. The determination PCS 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 if the setting of setpoint **Start To Dead Bus** is set to Disabled, meaning that healthy AC voltage is detected on the bus. If this is the case, the controller initiates the startup sequence by having the BCB closed to the energized bus.





The condition for continuing the startup sequence can also be a dead bus, meaning that no AC voltage is detected on the bus. If this is the case, the controller needs the setpoint **Start To Dead Bus** be set to enabled. The controller initiates the startup sequence by having the BCB closed to the deenergized bus. For this starting sequence the expectation is that the PCS is capable to be operated both in single island operation and in parallel operation with other generating sources

- The IntelliNeo can be in charge of the Precharge sequence. It all depends on the setup of the precharge and its configuration. There can be a selection for internal precharge (setting setpoint **Precharge Sequence** = Internal) in which the controller activates signal LBO **PRECHARGE RELAY** to command the beginning of the precharge. Activation of LBI **PRECHARGE FINISHED** confirms that the precharge process is complete. With the precharge process complete the values **ES Voltage Meas** and **PCS Voltage Meas** should be in a voltage window defined by the setting of setpoint **DC Voltage Window**. With correct precharge and voltages of the ES and PCS in defined voltage range will the activation of the lbo take **ESCB CLOSE/OPEN** place. Expected LBI **ESCB Feedback** is required in order to have the DC setup connected. There can also be an external precharge setup in which the controller is only waiting of LBI **ESCB Feedback** activation. For more information about precharging **see BESS Precharge Types on page 226**
- After closing the DC link (LBI **ESCB Feedback** =1), 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 **PCS READY TO LOAD**. This confirmation is expected within the interval defined by the setpoint **PCS Ready To Load TO**. If the controller does not receive confirmation within this timeout, it transitions to the error **Start Fail**.
- 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. 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	<p>Conditions for the value BESS state be in this state:</p> <ul style="list-style-type: none"> <li>➤ There is no 2nd level alarm or alarm that sets the value BESS state to NotReady (for instance <b>Wrn Energy Storage Not Ready</b> in the alarm list.)</li> <li>➤ The setting of setpoint <b>Controller Mode</b> is set to MAN or AUTO mode.</li> <li>➤ The configured LBI <b>PCS READY TO LOAD</b> = 0 must be deactivated at the beginning.</li> </ul>
DC String Coupling	<p>Having the setup ready for Multi BMS this state will appear. Important for this state is to have active SW Key and setpoint <b>Multi BMS</b> = Enabled. More information can be read in <b>DC String Coupling or Energy storage with Multiple BMS control</b></p>
ES Starting	<p>Depending on the setting of setpoint <b>Precharge Sequence</b> will this state be requiring certain actions.</p> <ul style="list-style-type: none"> <li>➤ Precharge Sequence = Internal <ul style="list-style-type: none"> <li>➤➤ Controller activates LBO <b>ES RUN REQUEST</b></li> <li>➤➤ Controller activates LBO <b>BCB CLOSE/OPEN</b> and is waiting for receiving of active LBI <b>BCB FEEDBACK</b>. This behavior is condition depending on configuration and setting of setpoints <b>BCB Type</b>, <b>BCB Control Mode</b>.</li> <li>➤➤ Controller is waiting from the BMS for information that ES is ready to load via LBI <b>ES READY TO LOAD</b> once LBO <b>ES RUN REQUEST</b> is activated. .</li> </ul> </li> <li>➤ Precharge Sequence = External <ul style="list-style-type: none"> <li>➤➤ Controller activates LBO <b>ES RUN REQUEST</b> after the LBI <b>ESCB Feedback</b> is closed</li> <li>➤➤ Controller activates LBO <b>BCB CLOSE/OPEN</b> and is waiting for receiving of active LBI <b>BCB FEEDBACK</b>. This behavior is condition depending on configuration and setting of setpoints <b>BCB Type</b>, <b>BCB Control Mode</b>.</li> <li>➤➤ Controller is waiting from the BMS for information that ES is ready to load via LBI <b>ES READY TO LOAD</b> once LBO <b>ES RUN REQUEST</b> is activated.</li> </ul> </li> </ul>
Precharge	<p>Having the setpoint <b>Precharge Sequence</b>= Internal activates this state. During this state the LBO <b>PRECHARGE RELAY</b> is active. This state is present until the difference between <b>ES Voltage Meas</b> and <b>PCS Voltage Meas</b> is inside of the range calculated as a percentage (set by setpoint <b>DC Voltage Window</b>) of <b>ES Nominal Voltage</b>. If voltage difference is not within the range longer then time set in setpoint <b>Precharging TO</b>, then the controller interrupts starting sequence and Sd <b>Start Fail</b> will appear. Having the setpoint <b>Precharge Sequence</b>= External will skip this state and continue next to BESS State = Ready To Start.</p>
ESCB Closing	<p>Depending on the setting of setpoint <b>ESCB Type</b>, different actions will be executed.</p> <ul style="list-style-type: none"> <li>➤ <b>ESCB Type</b> = Breaker <ul style="list-style-type: none"> <li>➤➤ Controller starts doing ESCB control by activating the corresponding LBOs. For more information on the control of ESCB read <b>Breaker control outputs</b></li> <li>➤➤ Controller commands via LBOs to have a closed DC connection via LBI <b>ESCB Feedback</b>.</li> </ul> </li> <li>➤ <b>ESCB Type</b> = Fuse/Disc.</li> </ul>



State	Description
	<p>» Controller commands to have a closed DC connection via LBI <b>ESCB Feedback</b> at the beginning of the start of the system.</p>
<b>Ready To Start</b>	<p>During this BESS state the controller needs data via LBI <b>PCS READY TO START</b> that the PCS is capable of starting. It is important to have the LBI <b>PCS READY TO START</b> active before the countdown of setpoint <b>PCS Ready To Start TO</b> elapses.</p> <p>After the LBI <b>PCS READY TO START</b> is received by the controller, the system activates signal LBO <b>PCS RUN REQUEST</b> and countdown via setpoint <b>PCS Ready To Load TO</b> is started to be counted down. During this second countdown the controller is requesting from the PCS information that it is capable of converting voltage. This information is important to provide to the LBI <b>PCS READY TO LOAD</b> before the countdown elapses.</p>
<b>Soft Load</b>	<p>Once the LBI <b>BCB FEEDBACK</b> is confirmed to be active will the BESS load be ramped according to <b>Soft Load Ramp</b> if it is able to (single island operation), otherwise this step is skipped and goes to Loaded immediately. Once the BESS power reaches the required value but before the load ramp has elapsed, the state machine continues to the state Loaded.</p>
<b>Loaded</b>	<p>The BESS is loaded and it follows the selected strategy of load control. See <b>BESS P and Q control strategies</b>. The active power of the BESS is ramped to the actual request <b>BESS Required P Target</b> according to the ramp <b>Load Ramp PTM</b> or <b>Load Ramp Island</b>.</p>
<b>Soft Unload</b>	<p>Soft unload is available only if there is another source in a system that can take the load from the unloading BESS. When the BESS stopping request or BCB opening request received the BESS initiates the soft unloading process. The BESS power output regulation is ramped down to zero. BCB opens and the state machine steps to the state Energized or Stop. During the unloading process the <b>Soft Unload Ramp</b> is used.</p>
<b>Stop</b>	<p>The BESS is being stopped. The <b>PCS RUN REQUEST</b> is deactivated and BESS is expected to not produce any voltage on its output, see <b>Bus Dead Level</b>. Once no other evidence of BESS running is detected, the BESS goes to the state Ready. In other case the alarm <b>Wrn Stop Fail</b> is issued if the BESS stopping is not correctly executed and the BESS running signals are detected after <b>Stop Time</b> elapsed. Evidence that the BESS is correctly stopped is that both of the breakers BCB and ESCB are opened having the LBI <b>ESCB Feedback</b> and LBI <b>BCB FEEDBACK</b> deactivated. This is only true if the breaker BCB and ESCB are set as Breaker options via the setpoint <b>BCB Type</b> or <b>ESCB Type</b>. Another evidence that the controller needs from the BESS is an indication that the BESS is no longer partaking in providing Load. This is done by having the LBI <b>PCS READY TO LOAD</b> being deactivated.</p>

**Note:** In order to start the BESS again it is important to have the controller in BESS State= Ready and not have certain conditions active from the previous running operation. Such conditions are to have LBI PCS Ready To Load not active, in cases with setpoint BCB breaker =Breaker the BCB Feedback must be opened, also in cases with setpoint ESCB Breaker = Breaker the ESCB Feedback must be opened and the values BESS voltage and BESS Frequency must be 0.



## 5.5.4 BESS Operation States

### Electric state machine

<b>Init</b>	Initialization of the controller. The application is not active yet.
<b>BrksOff</b>	MCB is opened and BCB is opened (LBO <b>BCB CLOSE/OPEN</b> is not active and LBI <b>BCB FEEDBACK</b> is not active either).
<b>MultIsOper</b>	Island operation: MCB is opened, any other GCB is closed, and LBO <b>BCB STATUS</b> is active.
<b>MainsOper</b>	BCB is opened and MCB is closed.
<b>Synchro</b>	The Controller is in synchronisation process.
<b>MultParOp</b>	Multiple Parallel Operation, the BCB and MCB is closed.
<b>Valid Flt</b>	Indication of incorrect state
<b>EmergMan</b>	With LBI <b>Emergency Man</b> active the state will be shown.
<b>ES Not Oper</b>	this state indicates that battery is not operable

### BESS state machine

<b>Init</b>	Initialization of the controller. The application is not active yet.
<b>NotReady</b>	<p>BESS is not ready to start.</p> <p>Controller is not ready to perform any commands.</p> <p><b>Example:</b> When shutdown alarm is active or unit is in OFF mode.</p>
<b>Ready</b>	<p>BESS is ready to run.</p> <p>Controller is ready to perform commands from the functions and PLC. The controller is expecting information from the Energy Storage the it is able to start so it is important to have LBI <b>ES READY TO START</b> active.</p> <p>Conditions for the value BESS state be in this state:</p> <ul style="list-style-type: none"> <li>➤ There is no 2nd level alarm or alarm that sets the value BESS state to Not Ready (for instance <b>Wrn Energy Storage Not Ready</b> in the alarm list).</li> <li>➤ The setting of setpoint <b>Controller Mode</b> is set to MAN or AUTO mode.</li> <li>➤ The configured LBI <b>PCS READY TO LOAD</b> = 0 must be deactivated at the beginning.</li> </ul>
<b>DC String Coupling</b>	<p>Having the BESS setup configured for Multiple BMS control this state can appear. Important for this state is to have active SW Key and setpoint <b>Multi BMS</b> = Enabled. More information can be read in <b>DC String Coupling or Energy storage with Multiple BMS control</b></p>



## ES Starting

Depending on the setting of setpoints **Starting Sequence BCB Control** and **Precharge Sequence** will this state be requiring certain actions.

- Starting Sequence BCB Control = Start with BCB Opened and Precharge Sequence = Internal
  - » Controller activates LBO **ES RUN REQUEST**
  - » Controller is waiting from the BMS for information that ES is ready to load via LBI **ES READY TO LOAD**.
- Starting Sequence BCB Control = Start with BCB Closed and Precharge Sequence = Internal
  - » Controller activates LBO **ES RUN REQUEST**
  - » Controller activates LBO **BCB CLOSE/OPEN** and is waiting for receiving of active LBI **BCB FEEDBACK**. This behavior is condition depending on configuration and setting of setpoints **BCB Type, BCB Control Mode**.
  - »  
Controller waits for the ES to confirm readiness to accept the load once LBO **ES RUN REQUEST** is activated. Readiness is confirmed by activation of LBI **ES READY TO LOAD**.
- Starting Sequence BCB Control = Start with BCB Opened and Precharge Sequence = External
  - » The LBO **BESS ACTIVE** is activated as an indicator the a start command has occurred by the controller.
  - » Controller activates LBO **ES RUN REQUEST** after LBI **ESCB Feedback** is closed.
  - » Controller waits for the ES to confirm readiness to accept the load once LBO **ES RUN REQUEST** is activated. Readiness is confirmed by activation of LBI **ES READY TO LOAD**.
- Starting Sequence BCB Control = Start with BCB Closed and Precharge Sequence = External
  - » The LBO **BESS ACTIVE** is activated as an indicator the a start command has occurred by the controller.
  - » Controller activates LBO **ES RUN REQUEST** after the LBI **ESCB Feedback** is closed
  - » Controller activates LBO **BCB CLOSE/OPEN** and is waiting for receiving of active LBI **BCB FEEDBACK**. This behavior is condition depending on



	<p>configuration and setting of setpoints <b>BCB Type</b>, <b>BCB Control Mode</b>.</p> <ul style="list-style-type: none"> <li>» Controller waits for the ES to confirm readiness to accept the load once <b>LBO ES RUN REQUEST</b> is activated. Readiness is confirmed by activation of <b>LBI ES READY TO LOAD</b>.</li> </ul>
<b>Precharge</b>	<p>This state is valid only for setpoint <b>Starting Sequence BCB Control</b> = Start with BCB Open and setpoint <b>Precharge Sequence</b> = Internal. During this state the <b>LBO PRECHARGE RELAY</b> is active. This state is present until the difference between <b>ES Voltage Meas</b> and <b>PCS Voltage Meas</b> is in the range calculated from the percent (set by setpoint <b>DC Voltage Window</b>) of <b>ES Nominal Voltage</b>. If the voltage difference is not within the DC Voltage Window before <b>Precharging TO</b> elapse then the controller interrupts starting sequence and <b>SD Start Fail</b> will appear.</p>
<b>ESCB Closing</b>	<p>Depending on the setting of setpoint <b>ESCB Type</b>, different actions will be executed.</p> <ul style="list-style-type: none"> <li>&gt; <b>ESCB Type</b> = Breaker <ul style="list-style-type: none"> <li>» Controller starts doing ESCB control by activating the corresponding LBOs. For more information on the control of ESCB read <b>Breaker control outputs</b></li> <li>» Controller commands via LBOs to have a closed DC connection via <b>LBI ESCB Feedback</b>.</li> </ul> </li> <li>&gt; <b>ESCB Type</b> = Fuse/Disc. <ul style="list-style-type: none"> <li>» Controller commands to have a closed DC connection via <b>LBI ESCB Feedback</b> at the beginning of the start of the system.</li> </ul> </li> </ul>
<b>Ready To Start</b>	<p>Controller is waiting to receive <b>LBI PCS READY TO START</b>. The activation of the LBI must happen before <b>PCS Ready To Start TO</b> elapse.</p> <p>After the <b>LBI PCS READY TO START</b> is received by the controller, the system activates signal <b>LBO PCS RUN REQUEST</b> and countdown via setpoint <b>PCS Ready To Load TO</b> is started to be counted down. During this second countdown the controller is requesting from the PCS information that it is capable of converting voltage. This information is important to provide to the <b>LBI PCS READY TO LOAD</b> before the countdown elapses.</p>
<b>Energized</b>	<p>The BESS AC Output is energized and it is possible to start the synchronization process. More information in <b>Synchronization Process</b>. For certain situations the stabilization process occurs. More information in the <b>BESS</b></p>



	<b>Stabilization (DC Precharge)</b>
<b>Soft Loading</b>	Once the LBI <b>BCB FEEDBACK</b> is confirmed to be active will the BESS load be ramped according to <b>Soft Load Ramp</b> if it is able to (single island operation), otherwise this step is skipped and goes to Loaded immediately. Once the BESS power reaches the required value but before the load ramp has elapsed, the state machine continues to the state Loaded.
<b>Loaded</b>	When the BESS power output reaches BESS P required Target the BESS state machine goes to Loaded state.
<b>Soft Unload</b>	BESS power is ramping down according to <b>Soft Unload Ramp</b> .
<b>Stop</b>	The BESS is being stopped. The <b>PCS RUN REQUEST (PAGE 1)</b> is deactivated and BESS is expected to not produce any voltage on its output, see <b>Bus Dead Level (page 1)</b> . Once no other evidence of BESS running is detected, the BESS goes to the state Ready. In other case the alarm <b>Wrn Stop Fail (page 1)</b> is issued if the BESS stopping is not correctly executed and the BESS running signals are detected after <b>Stop Time (page 1)</b> elapsed. Evidence that the BESS is correctly stopped is that both of the breakers BCB and ESCB are opened having the LBI <b>ESCB Feedback</b> and LBI <b>GCB FEEDBACK (PAGE 1)</b> deactivated. This is only true if the breaker BCB and ESCB are set as Breaker options via the setpoint <b>BCB Type</b> or <b>ESCB Type</b> . Another evidence that the controller needs from the BESS is an indication that the BESS is no longer partaking in providing Load. This is done by having the LBI <b>BESS 01PCS READY To LOAD</b> being deactivated.
<b>Shutdown</b>	2nd level alarm is active present in the alarm list.

### 5.5.5 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.



## 5.5.6 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 BESS state goes to Energized. 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 BESS state goes to Energized and the **Minimal Stabilization Time** has finished counting down. 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.

## 5.5.7 BESS Precharge Types

This function allows adjustment of the BESS pre-charging type. There are setpoints **Starting Sequence BCB Control**, **Precharge Sequence** which enable the selection of what type of **AC** or **DC** precharge of the inverter is going to be utilized. This is a very influential factor in determining the ability of an inverter to generate alternating voltage at its output.

InteliNeo support two methods of BESS starting sequences. The selection of the appropriate method is determined by the process of closing the DC circuit between BESS inverter (Power Conversion system - PCS) and the energy storage. If the connection of the DC circuit is provided via internal DC contractor the system must ensure that the voltages on both sites of the contractor are almost the same to prevent inrush currents. Providing the needs of achieving the same DC voltage the BESS can additionally require a process that is called a 'precharge' procedure where the PCS DC circuit is charged either internally by its DC bus (from energy storage) or from the AC side. This is known as 'DC precharge' or 'AC precharge', respectively.

Controller forces the user to configure all the necessary inputs, outputs and safety setpoints before the ES can be fully utilized. If configuration is not correct, Alarm Sd **ES Configuration Incorrect** or other SD will appear. Not having certain configured inputs at a given time will not allow the controller to progress into next BESS states and thus potentially triggering alarms such as SD **Start Fail**

### Necessary configured inputs and outputs:

- Logical Binary Inputs
  - ES READY TO START
  - ES READY TO LOAD
  - ESCB FEEDBACK



- » ES CHARGE ENABLE
- » ES DISCHARGE ENABLE
- » BCB FEEDBACK
- » PCS READY TO START
- » PCS READY TO LOAD
- > Logical Analog Inputs
  - » ES SOC
  - » ES MAX CHARGING CURRENT
  - » ES MAX DISCHARGING CURRENT
  - » ES CURRENT
  - » PCS VOLTAGE MEAS
  - » PCS CURRENT MEAS
  - » ES VOLTAGE MEAS
  - » ES VOLTAGE

## 5.5.8 Energy storage with Multiple Battery management systems (BMS)

### Energy storage with Multiple BMS control

Some energy storage systems are composed from multiple battery strings that are equipped by individual battery management systems (BMS).

Mutli BMS feature allows the integration of multiple battery strings with the same nominal voltage to be operated in parallel on the DC bus line, making it essential for larger energy storage systems.

InteliNeo 530 BESS supports up to 8 battery strings, allowing for the direct integration of up to 8 BMS.

Terminology Battery String is meant a series of connected battery modules which are controlled by a single BMS. New function **DC String Coupling** is essential to connect together battery strings in parallel.

**IMPORTANT: This is a premium function which requires SW Key in order to be used. Order code for the SW Key is SKMCON8BMS01.**

The set of signals from each BMS is always the same.

The following set of signals must be configured depending on the amount of BMS used:

**STRING VOLTAGE 1**

**LBI STRING HEALTHY 1**

**SBMB FEEDBACK 1**

...

**STRING VOLTAGE 8**

**LBI String Healthy 8**

**SBMB FEEDBACK 8**



Each BMS module is associated with information about its activity through the listed signals. The values of all signals are aggregated into the common value **Operational Strings**. This value indicates the amount of BMS in the multi BMS system that are in an operable state. An operable state for a BMS means that the BMS can be connected to the DC bus and actively contribute to the system. If the BMS is not in this state (for example, if the BMS has a fault preventing its operation), it is necessary to ensure that the corresponding signal **LBI STRING HEALTHY 1 ... LBI String Healthy 8** is inactive.

When setting the configuration of the controller it is important to set the setting of the setpoint **BESS Nominal power** with the aggregated nominal power value of all of the total installed Battery Strings. The nominal power of the Battery String, that is not in an operable state, is not included in the **DC String Coupling** and will run the controller in status of not using the full nominal power of the Energy Storage system. Only having a correctly configured controller allows the proper functioning of the Multi BMS function.

Data from all of the BMS within a single IntelliNeo 530 BESS are aggregated into the value **Group: Energy Storage** and the **Subgroup: Multi BMS**. Within a single energy management system, there can be multiple IntelliNeo 530 BESS controllers integrating multiple BMS control.

**Note:** The amount of configurable analog inputs that can be read via communication from the BMS for the MultiBMS system is limited in total to 400. Please be aware that if all 400 configurable analog inputs are used only for Multi BMS then none will be left for other important functions.

**Note:** Function of Multi BMS does not take into consideration the max charge and max discharge current from the individual battery strings. For establishing the **ES Max Charging Power** and **ES Max Discharging Power** it is necessary to create a PLC logic using the PLC editor. The PLC logic can be the aggregation of each max charge current to create a total energy storage max current (set the output of the PLC to LAI **ES MAX CHARGING CURRENT**). The same can be done for max discharge current (set the output of the PLC to LAI **ES MAX DISCHARGING CURRENT**).

**Note:** Function of Multi BMS does not take into consideration the total SOC of the energy storage aggregated from the individual battery strings. For that it is necessary to create a PLC logic using the PLC editor. The PLC logic can be the aggregation of each battery string SOC to create a total energy storage SOC (set the output of the PLC to LAI **ES SOC**)

## DC String Coupling

DC String Coupling is a feature that allows the connection of multiple battery strings in parallel. In order for the DC string coupling to occur the user needs to have the configuration set up prepared depending on the amount of BMS that the user wants to utilize.

The way it works is that all of the BMS devices provide necessary inputs to our system.

- First action is to establish which of the BMS are able to be part of the DC String Coupling for Multi BMS operation. This is done by evaluating if **LBI STRING HEALTHY 1** up to **STRING HEALTHY 8** are active.
- Another evaluation is done by the measured voltage from the LAI **STRING VOLTAGE 1** up to **STRING VOLTAGE 8** and that is if the value of LAI are between the set limits of setpoints **String V>** and **String V<**. Evaluation of battery strings voltage is done taken from the nominal which is set by setpoint **ES Nominal Voltage**.

**Note:** Indication from the controller to the user that the battery strings are considered ready for DC String Coupling is by having active **LBO STRING VOLTAGE HEALTHY 1 ... STRING VOLTAGE HEALTHY 8**.



- After establishing which of the Battery strings can partake in the Multi BMS operation, the action to connect battery strings together in parallel starts to occur. The IntelliNeo 530 BESS sets up the Multi BMS system as the first action so that it can be taken as a energy storage. The Battery string with passed evaluation check up and highest measured voltage will be taken as the first to connect to the dead dc bus (value **ES Voltage Meas**=0 is an indication of a dead DC bus) after a start command is activated. For the connection to the bus an LBO SBMB Close/Open X (x = 1...8 ) will activate. Delay for receiving mandatory breaker feedback LBI SBMB Feedback X (x = **SBMB FEEDBACK 1**...**SBMB FEEDBACK 8**) is adjusted via setpoint **SBMB Breaker Feedback TO**. As soon as on of LBI SBMB Feedback X is active a next battery string with highest voltage will be attempting to connect to already live DC bus.

**Note:** Indication that live DC bus is present needs to be given to the LAI **ES Voltage Meas** within a short time of 100 ms after receiving the SBMB Feedback X. For this short time evaluation it is recommended to utilize the module **Inteli DC4/4**, which measures the DC voltage on the DC bus and provides necessary key reliability that the DC voltage is present to the controller.

- The next LBO SBMB Close/Open Y (y = 1...8) will be activated when the difference between value **ES Voltage Meas** and value String Voltage Y is inside of the range calculated as a percent (set by setpoint **DC Voltage Window**) of **ES Nominal Voltage**. This DC String Coupling function reoccurs until all of the evaluated **Operational Strings** for DC String Coupling have been connected in parallel. The LBO **DC STRINGS COUPLED** activates and stays active until a stop command is activate or a 2nd level protection appears.
- The stopping of the MultiBMS system occurs after the deactivation of the LBO **PCS RUN REQUEST** and opening of the LBI **ESCB FEEDBACK** (for setpoint **ESCB Type = Breaker**). A command to open all of the Battery strings breaker is activated simultaneously (LBO **SBMB CLOSE/OPEN 1**...8 =0).

## 5.5.9 DC PV Coupled Monitoring

With IntelliNeo 530 BESS it is possible to monitor DC PV values using LAI functionality of the controller. The LAIs **DC PV P**, **DC PV NOMINAL P** and **DC PV kWh** are able to be utilized for monitoring actual power of the PV site, nominal power of the PV Site and the amount of energy the PV site has generated. All of these values are expected to be communicated to the controller via the **Modbus-RTU**, **Modbus/TCP** function. Configuring the LAI **DC PV P** can provide information on how much power is being given from the PV site and thus allowing to distinguish the amount of power being generated by the energy storage on the dc bus. The values that mirror the LAIs are in **Group: DC PV Monitoring**. The controller does not by default do any control of the PV, the control is expected to be handled by the PCS or MPPT. For DC PV control the use of PLC can be used based on necessary requirements.



## 5.5.10 Connecting To Load

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Starting with Opened BCB (DC External) .....	230
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Synchronization .....	232

### HLC Control mode

Before connecting of the BESS to the load the LBI **REMOTE START/STOP** must be activated in case of AUT mode or start button must be pressed in case of MAN mode.

### Starting with Closed BCB (AC External)

The connection of the BESS to the bus/load differs according to the setpoint **Starting Sequence BCB Control**. In case the AC option 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 with AC precharge 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.

### Starting with Opened BCB (DC External)

In case the DC option 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.

**Note:** *The frequency governor and AVR must be adjusted properly to achieve these limits as the controller does not perform any regulation and the regulation outputs have constant values given by the **Voltage Regulator Bias and Frequency Governor Bias** setpoints.*

Connecting to load depends on the state of **MCB FEEDBACK** and on the measured bus voltage. In case the Load is without power (bus voltage is below 2 % of nominal voltage and MCB is opened) the **Connecting To Dead Bus** is applied, in other case the **Synchronization** process is needed.



## Connection of the BESS to the bus - Synchronization

There are many methods in order to connect the BESS to the bus using via synchronization. For synchronization the usage of AC measurements directly at the controller terminals, specifically the terminals T30 - T41 and T42-T45 (**Terminal Diagram**) are necessary. The action of synchronization is influenced by many of the setpoints that can be found in the setpoint group Synchronization and specifically subgroups AC Synchronization and Breaker Control. Important for the controller algorithm setup for synchronization is to distinguish what type of **Starting Sequence BCB Control** will be utilized. More will be described in the text below which describes what each option provides.

To mention there are setups that do not need actions of synchronization if the connection of the BESS and BUS is directly connected with either fuse, manual switch or dis-connector (setpoint BCB Type for more information).

### Start with Closed BCB

The connection of the BESS to the bus/load differs according to the setpoint **Starting Sequence BCB Control**. In case the Start with Closed BCB option is set, the BCB breaker can be closed immediately after the BESS is in the running phase. No stabilization time is counted. Depending on the PCS if it is possible to create a grid forming or grid following set up. If the setting is grid following it is not able to generate AC voltage on its output without being connected to a healthy AC bus. In the case of a PCS that can do grid forming, the option to start up the system with a closed BCB to a dead bus is available. The option to choose whether the PCS can start up to dead bus can be chosen by setting of setpoint **Start To Dead Bus**. Once the connection of the BESS to the bus/load is established the option to open breaker is possible to unload the BESS. In order to close the breaker again a potential of synchronization is needed to a healthy bus. For unhealthy bus the connection can not be established. If the bus is considered dead the breaker can be closed and the BESS can provide necessary load to the bus. Further information can be received in page **Synchronization Process**

### Start with Opened BCB

In case the Start With Opened BCB option is set, connecting the BESS to the load is done after the DC part of the BESS is energized. After wards the BCB is closed to either a dead bus or via synchronization. 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.

**Note:** The frequency governor and AVR must be adjusted properly to achieve these limits as the controller does not perform any regulation and the regulation outputs have constant values given by the **Voltage Regulator Bias and Frequency Governor Bias** setpoints.

Connecting to load depends on the state of **MCB FEEDBACK** and on the measured bus voltage. In case the Load is without power (bus voltage is below setting of setpoint **Bus Dead Level** of nominal voltage and MCB is opened) thesee **Connecting To Dead Bus on page 232**) is applied, in other case the see **Synchronization on page 232** process is needed.



## Connecting To Dead Bus

### 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 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 such as LBO Stop Bus Energize.

**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:**

$$L1 : \left| \frac{\text{BESS Voltage } L1-N}{\text{BESS Nominal Voltage } Ph-N} - \frac{\text{Mains/Bus Voltage } L1-N}{\text{Mains/Bus Nominal Voltage } Ph-N} \right| \times 100 \leq \text{Voltage Window}$$

$$L1 - L2 : \left| \frac{\text{BESS Voltage } L1-L2}{\text{BESS Nominal Voltage } Ph-Ph} - \frac{\text{Mains/Bus Voltage } L1-L2}{\text{Mains/Bus Nominal Voltage } Ph-Ph} \right| \times 100 \leq \text{Voltage Window}$$

➤ **2nd Bit, logical 1 when:**

$$L2 : \left| \frac{\text{BESS Voltage } L2-N}{\text{BESS Nominal Voltage } Ph-N} - \frac{\text{Mains/Bus Voltage } L2-N}{\text{Mains/Bus Nominal Voltage } Ph-N} \right| \times 100 \leq \text{Voltage Window}$$

$$L2 - L3 : \left| \frac{\text{BESS Voltage } L2-L3}{\text{BESS Nominal Voltage } Ph-Ph} - \frac{\text{Mains/Bus Voltage } L2-L3}{\text{Mains/Bus Nominal Voltage } Ph-Ph} \right| \times 100 \leq \text{Voltage Window}$$

➤ **3rd Bit, logical 1 when:**

$$L3 : \left| \frac{\text{BESS Voltage } L3-N}{\text{BESS Nominal Voltage } Ph-N} - \frac{\text{Mains/Bus Voltage } L3-N}{\text{Mains/Bus Nominal Voltage } Ph-N} \right| \times 100 \leq \text{Voltage Window}$$

$$L3 - L1 : \left| \frac{\text{BESS Voltage } L3-L1}{\text{BESS Nominal Voltage } Ph-Ph} - \frac{\text{Mains/Bus Voltage } L3-L1}{\text{Mains/Bus Nominal Voltage } Ph-Ph} \right| \times 100 \leq \text{Voltage Window}$$

**IMPORTANT:** Bits are counted from right to left!

## Synchronization via BCB in AUTO mode

BESS synchronization to the Mains (common bus bar) via BCB :

- 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 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:

- 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.

🔍 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** / 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**). 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).



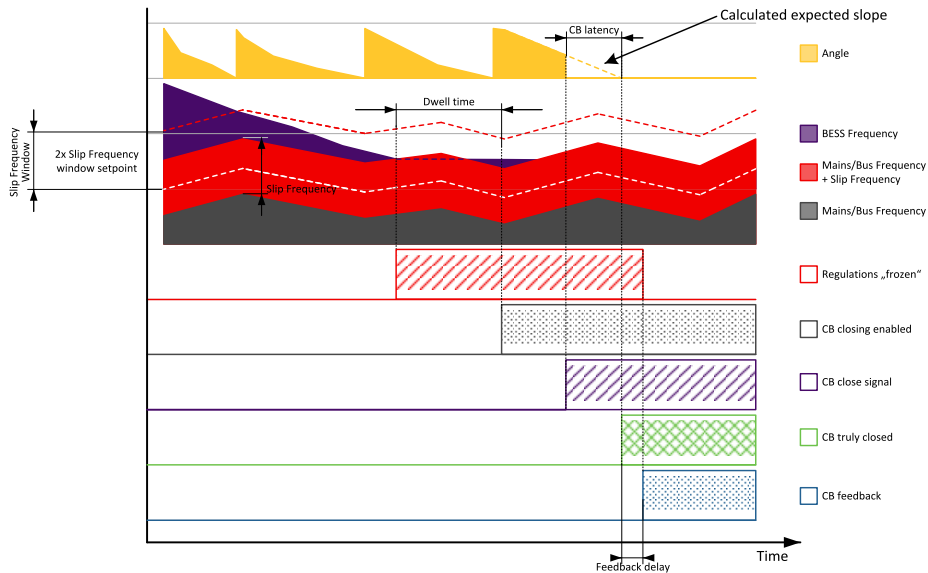


Image 5.112 Slip synchronization

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**.

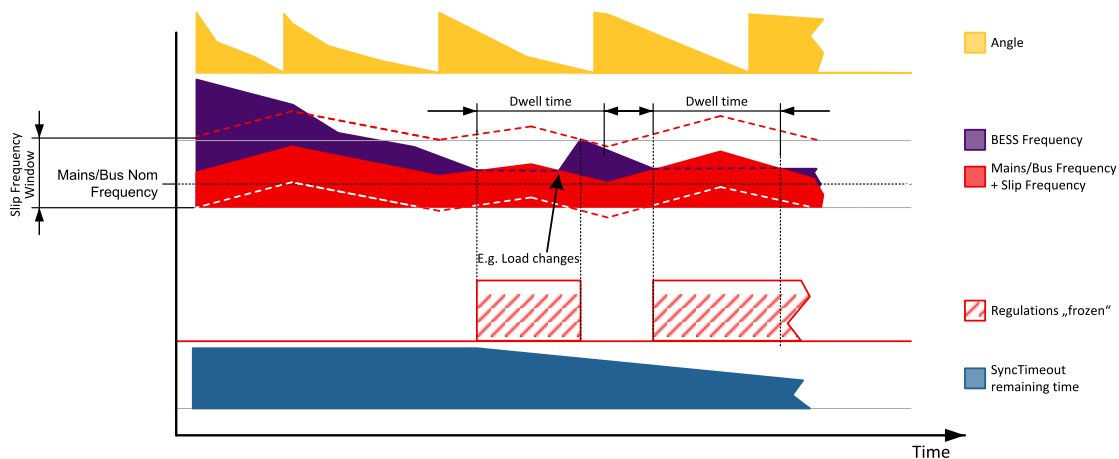


Image 5.113 Slip synchronization

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).



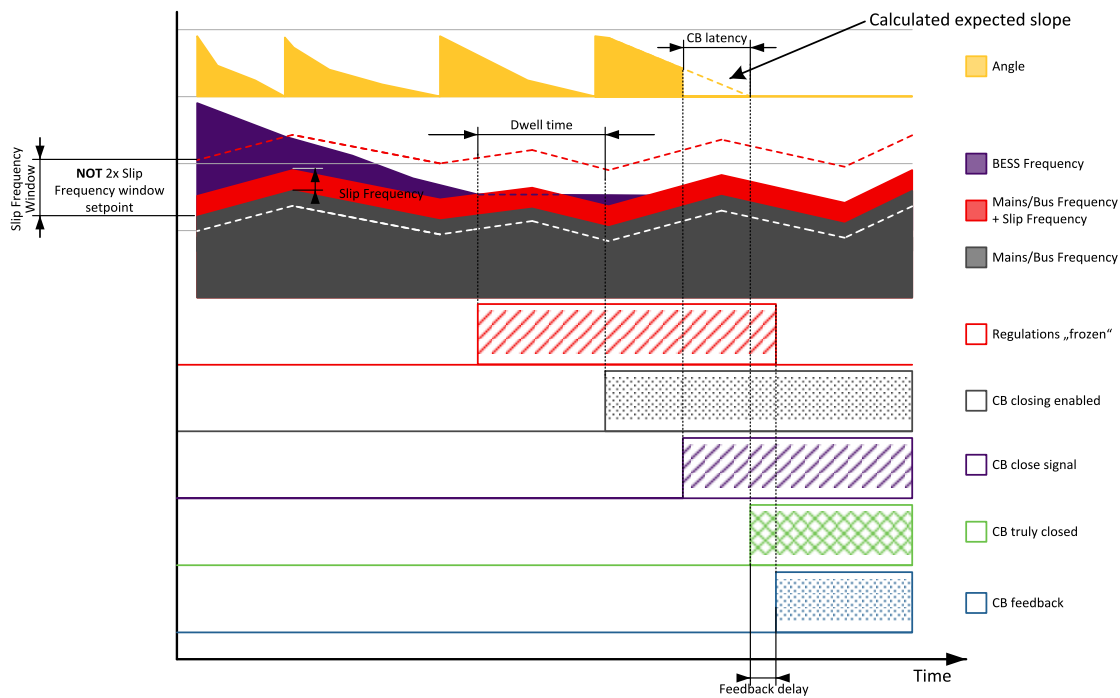


Image 5.114 Slip synchronization

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.

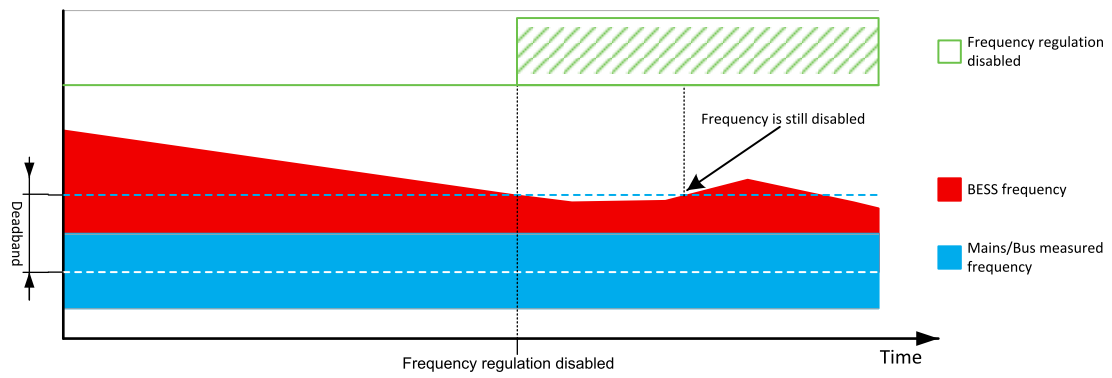
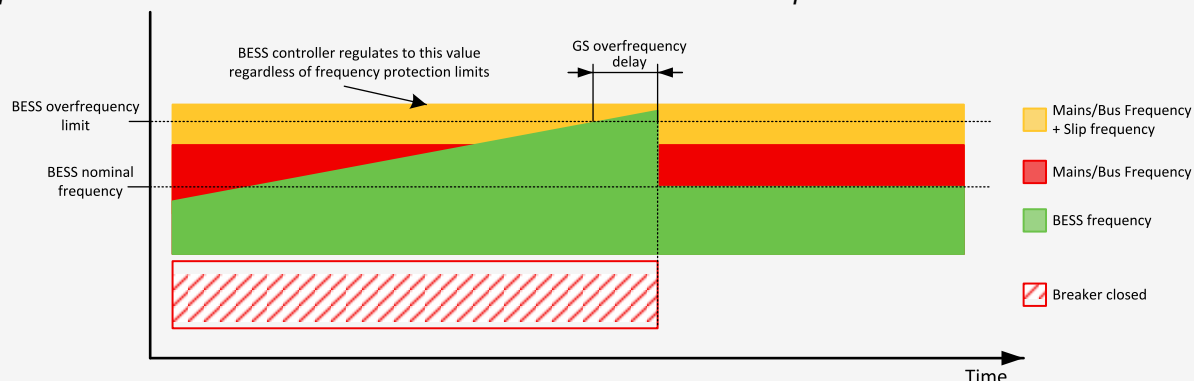


Image 5.115 Slip synchronization - deadband



**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.



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## 5.5.11 BESS AC values measured over LAIs

The standard integration of BESS into the system using IntelliNeo assumes that the output AC values of BESS are obtained through AC measurements directly at the controller terminals, specifically the terminals T30 - T41 (**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. One of these limitations is the disabling of Synchronization function, due to the controller not being able to evaluate itself the slip angle.

The mode of AC measurement for BESS is determined by the setpoint **AC BESS P/Q/A Measurement**. BESS can be operated in the following modes:

- With fully functional AC voltage and current measurement - **AC BESS P/Q/A 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 - **AC BESS P/Q/A Measurement** = Current Analog Input.
- With both voltage and current measured through LAI - **AC BESS P/Q/A 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.



- BESS in the configuration **AC BESS P/Q/A Measurement** = Current & Voltage Analog Input and **Starting Sequence BCB Control** = DC has deliberately blocked synchronization to the live bus. Information about the slip angle between the BESS output and the bus cannot be obtained through communication, so synchronization is intentionally disabled. This measurement configuration is most often used in combination with **Starting Sequence BCB Control** = AC and BESS power control in P-Q mode.

**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, BESS IDMT >A Protection, or BESS IDMT Overload Protection. All critical protections must be ensured directly by the BESS control controller (PCS).**

In case the LAI in the table below are not configured with giving settings of setpoints or the LAI has an invalid value will the protection **SD Wrong BESS Meas Config** activate.

LAI	Expected format	AC BESS P/Q/A Measurement = Current Analog Input	AC BESS P/Q/A Measurement = Current & Voltage Analog Input	Target value
AC BESS CURRENT L1	1 A	Mandatory	Mandatory	BESS Current L1
AC BESS CURRENT L2	1 A	Mandatory	Mandatory	BESS Current L2
AC BESS CURRENT L3	1 A	Mandatory	Mandatory	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
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 IntelliNeo, 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.

## 5.5.12 BUS AC values measured over LAIs

Typically, the IntelliNeo 530 BESS expects to directly measure the BUS voltage via the terminals on the controller unit (CU), specifically terminals T42-T45 (**Terminal Diagram**). Only by direct measurement is it possible to fully utilize key functions such as active (forward) synchronization to a live BUS (via a controlled BCB) and direct, fast acting protections.

However, if direct measurement of the BUS AC values is not possible or desirable, the controller can be configured to get these values from an external source via Modbus, and have them available as LAIs. Certain limitations on BESS startup and synchronization will apply in this case, see the table below.

Selection of the BUS AC Values source happens via the **Bus AC Measurement** setpoint with the following options:

- Onboard CU Measurement = BUS AC values are measured directly via the terminals on the controller in the standard way and none of the BUS AC values LAIs are utilized.
- Voltage Analog Input = BUS AC Values are not measured directly but instead come from LAIs which are connected to Modbus values. See the table below for the list of mandatory inputs and setpoints related to this selection.
- No Voltage Sensing = BUS AC Values are not read directly or via LAIs, typically when there is no controlled BCB installed. See the table below for the list of mandatory inputs and setpoints related to this selection.

**CAUTION: One of the most significant impacts of this function is its effect on protections. Protections are still evaluated in the standard way but are now based on values read over Modbus. Due to communication latency, some protections (typically those evaluated without delay) may be unable to fulfill their expected function.**

In case the LAI in the table below are not configured with giving settings of setpoints or the LAI has an invalid value will the protection **SD Wrong BUS Meas Config** activate.



BUS AC Measurement Selection	Mandatory Inputs	Mandatory Setpoints	Starting Sequence setup	Forward Synchronization
Voltage Analog Input	LAI: <b>AC BUS Voltage L1</b> = Function: BUS Voltage L1-N  LAI: <b>AC BUS Voltage L2</b> = Function: BUS Voltage L2-N  LAI: <b>AC BUS Voltage L3</b> = Function: BUS Voltage L3-N  LAI: <b>AC BUS Frequency</b> = Function: BUS Frequency	BESS Settings, BESS Control, Starting Sequence BCB Control	<b>Starting Sequence BCB Control =Start with Closed</b>	Not Possible

**Note:** If the BUS AC values are measured over LAIs, internal Start with Opened BCB startup of the BESS is not permitted. This ensures a safe startup of the BESS and connection to the BUS..

**Note:** The voltage measurement LAIs should be Ph-N values. The values for BUS Voltage L1-L2, BUS Voltage L2-L3 and BUS Voltage L3-L1 are calculated internally.

**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 the BUS voltage measurement device during BESS operation, most often results in the activation of BUS voltage and frequency protections.

### 5.5.13 BESS Charging/Discharging Control

This function allows managing of the charging process (storage of energy from the bus = Mains / Gen-sets / Renewable) 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 **ES CHARGE ENABLE** and LBI **ES DISCHARGE ENABLE**. If both LBIs for charging and discharging are activated at the same time, the battery cycling of the system will take place. The battery will be by default cycling between charging/discharging targets given by setpoints **SOC Low Target** and **SOC High Target**(see **BESS SOC Control on page 243**). Only if setpoint **ES Target Control** is set to SOC will the BESS be controlled by the value **ES SOC**. Otherwise if the user would prefer to control the battery using the actual dc voltage of the Energy Storage (see **Energy Storage Voltage Relative Control on page 245**), the option ES Voltage Rel is recommended to be set for the setpoint **ES Target Control**.

The source for the BESS active power output request can be selected by the Setpoint **BESS P Control** . There are three types of sources:

- **Analog:** The controller receives a **BESS P REQUEST** from the LAI **BESS P REQUEST**. This LAI is used as a direct BESS Power Request.



- **Setpoint:** The value of **BESS P REQUEST** is given by setpoints **BESS Charge Power (page 1)** or **BESS Discharge Power (page 1)**.
- **Balance:** The **BESS P REQUEST** is calculated using internal controller's algorithms. This calculation maintains the balance of energy flow through the system. For example, in OFF Grid application the battery is only charged using the excess power in the system. Any extra Gen-set power is not required to charge.

**Note:** All sources are influenced by LBIs mentioned above. When **LBI ES CHARGE ENABLE** is not active the Charge Request is unavailable. In case the **LBI ES 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.

ES CHARGE ENABLE	ES DISCHARGE ENABLE	Charge/Discharge	BESS P Request Source
0	0	Blocked	0
0	1	Discharge	<b>BESS Discharge Power (page 1)</b>
1	0	Charge	<b>BESS Charge Power (page 1)</b>
1	1	Battery cycling	<b>BESS Discharge Power (page 1)</b>

## Variable Max Power Output

The active power of charging and discharging is primarily given by the setpoint **BESS Nominal power**. But in some cases the BESS cannot work on this power level. In these cases the variable maximal power output is used and the maximal charging/discharging power is limited according to the values **ES Max Charging Power** and **ES Max Discharging Power**.

These values are used to limit BESS charging/discharging no matter what source/algorithm is used for the **BESS Required P Target** calculation. This function also affects calculations in the functions **PV Curtailment** (more info in the AC PV controllers InteliNeo6000 and InteliNeo5500 manual) and **Dynamic Spinning Reserve**.

## Load Control Balance - Calculation of BESS P Request

The Power output of the BESS is controlled in way to consume excess or support deficit of power in the system. The power balance of the system is given by equation:

$$\#Gen P Min + PV Actual P - Load P = - BESS P$$

Priority is to produce minimum power from Gen-sets (diesel), however in long term the Gen-sets have to operate on some certain minimal power level. This level is given by the setpoint **#Gen P Min**.

- Excess of the power in the system is consumed by the BESS until it is running on -100% of its nominal power, then the Gen-sets have to leave the **#Gen P Min** and ramp down. The function **PV Curtailment** can be used to limit output power of the PV inverter in order to keep the Gen-sets running on their **#Gen P Min**.
- Deficit of power is firstly covered by the BESS until it is running on 100 % of its nominal power, then Gen-sets start helping the BESS to cover the load.
- If SOC is low or BESS cannot discharging for any reason, then the BESS output is limited to 0 and the power demand has to be covered by Genset.



## State of Charge Control

The charging and discharging process of the BESS can also depend on the State Of Charge (SOC). When the value **ES SOC** reaches limit given by the setpoint **SOC Low Target** the discharging process is stopped and the LBO **ES SOC DISCHARGE DISABLED** is activated. When the value **ES SOC** reaches limit given by the setpoint **SOC High Target** the charging process is stopped and the LBO **ES SOC CHARGE DISABLED** is activated. The charging/discharging process can be activated again after the value **ES SOC** leave the hysteresis which are defined by the setpoints **SOC Low Hysteresis** and **SOC High Hysteresis**. So, once the SOC Actual reach the low target then the BESS cannot be discharged anymore until the BESS is charged at least on the level of SOC Hysteresis. For more information see **BESS SOC Control on page 243**.

## ES voltage relative Control

The charging and discharging process of the BESS can also depend on the ES voltage relative to ES nominal voltage. When the value **ES Voltage Rel** reaches limit given by the setpoint **V Rel Low Target** the discharging process is stopped and the LBO **ES V REL DISCHARGE DISABLED** is activated. When the value **ES Voltage Rel** reaches limit given by the setpoint **V Rel High Target** the charging process is stopped and the LBO **ES V REL CHARGE DISABLED** is activated. The charging/discharging process can be activated again after the value **ES Voltage Rel** leave the hysteresis which are defined by the setpoints **V Rel Low Hysteresis** and **V Rel High Hysteresis**. So, once the SOC Actual reach the low target then the BESS cannot be discharged anymore until the BESS is charged at least on the level of SOC Hysteresis. For more information see **Energy Storage Voltage Relative Control on page 245**.

## Daily BESS Cycles Control

The number of battery cycles per day can be limited by the setpoint **Max BESS Cycles Per Day**. In one day the statistic value **BESS Cycles** cannot be increased more times than the setpoint **Max BESS Cycles Per Day** specifies. If the daily number of battery cycles is reached the LBO **DAILY BESS CYCLES REACHED** and **Daily BESS 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 cycle is defined as complete discharge of fully charged battery or a series of partial drains equal to the battery's capacity.

### 5.5.14 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 **ES CHARGE ENABLE** and LBI **ES 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** (**V Rel Low Target** and **V Rel High Target**).

**Note:** All sources are influenced by LBIs mentioned above. When LBI **ES CHARGE ENABLE** is not active the Charge Request is unavailable. In case the LBI **ES 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.



ES CHARGE ENABLE	ES DISCHARGE ENABLE	Charge/Discharge
0	0	Blocked
0	1	Discharge
1	0	Charge
1	1	Battery cycling

**IMPORTANT:** The LBIs **ES CHARGE ENABLE** and **ES 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.

### 5.5.15 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 **ES SOC**. This LAI is mandatory. If left not configured, an alarm **BESS SOC Not Configured (page 1)** 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**.

**Note:** Target control can be done in two different ways and it depends on the setting of setpoint **ES Target Control**. The options are to control the BESS using SOC value or using the measured energy storage dc voltage value.

When the value **ES SOC** reach limit given by the setpoint **SOC Low Target** the discharging process is stopped and the LBO **ES SOC DISCHARGE DISABLED** is activated. When the value **ES SOC** reach limit given by the setpoint **SOC High Target** the charging process is stopped and the LBO **ES SOC CHARGE DISABLED** is activated. The charging/discharging process can be activated again after the value **ES 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 **ES CHARGE ENABLE** and **ES DISCHARGE ENABLE**.

**Note:** All relative setpoints/values are related to the LAI **ES kWh NOMINALCAPACITY** respectively to value **ES 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.





**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 ES <<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 ES <<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 **ES <<SOC Protection** and activate the function of ignoring target control (see **Ignore Target Control on page 244**) or set the setpoint **SOC Low Target** to below the actual value.

**IMPORTANT:** The LBIs **ES CHARGE ENABLE** and **ES 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.

## 5.5.16 Ignore Target Control

Under specific operating conditions, it may be beneficial to ignore the target control setpoints and therefore continue to use the BESS to its maximum capability. There are two possibilities of ignoring target controls, one is to ignore the low target setting and be able to discharge the BESS even further till it reaches its limits and the second is to ignore the high target settings and be able to charge the BESS as much as possible. Ignoring low target control for the controller is not to end the discharging up to the setting of setpoint **SOC Low Target** or to setting of setpoint **V Rel Low Target**, but continue discharging until the user reaches required discharged state or until alarm **Sd SOC Critical Low** or **Sd ES <<V** activates. Ignoring high target control for the controller is not to end the charging up to the setting of setpoint **SOC High Target** or to setting of setpoint **V Rel High Target**, but continue charging until the user reaches required charged state or until alarm **Sd SOC Critical High** or **Sd ES >>V** activates.

**IMPORTANT:** When using the function ignore target control, it is not recommended to have the protections for SOC and voltage blocked in the setpoint Group: BESS Protections Having these protections blocked could lead up to dangerous limits of the BESS system.

In order to activate the ignoring of the target control it is required to configure the following LBIs **IGNORE LOW SOC**, **IGNORE HIGH SOC**, **IGNORE HIGH V REL**, **IGNORE LOW V REL**. Depending on the setting of the setpoint **ES Target Control** will the given LBIs ignore either the value of **ES SOC** or the value **ES Voltage Rel**. Having the LBIs active will provide alarm indications **AHI Ignore Low SOCTarget Activated** or **AHI Ignore High Target Activated** and new history record message in order for the user to understand that the ignoring of target control is taking place. Also new history records **Hst Ignore High Target Deactivated** and **Hst Ignore Low Target Deactivated** are created if the active LBIs are deactivated. This is to provide information on how long the ignoring functions was taking place.



During the ignoring of the target controls, specific dedicated LBOs that can provide information to the BESS to charge or discharge are disabled and do not activate. These are the following LBOs that do not activate during the ignoring function **ES SOC DISCHARGE DISABLED**, **ES SOC CHARGE DISABLED**, **ES V REL CHARGE DISABLED**, **ES V REL DISCHARGE DISABLED**.

**IMPORTANT:** The LBIs **ES CHARGE ENABLE** and **ES DISCHARGE ENABLE** are crucial for BESS charging or discharging control even during ignoring of target 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.

### 5.5.17 Energy Storage Voltage Relative Control

The energy storage voltage is also one of the most critical parameters of the BESS. It can provide information on the extent to which the BESS is charged within its capacity. From the energy storage voltage compared to its nominal voltage, one can conclude how much energy is stored in the BESS at any given moment.

InteliNeo requires logical analog input LAI **ES VOLTAGE MEAS** to be configured in order to have function of the energy storage voltage relative (ES Voltage Rel) control. If left unconfigured, an alarm **ES Configuration Incorrect** will appear in the alarm list. The ES Voltage Rel control is a function that can be chosen by the user setting the setpoint **ES Target Control**= ES Voltage Rel. When the function for ES Voltage Rel is chosen, the value **ES Voltage Rel** is evaluated based on settings from a list of setpoints in setpoint **Subgroup: V Rel Control**

InteliNeo will maintain the value **ES Voltage Rel** of the BESS within the interval defined by the setpoints **V Rel Low Target** and **V Rel High Target**.

When the value **ES Voltage Rel** reaches the limit given by the setpoint **V Rel Low Target** the discharging process is stopped and the LBO **ES V REL DISCHARGE DISABLED** is activated. When the value **ES Voltage Rel** reaches the limit given by the setpoint **V Rel High Target** the charging process is stopped and the LBO **ES V REL CHARGE DISABLED** is activated. The charging/discharging process can be activated again after the value **ES SOC** leave the hysteresis which are defined by the setpoints **V Rel Low Hysteresis** and **V Rel High Hysteresis**.

**Note:** Charging and discharging is influenced all the time by the LBIs **ES CHARGE ENABLE** and **ES DISCHARGE ENABLE**.

**Note:** All relative setpoints/values are related to the LAI/Value **ES kWh NOMINALCAPACITYES Nominal Capacity**.

In the picture below you can see the red and orange (Sd and Wrn) alarm areas. The appropriate alarms are activated when value **ES Voltage Rel** are within the evaluation threshold given by the setpoints in the **Subgroup: Voltage Protection**. The green area is a safety operation area and Voltage Relative (V Rel) targets should be placed in it. The battery should cycle between these targets in the green area.

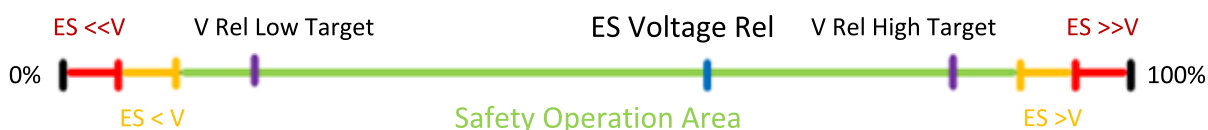


Image 5.117 ES Voltage Relative function



**IMPORTANT:** The ES V Rel 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 ES V Rel of the BESS can then fall below the target value and even reach the ES <<V limit. In such cases, the system will shut down due to **Sd ES <<V Protection**".

**Note:** When **Sd ES <<V** protection is active, it causes the BESS to shut down and it must be charged above the ES <<V 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 ES <<V protection using the setpoint **ES <<V Protection** and activate the function of ignoring target control (see **Ignore Target Control** on page 244), or set the setpoint **V Rel Low Target** and **V Rel Low Hysteresis** below the actual value.

**IMPORTANT:** The LBIs **ES CHARGE ENABLE** and **ES 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.

**IMPORTANT:** The function of SOC Balancing does not support the Energy Storage Voltage Relative Control. Having the setpoint **ES Target Control= ES Voltage Rel** on the controller, will the power distribution be according to nominal values of the BESS even when the setpoint **SOC Balance = Enabled** and the setpoint **BESS P Control = Balance**.

## 5.5.18 Daily BESS cycles control

The number of battery cycles per day can be limited by the setpoint **Max BESS Cycles Per Day**. In one day the statistic value **BESS Cycles Daily Evaluated** cannot be increased more than the setpoint **Max BESS Cycles Per Day** specifies. Another value is **BESS Cycles** which provides as an indicator on how many BESS cycles have been evaluated of the life cycle of the BESS.

**Note:** The controller counts a day from midnight to midnight, meaning that this functions outputs and values reset at the earliest of midnight.

Increasing of the value **BESS Cycles Daily Evaluated** by an amount that is the same number or above the daily number of battery cycles set limit threshold, the LBO **DAILY BESS CYCLES REACHED** is activated and the alarm **Daily BESS Cycles Reached** is present in the alarm list. The controller also no longer allows the system to do discharging with active LBO **DAILY BESS CYCLES REACHED**. No limitation to charge the BESS is activated by the controller with the activation of LBO **DAILY BESS CYCLES REACHED**.

**Note:** Usually one cycle is defined as a complete discharge of fully charged BESS or a series of partial drains equal to the BESS capacity. With active LBO **DAILY BESS CYCLES REACHED** the BESS can complete a full charge and stay in a Idle state until new conditions apply.

Once the LBO **DAILY BESS CYCLES REACHED** and the alarm **Daily BESS Cycles Reached** are active they will be deactivated with certain conditions. For instance one of the conditions is that a new day arrives.



Another condition that can deactivate the LBO **DAILY BESS CYCLES REACHED** and the alarm **Daily BESS Cycles Reached** is to increase the setpoint **Max BESS Cycles Per Day**.

**Note:** In order to not utilize the Daily evaluation of BESS cycles the setpoint **Max BESS Cycles Per Day** can be set to OFF.

## Evaluation of BESS Cycles

The values **BESS Cycles Daily Evaluated** and **BESS Cycles** can be incremented using one of two optional methods. The user can choose between increasing of the values using the LAI **BESS CYCLES** or using the Depth of Discharge Tracking method. The setpoint **BESS Cycles Evaluation** allows the user to choose which of these methods is more suitable for the given setup.

### Received BESS cycle value

Setting the setpoint **BESS Cycles Evaluation** to the option Analog will the controller evaluate the function of BESS cycles from the LAI **BESS CYCLES**. Utilizing the LAI **BESS CYCLES** can be more suitable for setups where the BESS system provides accurate cycle evaluation. Linking the cycle information from the BESS unit to the LAI will allow the controller to limit the amount of daily BESS cycles using the Daily BESS Cycles control function.

### Depth of Discharge Tracking

Setting the setpoint **BESS Cycles Evaluation** to the option DoD Tracking will the controller internally calculate a BESS cycle using the cumulative Depth of Discharge (DoD) algorithm. Throughout one BESS cycle an accumulation of DoD occurs until the accumulation bypasses the threshold set by the setpoint **Cycle DOD Limit**. The values **BESS Cycles Daily Evaluated** and **BESS Cycles** increment by 1 when the threshold of the setpoint **Cycle DOD Limit** is surpassed.

The setpoint **Cycle DOD Limit** sets the threshold of one BESS cycle. Having the default 100 % setting of the setpoint the evaluation is taken as the nominal capacity of the BESS. Any lower setting of the setpoint is indicating of the usage for partial capacity. The lower the setting of this setpoint the more internally calculated BESS cycles will be evaluated.

**Example:** The following start setup of the controller with setpoints and values is as follows **BESS Cycles Evaluation**= DoD Tracking; **Cycle DOD Limit**= 100 %; **BESS Cycles Daily Evaluated**= 0.0; **ES SOC**= 60 %. The controller will have BESS get to loaded state and start discharging. The BESS will discharge from SOC 60 % to 50 % and this will change the value **BESS Cycles Daily Evaluated** to 0.1.

**Note:** As a safety precaution to prevent unintended accumulation of cycle during small fluctuations, a dead-band exist for discharging. It is set to a threshold 2% of SOC, meaning a 1% discharge fluctuation will not be taken into account for the **BESS Cycles Daily Evaluated** value.

**Note:** Switching between options of the setpoint **BESS Cycles Evaluation** the internal calculation does not change and the user must do a statistic reset in order to set the values to the wanted number.

## 5.5.19 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 **BESS 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 **ES MAX CHARGING CURRENT (PAGE 1)** and **ES MAX DISCHARGING CURRENT (PAGE 1)**. 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 **BESS Nominal power** will apply again.

## 5.5.20 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 243**), 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 243**), 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 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.



## 5.5.21 BESS Output Control

In general there are two types of output control of the BESS inverter. It depends on what input can be send to the BESS inverter as request. One option is that the inverter accept only P-Q request, another option is U-f request or both. Because each option has its requirements and limits the LBI **PCS OUTPUT CONTROL MODE U-F/P-Q** **PCS OUTPUT CONTROL MODE U-F/P-Q** **PCS OUTPUT CONTROL MODE U-F/P-Q** is used to choose what output control method will be used by IntelliNeo 530 BESS controller.

### P-Q Output Control

In this case the input request for the BESS inverter output is given by active and reactive power. The active and reactive power request is given by the controller's values **BESS Required P** and **BESS Required Q** in case of absolute values, or **HLC P Request** and **HLC Q Request** in case of relative values.

The BESS inverter using this output control method is able to work only in Grid Supporting mode because it cannot control voltage and frequency level on it's output. In this case the BESS cannot be connected to the grid without Mains/Gen-sets. It is not possible to close BCB if there is not healthy voltage on the bus.

**Note:** *The Start with Closed BCB should be used because the controller cannot use active synchronization properly (it cannot control voltage and frequency levels). See the chapter **BESS Precharge Types** for more information.*

**Note:** *If the BESS is connected to the Grid alone after Gen-set/Mains is disconnected, the BCB is opened because of anti islanding protection (**BESS Anti Islanding**).*

### U-f Output Control

In this case the input request for the BESS inverter output is given by frequency and voltage. The frequency and voltage request is given by the controller's values **Frequency Regulator Output** and **Voltage Regulator Output**.

The BESS inverter using this output control method is able to work in Grid Forming mode because it can control voltage and frequency level on it's output. In this case the BESS can be connected to the grid without Mains/Gen-sets. The BCB can be closed to the dead bus both in Start with Opened BCB and Start with Closed BCB depending on the setting of setpoint **Start To Dead Bus**.

**Note:** *The values described above are send to the BESS inverter via **Modbus Client (Master)** function for both cases.*

### U-f Output Control with droop

The controller of BESS (Battery Energy Storage System) generates the values for control of the BESS output. Specific BESS as devices requires the different approach of control in u-f mode and it means it requires the control inputs in different format. IntelliNeo offers the most typical formats of values dedicated for BESS output control. It provides control values for both active and reactive requirement.

**For Active Power and Frequency control** these values specifically are: **PCS Frequency Request**, **PCS Frequency Offset Request**, **PCS P Request %**

All these values are calculated based on the Frequency regulator output and definition of the droop settings of the BESS. It uses the Setpoint: **PCS Frequency Droop Slope** for calculation. This Setpoint has to be set accordingly to the actual BESS (PCS) frequency droop slope settings.

**For Reactive Power and Voltage control** these values specifically are: **PCS Voltage Request**, **PCS Voltage Offset Request**, **PCS Q Request %**



All these values are calculated based on the Voltage regulator output and definition of the droop settings of the BESS. It uses the Setpoint: **PCS Voltage Droop Slope** for calculation. This Setpoint has to be set accordingly to the actual BESS (PCS) voltage droop slope settings.

## 5.5.22 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. IntelliNeo 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 **HLC P Request** and **HLC Q Request** in case of relative values.

The P-Q mode setting in BESS and IntelliNeo must be consistent. If BESS is in P-Q control mode, then LBI **PCS 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 IntelliNeo 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. IntelliNeo 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 IntelliNeo 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. IntelliNeo supports such input formats for control through the values

**PCS Frequency Request**, **PCS Frequency Offset Request**, or in the format of a request in terms of the required relative active power **PCS P Request %**. For correct calculation - conversion of the control outputs



to values of this format, it is necessary to set the setpoint **PCS Frequency Droop Slope** in accordance with the internal settings inside BESS.

In terms of voltage and reactive power Q control, or PF, the outputs **PCS Voltage Request**, **PCS Voltage Offset Request**, **PCS Q Request %** are designated for control. For correct calculation - conversion of the control outputs to values of this format, it is necessary to set the setpoint **PCS 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 value 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 <b>Soft Load Ramp</b> , <b>Load Ramp PTM</b> or <b>Load Ramp Island</b> 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 <b>PCS Frequency Droop Slope</b> .	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 <b>PCS Frequency Droop Slope</b> and offset 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 <b>PCS Frequency Droop Slope</b> 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 <b>PCS Voltage Droop Slope</b> .	U-f
BESS Voltage Offset	V	0,01	This is the output of the Voltage / Reactive Power regulation loop rescaled to the AC Voltage dimension over the setpoint <b>PCS Voltage Droop Slope</b> 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 <b>PCS Voltage Droop Slope</b> and BESS Samax.	U-f

### 5.5.23 Output Control – Frequency/Load

The frequency control output is used to control the frequency or the power of the BESS. The frequency regulation, load regulation and load sharing are realized through the frequency control. The Frequency Request is internal value of the regulator which is transformed to range -10 .. 10 V based on setpoints **Frequency Governor Low Limit** and **Frequency Governor High Limit**. This value of frequency request is then transformed to request which comes out of the controller. The analog or binary pulse outputs can be send to the BESS inverter via MODBUS client (master) function.

- > Analog output
- > Binary pulse control

## Frequency control outputs

### Analog Output

The frequency regulator of the BESS is controlled by the analog signal from controller.

The direction of frequency regulation required by frequency regulator of the BESS is given by the setpoint **Frequency Regulator Character**. A full range change of the frequency governor output (from **Frequency Governor Low Limit** to **Frequency Governor High Limit**) should cause 5-10% change of the BESS frequency



(Frequency Governor Low Limit ~ 95% Nominal Frequency, Frequency Governor Bias ~ 100% Nominal Frequency, Frequency Governor High Limit ~ 105% Nominal Frequency).

**IMPORTANT: Frequency governor has to be adjusted for optimum performance before Frequency/Load control adjusting. Check BESS phase sequence before the first BCB connection.**

### Binary pulse control

The internal regulation is transformed to Up/Down pulse control. These pulses are output from the controller via binary outputs **SPEEDFREQUENCY UP** and **SPEEDFREQUENCYFREQUENCY DOWN**. Length of pulses **SPEEDFREQUENCY UP** and **SPEEDFREQUENCYFREQUENCY DOWN** depends on the difference of the actual frequency and requested frequency (actual power and requested power) and on the parameter **Tau Frequency Governor Actuator**. **Tau Frequency Governor Actuator** defines the pulse duration which is needed for the minimal position to the maximal position. The Maximum length of pulses is limited to 5 s, the minimal length of pulses is limited to 150 ms and minimal length between the pulses is 200 ms.

## Frequency/Load Control Adjustment

**IMPORTANT: Prior to Frequency/Load control adjustment, the Voltage/PF control has to be adjusted.**

### Frequency & Synchronization Adjustment

Frequency and Angle control loop is active during synchronization process.

1. Set **Frequency Gain** to 0 and start the BESS in MAN Mode.
2. Set the BESS frequency by **Frequency Governor Bias**, **Frequency Governor Low Limit** and **Frequency Governor High Limit** to achieve frequency according to setpoint **Nominal Frequency**.
3. Increase **Frequency Gain** to unstable frequency control and decrease value by 30 % to insure stable performance.
4. Adjust **Frequency Int** to stable (fast and smooth) frequency control.
5. Set **Angle Gain** to 0 and start the synchronization by pressing BCB ON/OFF button. To stop synchronization press again BCB ON/OFF .
6. Synchroscope movement on the controller measure screen should slow down and stop (in any position, because **Angle Gain** control is off).
7. Set **Angle Gain**. Synchroscope on the controller measure screen should move slowly and stop in “up” position. Set **Angle Gain** to unstable value (synchroscope swings) and decrease value by 30 % to insure stable performance.
8. Now your speed regulation loop setup is done.

### Load Control Adjustment

#### MINT application

Load control loop is active in parallel to Mains mode only (**MCB FEEDBACK** is closed). Switch off other parts of the system (BESSs) while adjusting.

1. Set **#System Baseload** setpoint to 30 % of one BESS.
2. Set **Load Gain** and **Load Int** to 0. Via this is the frequency regulation deactivated.
3. Start the BESS in MAN Mode, press BCB ON/OFF button to synchronize and close BESS to Mains.
4. When BCB is closed, BESS load slowly increases to the **#System Baseload** value. Check that BESS power is positive (CT polarity).



5. Increase **Load Int** to unstable load control and decrease value by 30 % to insure stable performance. When **Load Int** factor is set to zero BESS load can differ from required **#System Baseload**.
6. To adjust and optimize **Load Int** change **#System Baseload** several times between 30 and 70 % of **BESS Nominal power**.
7. When BESS is running under full load check if
  - a. Regulator output voltage value is not limited (it does not reach **Frequency Governor Low Limit** or **Frequency Governor High Limit**).
8. Now your Load regulation loop setup is done.

**Note:** Load Sharing adjustment is similar to the load control adjustment but BESS is running in Multiple Island Operation with second BESS. One BESS is in local baseload and another in Load Sharing. Change **BESS P Control** to Setpoint and set **Load Sharing Gain/Load Sharing Int** to get stable Load Sharing regulation.

## 5.5.24 Output Control - Voltage/PF

The voltage control output is used to control the voltage or the power factor of the Gen-set. The voltage regulation, PF regulation and VAr sharing are realized through the voltage control. The **Voltage Request** is internal value of the regulator which is transformed to range -10 .. 10 V based on setpoints **Voltage Regulator Low Limit** and **Voltage Regulator High Limit** and stored in value **Voltage Regulator Output**. This value is transformed to a request which comes out of the controller. The analog or binary pulse outputs can be send to the BESS inverter via MODBUS client (master) function.

### Voltage control outputs

#### Analog output

The voltage regulator of the BESS is controlled by the analog signal from controller.

The direction of voltage regulation required by voltage regulator of the BESS is given by the setpoint **Voltage Regulator Character**. A full range change of the voltage regulator (from **Voltage Regulator Low Limit** to **Voltage Regulator High Limit**) should cause 5-10% change of the voltage (**Voltage Regulator Low Limit** ~ 95% of **BESS Nominal Voltage Ph-N**, **Voltage Regulator Bias** ~ 100% **BESS Nominal Voltage Ph-N**, **Voltage Regulator High Limit** ~ 105% of **BESS Nominal Voltage Ph-N**).

#### Binary pulse control

The internal **Voltage Request** is transformed to Up/Down pulse control. These pulses get out of the controller via binary outputs **VOLTAGE UP** and **VOLTAGE DOWN**. Length of pulses **VOLTAGE UP** and **VOLTAGE DOWN** depends on the difference of actual voltage and requested voltage (actual reactive power and requested reacted power, actual PF and requested PF) and on the parameter **Tau Voltage Regulator Actuator**. **Tau Voltage Regulator Actuator** defines the pulse duration which is needed for the regulator of BESS inverter to regulate from minimal position to the maximal position. The Maximum length of pulses is limited to 5 s, the minimal length of pulses is limited to 150 ms and minimal length between the pulses is 200 ms.

### Voltage/PF control adjustment

#### Voltage Adjustment

1. Set **Voltage Gain**, **Voltage Int** to 0 and **Voltage Regulator Bias** to the half of expected applicable range.
2. Start the BESS in MAN Mode without load.



3. Change **Voltage Regulator Bias** to 0% and 100% to check BESS voltage control range (typically  $\pm 10\%$  of **BESS Nominal Voltage Ph-N**).
4. Set the BESS voltage by **Voltage Regulator Bias**, **Voltage Regulator High Limit** and **Voltage Regulator Low Limit** to achieve voltage according to setpoint **BESS Nominal Voltage Ph-N**.
5. Increase **Voltage Gain** to unstable voltage control and decrease value by 30 % to insure stable performance.
6. Adjust **Voltage Int** to stable (fast and smooth) voltage control and change **Voltage Regulator Bias** back to value which should correspond to the **BESS Nominal Voltage Ph-N**.
7. Now your voltage regulation loop setup is done.

## PF Adjustment

### MINT application

Power factor control loop is active in parallel to mains mode only (**MCB FEEDBACK** is closed). Switch off other parts of the system (Gen-sets) while adjusting.

1. Set **PF Gain** to the same value as parameters **Voltage Gain** and **Voltage Int** to 0.
2. Set **#System Baseload** = 30 % of **BESS Nominal power** and **#System Power Factor** = 1.0.
3. Start and synchronize the BESS in MAN Mode by pressing BCB ON/OFF.
4. When running in parallel to mains loaded on 30%, increase slowly **PF Gain** to unstable point and then decrease the value by 30 % to insure stable performance.
5. Increase **Load Int** to unstable load control and decrease value by 30 % to insure stable performance. When **Load Int** factor is set to zero BESS load can differ from required **#System Power Factor**.
6. Now your PF/Q regulation loop setup is done.

**Note:** Load Sharing adjustment is the similar to the load control adjustment but BESS is running in Multiple Island Operation with second BESS. One BESS is in local baseload and another in Load Sharing. Change **BESS P Control** to Setpoint and set **Load Sharing Gain/Load Sharing Int** to get stable Load Shar regulation.

## 5.5.25 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** (page 1) and



**BESS Discharge Power (page 1).** The direction of BESS charging or discharging is determined by LBI **ES CHARGE ENABLE** and **ES 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 ES CHARGE ENABLE and ES 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 IntelliMains 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.



## 5.5.26 BESS PF/Q Control

### BESS PF/Q Control

The PF/Q Control of the BESS is regulated according to the setpoint **#BESS Q Control**. There are two types of sources:

- **Analog:** The reactive power is regulated according to the the LAI **BESS Q REQUEST**. This LAI is used as a direct BESS Reactive Power Request.
- **Balance:** The PF of the BESS is regulated using internal calculation so the BESS covers reactive power peaks so Gen-sets (system) has the constant PF which is defined by the setpoint **#Genset PF Required**.

The PF/Q regulation is limited by the apparent power of the BESS. The **Capability L** and **Capability C** curves are used to circle area regulation defined as:

$$\sqrt{(\text{BESS P Actual}^2 + \text{BESS Q Required}^2)} = \text{S BESS} < \text{Smax}$$

### Regulations in the Grid Forming Mode

#### MINT with IM 1010 controller

- **#System PF Control PTM** = VAr Sharing
- **PF/Q Regulation Type (page 1)** = Base PF/Q Control or Import/Export PF/Q Control

#### MINT without IM 1010 controller

- **#System PF Control PTM** = Base PF or Base Q
- **PF/Q Regulation Type (page 1)** = Base PF/Q Control
  - The BESS will cover part of the PF/Q Request only if LAI is used as source.

## 5.5.27 Energy Equalization based on SOC

Energy equalization based on SOC or also known as SOC balancing, is a function for multiple BESS that provides coordinated management of energy distribution among several BESS units to ensure optimal performance, longevity, and economic efficiency. Energy equalization involves balancing the SOC across multiple IntelliNeo devices within a distributed energy storage site, meaning that all the controlled BESS maintain similar SOC levels. This ensure that no individual BESS in a site is overused or underutilized, which can lead to in-equal degradation or inefficiency. The distribution of the energy on the ac bus between the BESS is given by variables sources such as SOC and Effective Capacity.

The required power for distribution is evaluated based on calculated sources. One of the key source is the BESS effective capacity available to Target control limit. The calculated BESS effective capacity is taken from the LAI **ES kWh NOMINALCAPACITY** and the settings from the setpoints **SOC High Target** and **SOC Low Target**. The important emphasis here for the calculation is that the value takes the amount of available capacity to the target limit. For instance if value **ES SOC** is at 60 % and setpoint **SOC Low Target** is at 20 %, the amount of remaining effective capacity is 40 % from the LAI **ES kWh NOMINALCAPACITY**. This calculation will be influencing on how much power will the BESS be discharging. The same is applied for charging.

**Note:** If Ignoring (SOC) Target Control is active the controller calculates with a new set high/low value (for High it is 100 % and for Low it is 0 %). For more information see **Ignore Target Control**.

The SOC Balancing function operates under conditions similar to those used for **Load control in Parallel To Mains Operation - MINT Application**. However, for a BESS to actively participate in energy equalization based on SOC, two key settings must be configured. First the setpoint **BESS P Control** must be set to



Balance mode. Second is the setpoint **SOC Balance** must be enabled on all controllers on the **CAN Intercontroller Communication**.

**IMPORTANT:** If even one IntelliNeo controller has setpoint **SOC Balance = Disabled** (or not present), that controller will revert to distributing power based on the standard Load control method. Meanwhile, the IntelliNeo controllers with setpoint **SOC Balance = Enabled** will continue calculating energy equalization—but they will exclude the controller with set setpoint **SOC Balance = Disabled**. This mismatch can result in the system failing to meet the overall load requirements, as the excluded controller's contribution is not accounted for in the **SOC balancing process**.

The SOC Balance function will not allow an individual BESS to have the **BESS Required P Target** be above its available nominal power. In SOC balancing, a situation may arise when the required power is too high to be able to meet the proportional distribution of power according to the available energy. In cases such as mentioned, the SOC Balance algorithm ensures the gradual saturation of more loaded BESS at maximum power, while less loaded BESS will abandon their requirement based on the SOC balancing algorithm. However, as a whole, the BESS will always deliver the required power in an island or in parallel with other sources. Rather than individual BESS units simply saturating, the SOC Balance algorithm causes the more heavily loaded BESS units to saturate at their maximum output while the less loaded units simultaneously reduce or abandon their energy equalization requirement, since delivering the required power takes precedence over maintaining balance.

In the following examples there are two situations in which the BESS controllers have the setpoint **SOC Balance** with different settings. During the examples there are also the variables that influence the calculation of distributing of the power.

**Example:** There are only 3 BESS units in parallel to mains with setpoint **SOC Balance = Disabled** on all of the IntelliNeo controllers . Required power to export is 300 kW. Each BESS has a different value **ES SOC**

BESS	Value ES SOC	Value ES Nominal Capacity	Setpoint BESS Nominal power	Value BESS Required P Target
BESS n.1	30	100	200	100
BESS n.2	50	100	200	100
BESS n.3	70	100	200	100

**Example:** There are only 3 BESS units in parallel to mains with setpoint **SOC Balance = Enabled** on all of the IntelliNeo controllers . Required power to export is 300 kW. Each BESS has a different value **ES SOC**. Setpoint **SOC Low Target** is set to 20 % for this example.

BESS	Value ES SOC	Value ES Nominal Capacity	Setpoint BESS Nominal power	Value BESS Required P Target
BESS n.1	30	100	200	33
BESS n.2	50	100	200	100
BESS n.3	70	100	200	167



When comparing the two examples between each other, it can be observed that the 3 BESS with enabled setpoint **SOC Balance** are distributing energy between each other with taking in mind the actual value **ES SOC** of the BESS. This distribution of power will allow all of the 3 BESS in the second example to end their discharging cycle at the same time.

Not only does the actual SOC of the BESS influence the distribution of the power between the other BESS but also nominal capacity. Having receive invalid data or the LAIs **ES SOC** and **ES kWh NOMINALCAPACITY** will set the BESS to a 0 kW power request and activation of alarms.

For instance if the SOC Balance is enabled and the LAI **ES kWh NOMINALCAPACITY** is not configured or configured but the LAI has invalid data (###) the **Wrn Unknown Capacity** will appear in the alarm list.

**IMPORTANT: The function of SOC Balancing does not support the Energy Storage Voltage Relative Control. Having the setpoint ES Target Control= ES Voltage Rel on the controller, will the power distribution be according to nominal values of the BESS even when the setpoint SOC Balance = Enabled and the setpoint BESS P Control = Balance.**

## 5.5.28 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 Level BCB Open** 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.

## 5.5.29 BESS Operation Area

The BESS Operation area is defined by Application Curves **CAPABILITY L** and **CAPABILITY C** and is important when BESS operates in mains parallel operation.. The Default configuration defines these two curves to create the circle with radius equal to **Samax**. The vector of apparent power can only operate inside this circle. If the apparent power required as the result of Required P and Q is to be cross this circle, the Active power has always higher priority and reactive power is limited to keep the apparen power inside the circle.



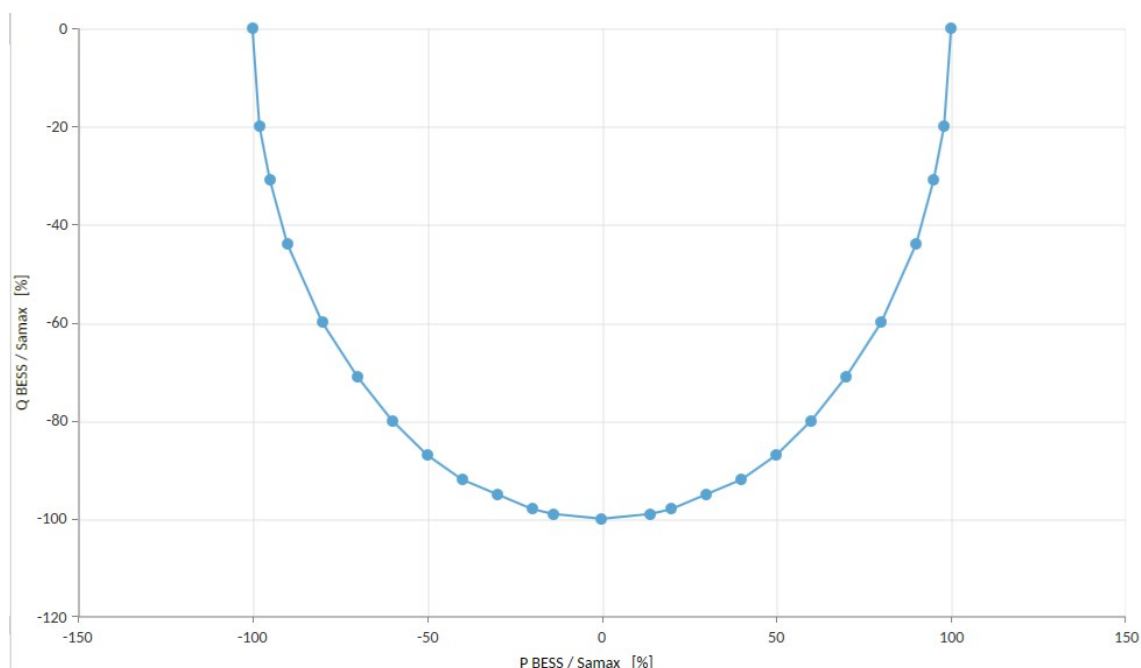


Image 5.118 L and C curves

### 5.5.30 BESS Forced power

The BESS can require specific Power Limitations which occurs in certain situations. In order to use this limitation, Forced power condition has to be fulfilled.

#### Forced power condition

Forced Power Condition of the BESS is applied to prevent overloading or reverse power of any unit in the system connected to the bus. If the power of the system is too low or too high the controller which is not included in Load Sharing (for example CU using local baseload) with the lowest priority, will be forced to increase or decrease power according to the Load Sharing. The system always needs to keep at least one unit running on Load Sharing line, so the system is capable of reacting to the changes in the load.

For IntelliNeo 530 BESS the BESS is running in "variable local baseload". It means that the controller controls charging or discharging of the BESS independently on Load Sharing. The priority is to keep the BESS in this state, but if the power of the system cannot be handled, the BESS is forced to join Load Sharing. The first case when the BESS is forced to join Load Sharing can be when Gen-sets power goes under **#Gen P Min** and the function **PV Curtailment** is disabled or the PV power is already reduced to the minimum. The other case can be when Gen-sets are overloaded and PV is already running on its maximum.

**Note:** Function of PV Curtailment is described in detail in the latest manual version of IntelliNeo6000 and IntelliNeo5500.

### 5.5.31 IntelliNeo 530 as Generic BESS Controller

BESS can be installed as a unit operating within the ComAp ecosystem consisting of Gen-set, Mains or BTB controllers (InteliGen, InteliMains). In this scenario it is connected directly to intercontroller CAN communication line and it behaves like a standard unit.

Another option for integrating the BESS is to make it a subordinate unit of a generic Higher Level Controller (HLC), such as the IntelliNeo 6000, IntelliNeo 5500, or any third-party unit. The IntelliNeo 530 can be integrated using a simple interface.



There is a setpoint **HLC Control mode** for this purpose and it offers these options:

- **Disabled** : HLC is not used and BESS is connected to Comap microgrid directly via CAN.
- **Enabled**: The controller accepts the request from the HLC via LAIs **HLC U-F CONTROL: Q REQUEST** and **HLC U-F CONTROL: P REQUEST**. It is not communicating with any other ComAp controller but following the request given by LAIs (-100 .. 100 % related to the **BESS Nominal power**).

**Note:** It is important to recognize between the cooperation/relation HLC to the BESS and InteliNeo530 to PCS. All optional control modes are limited or given by the options offered by the PCS. For Example if PCS only supports the P-Q control mode and is to be connected to the grid via Start with Closed BCB sequence, then the InteliNeo 530 should be set also to P-Q mode. On the other hand, when the PCS is configured to U-f control mode, the HLC can control the BESS either in U-f mode or in P-Q mode.

## Breaker Control and Precharging in combination with HLC:

Obviously there is several combination how the BESS and HLC (InteliNeo 6000) can cooperate in term of breaker control (setpoint **ESCB Type**) and precharge type settings (setpoint **Starting Sequence BCB Control** and **Precharge Sequence**). Lets see some scenarios.

- HLC does not control the Breaker, InteliNeo 530 does control the BCB. In this scenario Inteli Neo 530 controls the BCB in all possible modes and can do Start with Close BCB or Start with Opened BCB as needed. InteliNeo 6000 should have its BCB in External control mode and it should receive the BCB feedback only. The InteliNeo 530 can choose if the **BCB Type** is set to Breaker or Fuse/Disc.
- Situation when both controllers do control of its BCB can lead to these scenarios with various precharging type settings:

HLC (InteliNeo 6000, InteliNeo 5500)	The BESS settings	Description
Start with Closed BCB	Start with Closed BCB	InteliNeo 6000 closes its BCB to alive bus bar, then the BESS can close its BCB and start the AC precharging sequence.
Start with Opened BCB	Start with Opened BCB	InteliNeo 6000 send the Start Command to the InteliNeo 530. It does the DC precharge sequence and closes the BCB to the dead bus bar. Then the InteliNeo 6000 synchronize the BESS to the common bus bar or it can close the BCB to the dead common bus bar.
Start with Closed BCB	Start with Opened BCB	InteliNeo 6000 closes the BCB to the live common bus bar and sends the start command to the InteliNeo 530. It does the DC precharge sequence and close the BCB after synchronization to the bus.
Start with Opened BCB	Start with Closed BCB	InteliNeo 530 closes the BCB (or already has closed) to the dead common bus bar and starts is sent from the InteliNeo 6000. It does the DC precharge sequence and close the BCB of the InteliNeo 6000 after synchronization to the bus allows it

**IMPORTANT:** The BESS restricts the power demand according to the values **ES Max Charging Power** and **ES Max Discharging Power** only in P-Q mode. In the U-f mode the HLC has to ensure operation within these limits.



### 5.5.32 Deenergized DC Bus after BCB is Opened in PQ Mode

If the setpoint **Starting Sequence BCB Control** = Start with BCB Opened and BESS regulation is in PQ Mode (LBI **BESS Output Control Mode U-f/P-Q** is active) while the value **BESS state**= Energized, the BESS stays energized (precharged) for given time and cannot be synchronized to the bus, because voltage and frequency cannot be regulated. This situation is handled by logic, which opens afterwards ESCB breaker and deenergizing of the DC intermediate circuit (between PCS and ES). History record **DC Bus Deenergized** is written into the history. After this process, BESS can begin a new start sequence once the deactivation of **SD Wrong BCB Control Setting**, which can still be active if the conditions mentioned at the beginning of this chapter are still present.

### 5.5.33 Multiple Island Operation

This chapter describes the situation where multiple BESS and multiple Gen-sets are running parallel to each other but not with mains. This situation will occur either when:

- The common bus bar is dead due to opened MCB or there is no mains at all and the BESS and group of Gen-sets has been connected to the bus, or
- The group was running parallel to mains and the MCB has been opened.

**IMPORTANT: The controller in MINT application does not control the MCB! Only the MCB position is evaluated from the binary input MCB FEEDBACK and the position is the basic source of information for switching between island and parallel to mains operation. If MCB Feedback is not configured the state is automatically shared via intercontroller CAN.**

***Note:** The following description is common for Gen-set and BESS only in case the **BESS Precharge Types** is set to **Start with BCB Opened**. Otherwise the BESS cannot synchronize and it must be firstly precharged by closing the BCB and connecting dead output of the inverter to the healthy bus.*

If the bus bar is empty, the first Gen-set/BESS will close its GCB/BCB without synchronization. Following Gen-sets will synchronize to the already energized bus bar. In the event that multiple Gen-sets start simultaneously and the bus bar is empty, the system will prevent closing of multiple GCBs/BCBs to the bus bar without synchronization. Instead of this, one of the Gen-sets/BESS will close the GCB/BCB and energize the bus bar and the others will wait and then synchronize to the bus bar.

When a stop command is received, e.g. from the power management or binary input **REMOTE START/STOP** is deactivated or the STOP button is pressed, the GCB/BCB will be opened, the BESS will be stopped and Gen-sets will go to cool down phase.

Behavior of controllers is adjusted via **Power Management** settings. Please see this chapter for more information.



## 5.5.34 Parallel To Mains Operation - MINT Application

This chapter describes the situation where multiple BESS and multiple Gen-sets are running parallel to Mains. This situation will occur when the common bus bar is connected to the Mains (**MCB FEEDBACK** is present) and the BESS and group of Gen-sets has been connected to the bus. If the bus bar is healthy, all Gen-sets/BESS will synchronize to the already energized bus bar.

**IMPORTANT: The controller in MINT application does not control the MCB! Only the MCB position is evaluated from the binary input MCB FEEDBACK and the position is the basic source of information for switching between island and parallel to Mains operation. MCB feedback should be the same for all controllers (Gensets and BESS) on the common busbar. If MCB Feedback is not configured the state is automatically shared via intercontroller CAN.**

### Ramping the power

#### Power up

Ramp up starts when value **BESS Required P Target** is increased above value **BESS Required P**. The first phase of the Parallel To Mains operation is the ramp of the BESS up to the desired power level derived from the . The speed of the ramp is given by the setpoint **Load Ramp Island**. The setpoint adjusts the ramp time for a change from **Ramp Start Level** to 100 % of **BESS Nominal power** of the BESS.

#### Power down

Ramp down starts when value **BESS Required P Target** drops, value **BESS Required P** is ramped from **BESS P** down to the new value of **BESS Required P Target** based on **Load Ramp Island**. Setpoint **Load Ramp Island** determines how long it shall take to ramp down from **BESS Nominal power** of the BESS to 0 kW.

#### Soft unload

When BCB is about to be opened (BCB open command or stop command have been received), controller uses **Soft Unload Ramp** for ramp **BESS P** to **BESS Unload Level BCB Open**. Setpoint **Soft Unload Ramp** determines how long it shall take to ramp down from **BESS Nominal power** of the gen-set to 0 kW.

🔍 back to Parallel To Mains Operation - MINT Application

### Load control

If **MCB FEEDBACK** is active (parallel to Mains operation) the load of BESS group is controlled to reach the power defined by setpoint **#System Baseload** or by Load Sharing line. If the setpoint **#System Load Control PTM = IM Request** the system load is regulated by the IntelliMains supervisor controller, otherwise the load is controlled locally in each controller by load control regulation loop. The regulation loop is adjusted via setpoints **Load Gain** and **Load Int**.

🔍 back to Parallel To Mains Operation - MINT Application

### PF/Q control

If **MCB FEEDBACK** is active (Parallel To Mains Operation) the PF/Q of BESS is controlled to reach the PF/Q defined by setpoint **#System Power Factor/#System Base Q**. Var Sharing line is used automatically if Load Sharing is active or while island operation. If the setpoint **#System PF Control PTM = Var Shar** the system PF/Q is regulated by the IntelliMains supervisor controller, otherwise the load is controlled locally in each controller by var control regulation loop. The regulation loop is adjusted via setpoints **PF Gain** and **PF Int**.



## Base PF/Q Control

Base PF/Q Control ensures that the Gen-set keeps certain **BESS Q** to provide required **BESS Power Factor**.

### Base PF

#System PF Control PTM has to be adjusted to Base PF. The **BESS Required PF** with **BESS Required PF Character** are based on:

- **PF/Q Request Source** = Setpoint, requested PF is given by the Setpoint **#System Power Factor** or
- **PF/Q Request Source** = Analog External Value, requested PF is given by value from **LAI PF CONTROL: ANEXT BASE PF**.

### Base Q

#System PF Control PTM has to be adjusted to Base Q Control. The **BESS Required PF** with **BESS Required PF Character** are based on:

- **PF/Q Request Source** = Setpoint, **BESS Required Q** is given by **#System Base Q** or
- **PF/Q Request Source** = Analog External Value, **BESS Required Q** is given by value from **LAI Q Control: ANEXT Base Q**.

## Var Shar

If #System PF Control PTM is Var Shar the BESS PF/Q is controlled by IntelliMains controller.

🔍 back to Parallel To Mains Operation - MINT Application

## 5.5.35 Power Management in IntelliNeo products

### 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 **IntelliGen 1000 Global Guide**.

Therefore, IntelliNeo 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**.

### Role of IntelliNeo 530 BESS in Power management

The Power management settings provide the principles (rules) from which the system decides whether it is necessary to start or stop other resources to cover the current consumption and the required load reserve. Power management is a distributed logic and each controller makes decisions autonomously based on commonly shared information. IntelliNeo 530 BESS in the MINT application is part of the ComAp ecosystem and behaves according to the general rules of power management. It provides reserve in the form of unused power capacity from the BESS according to the valid conditions of the Power Management function (AUT mode, Power management setpoint Enabled) and also according to the conditions specific to the BESS battery storage. Specifically, it depends on whether the battery is in a state where the discharge request can be accepted. This is



based on the conditions of the **BESS Charging/Discharging Control**, or according to the status of the **LBI ES DISCHARGE ENABLE**.

The output of the renewable sources served by IntelliNeo controllers and integrated in the system can indirectly effect the power management due to the load reserve increase / decrease request. This principle is based on the **Dynamic Spinning Reserve**.

🔍 back to Power Management

## Basic power management

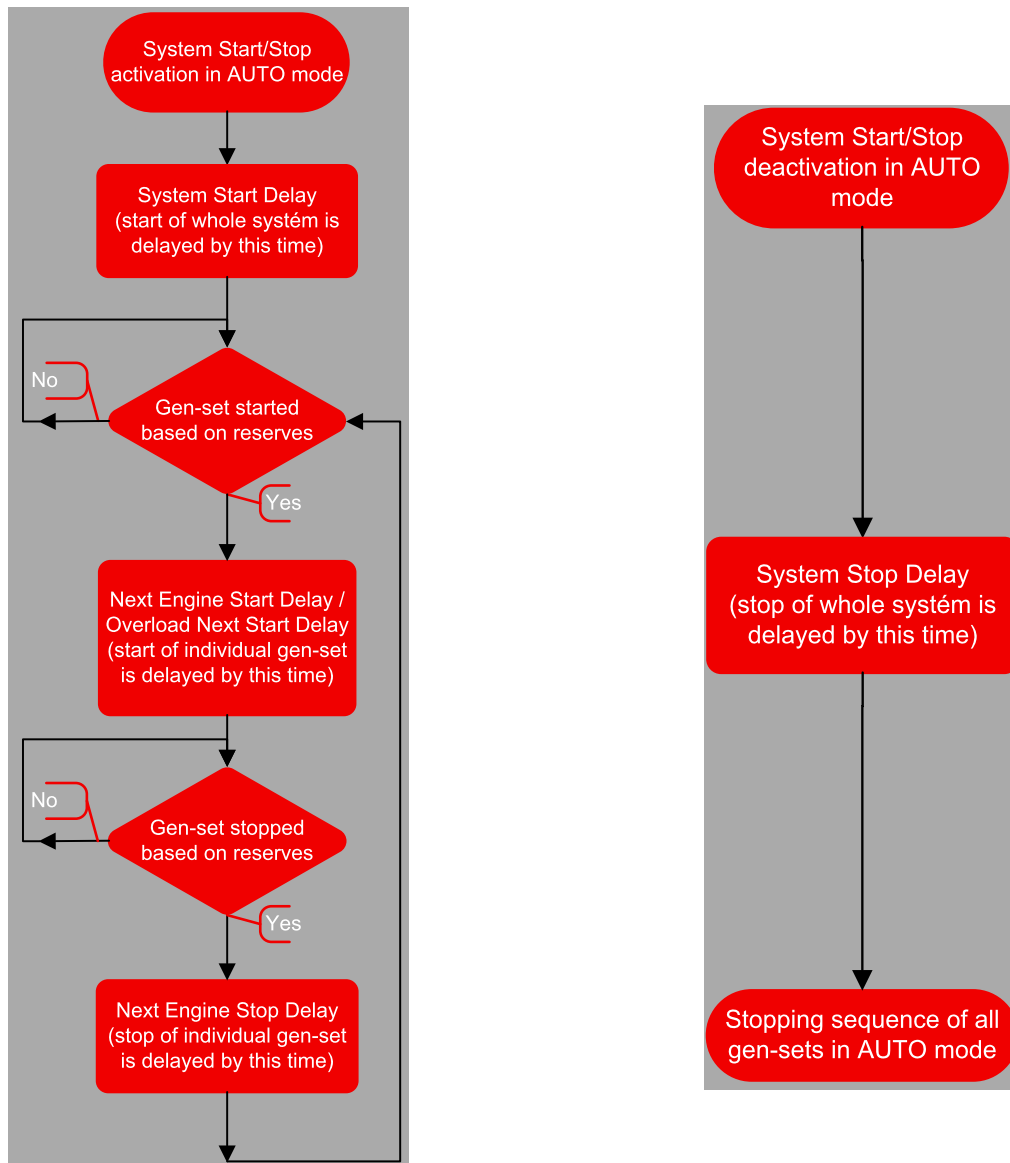
The Logical binary input **REMOTE START/STOP** requests the system to start or stop. If the input is not active, the system stops with delay **#System Stop Delay** after the input has been deactivated and will not start again if in **AUTO** mode. If the input is activated again, the delay **#System Start Delay** starts to count down. Once the delay elapsed, the system is activated and can be started by the power management. In other words, the power management is activated only if the Logical binary inputs **REMOTE START/STOP** is activated and the **AUTO** mode is selected.

🔍 back to Power Management

## Principle of power management

Internal conditions based on remaining load reserves and priorities are evaluated once a delay is elapsed. If the load reserve is insufficient the Mains is started after delay given by the setpoint **#Next Engine Start Delay** is elapsed. Once the Mains runs the controller evaluates stopping conditions based on load reserves and priorities. If the reserve is sufficient enough to stop a particular Mains, it is stopped after delay given by the setpoint **#Next Engine Stop Delay** is elapsed. All the time the system stop condition – i.e. the Logical binary inputs **REMOTE START/STOP** deactivated – is evaluated as well. Once the delay given by the setpoint **#System Stop Delay** has elapsed all BESSs in **AUTO** mode are stopped. Following figure depicts the system activation and deactivation logic.





Setpoint **#Overload Next Start Delay** is used in case that **#Overload Next Start Protection** is enabled and BESSs are running at **#Overload Next Start Level** or more of their nominal power.

🔍 back to Power Management

## Multiple source-types operating in MINT application

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.

### 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 REMOTE START/STOP**. This can be a genset controller, an IntelliMains controller, or an IntelliNeo. If another controller in the group does not have its own **LBI REMOTE START/STOP** configured, it will accept the System Start/Stop signal shared via inter-controller communication as a valid start command.

- **LBI REMOTE START/STOP**: This is used to start the BESS integrated by a single IntelliNeo controller. It does not propagate further to other BESS or other sources in the group. If IntelliNeo has this LBI configured, it does not respond to the shared **System Start/Stop** on inter-controller communication.

## 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 **BESS 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 MAX DISCHARGE 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 ES 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 IntelliNeo and any other IntelliMains or IntelliGen controllers connected to the same group.

If there are multiple IntelliNeo 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 IntelliNeo 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.

### 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 IntelliGen 1000 Global Guide.

The start or stop of BESS is governed exclusively by the **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.

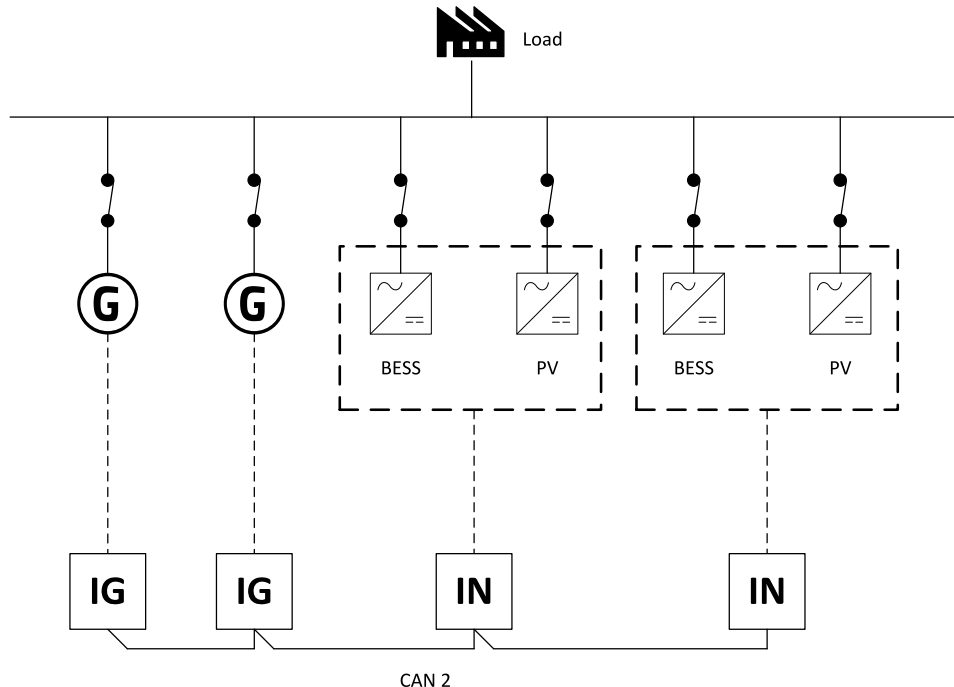
### Active power control in Off-grid operation

#### 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 IntelliNeo 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 (

**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.

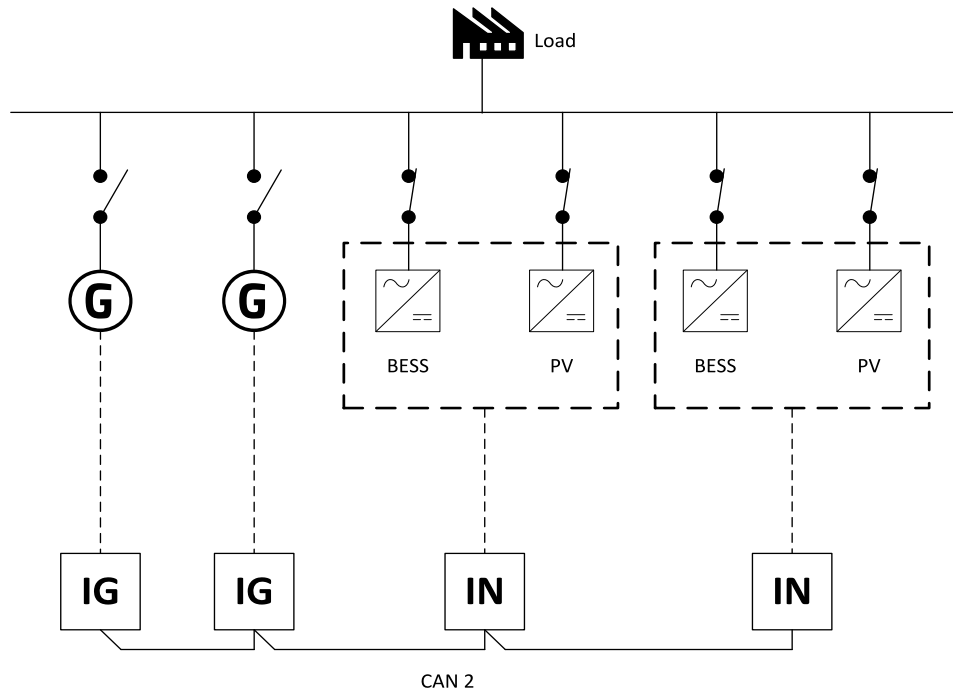
**Note:** Any BESS can be set to constant power mode see **BESS P and Q control strategies**(see . Such a BESS does not directly participate in the Balance function). In case of excess PV production, the BESS does not leave the constant power requirement, and PV curtailment is prioritized.



**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. PV Curtailment protects the system from overproduction of power from PV.

### 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.

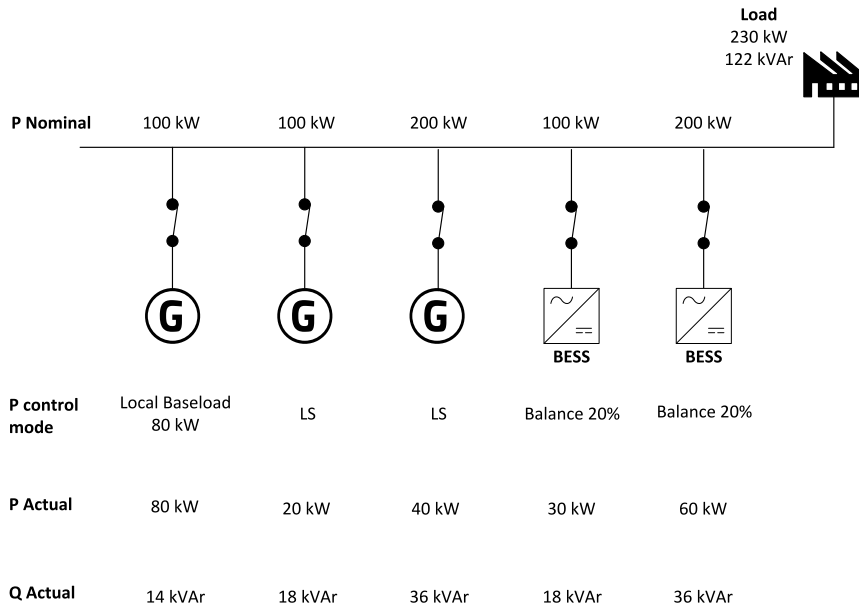
BESS Q Control	
#BESS Q Control	VAr Sharing
#Genset PF Required	1.000

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.



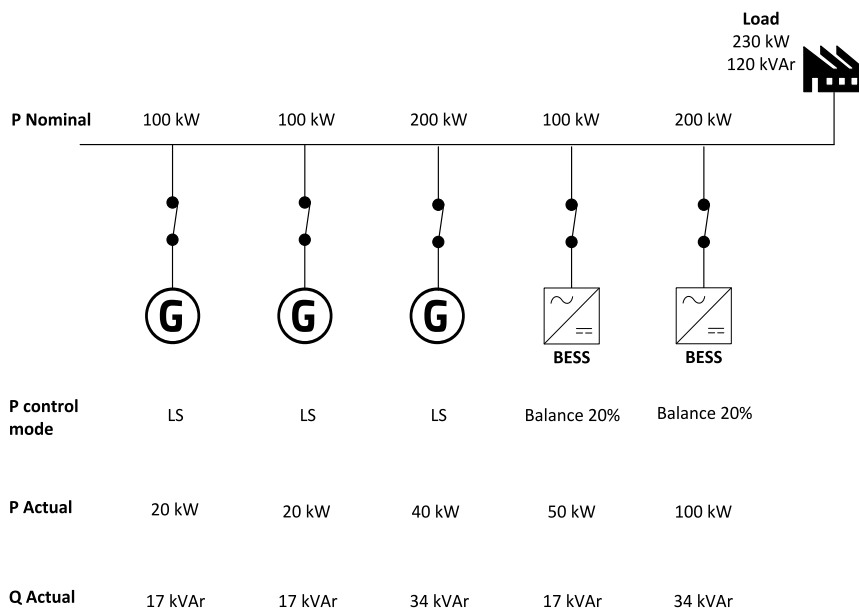
### Example 1:

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).



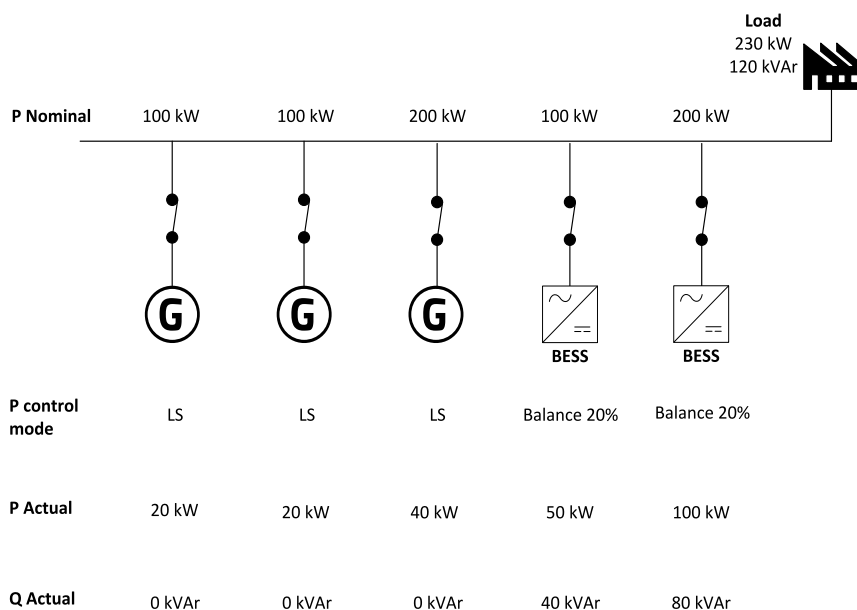
BESS Q Control	
#BESS Q Control	Balance
#Genset PF Required	1.000

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 (page 1)** in the ComAp1 format (see **Formats of Power Factor** and transformed into the value **PV Power Factor Request (page 1)** 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 IntelliNeo controller), this request is common to all PV inverters included in this system. For other PV systems integrated by another IntelliNeo controller, the PF requirement can be set independently.

## 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 IntelliMains 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:

<b>0 – Baseload</b>	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 <b>#System Baseload</b> or <b>LAI LOAD CONTROL: ANEXT BASELOAD</b> , depends on <b>Load Request Source</b> settings.
<b>1 –Import/Export</b>	Request for constant power from the grid. The requested value input the system either via setpoint <b>Import Load</b> or <b>LAI LOAD CONTROL: ANEXT IMP/EXP LOAD</b> , depends on <b>Load Request Source</b> settings.
<b>2 – Zero Import</b>	The goal is zero power import from the grid. Power is supplied exclusively by local sources.
<b>3 – Min Import</b>	Grid import is constant and equal to the value of <b>Mains Import Min</b> .
<b>4 – Max Import</b>	Grid import is constant and equal to the value of <b>Mains Import Max</b> .



<b>5 – Mains preference</b>	<p>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 <b>Mains Import Min</b> and <b>Mains Import Max</b>.</p> <ul style="list-style-type: none"> <li>➤ When the grid power remains within this range, the power delivered by the BESS is zero.</li> <li>➤ <b>Charging of BESS</b> begins when the grid power reaches the <b>Mains Import Min</b> limit, utilizing any excess power.</li> <li>➤ <b>Discharging of BESS</b> starts when the grid power reaches the <b>Mains Import Max</b> limit.</li> <li>➤ <b>Curtailement of PV</b> occurs only when the grid power is pushed below <b>Mains Import Min</b> and BESS is already charging at its maximum capacity.</li> <li>➤ If a <b>genset</b> is present in the system, its power is maintained at the level defined by <b>Gen P Optimal</b>.</li> <li>➤ In case of PV overproduction, the genset power gradually decreases down to <b>#Gen P Min</b>, after which PV curtailement begins.</li> </ul>
<b>6 – BESS Max Charging</b>	<p>This mode closely resembles <b>Mains Preference</b>, with a key difference in the behavior of the BESS.</p> <ul style="list-style-type: none"> <li>➤ In this mode, <b>the BESS charges at maximum possible rate</b>, determined both by its internal limits and the upper grid limit defined by <b>Mains Import Max</b>.</li> <li>➤ This charging occurs while maintaining maximum PV production.</li> <li>➤ The genset operates at the <b>Gen P Optimal</b> level, providing a stable contribution to the overall power balance.</li> </ul>
<b>7 – BESS Max Discharging</b>	<p>This mode is similar in structure to <b>Mains Preference</b>, but focuses on maximizing the discharging of the BESS.</p> <ul style="list-style-type: none"> <li>➤ In this mode, <b>the BESS discharges at maximum possible rate</b>, determined by its internal limits and system demand</li> <li>➤ The grid power is maintained above the lower limit defined by <b>Mains Import Min</b>.</li> <li>➤ The genset operates at <b>Gen P Optimal</b>, ensuring a stable baseline contribution.</li> <li>➤ All of this occurs while maintaining <b>maximum possible PV production</b>, meaning the BESS discharges only to the extent necessary to avoid curtailing PV output.</li> </ul>

**IMPORTANT:** This settings is part of the IntelliMains settings which the power request come from. The Setpoint of the same name in IntelliNeo 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 IntelliMains controller, and in certain situations, even without it. We will primarily focus on the application of Multiple Parallel Operation driven by IntelliMains.

The value of the required power P of all sources in the group generated by the IntelliMains controller can be monitored as the value **BESS Required P Target** in IntelliMains.



## 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. IntelliMains 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 IntelliMains. BESS in constant power mode (Setpoint or Analog) does not follow the requirement from IntelliMains 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 IntelliMains 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:**

IntelliNeo 6000	v. 2.0.0
IntelliNeo 5500	v. 2.0.0
IntelliNeo 530	v. 2.0.0
IntelliGen 1000	v. 3.3.0
IntelliMains 1010	v. 3.3.0
IntelliSys 2000	v.1.6.0
IntelliGen 500 G2	v.2.4.0.
IntelliMains 510	v 1.2.0
IntelliGen 4 200	v 2.3.0
IntelliMains 210 G2	v 3.2.0

**IMPORTANT: The setpoint #System Load Control PTM must be set to the value IM Request.**

#System Load Control PTM	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**.

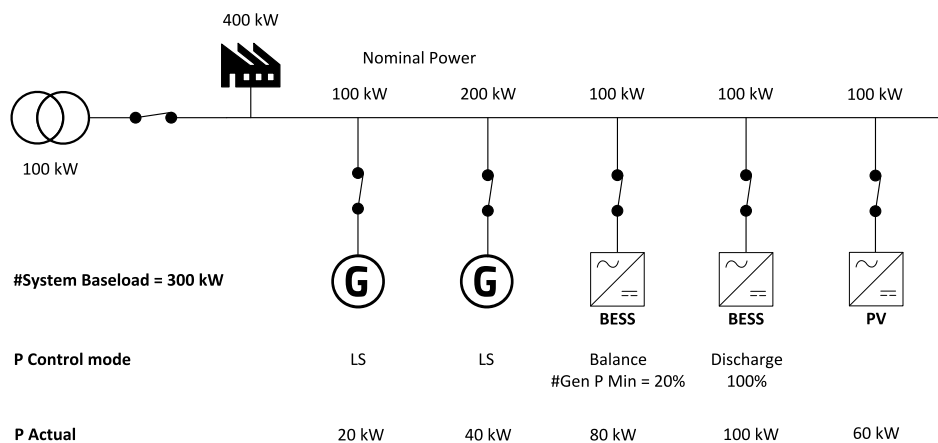
**Load Control PTM Mode (page 1)** = Baseload. The setpoint determines that the chosen control strategy is Baseload.

**#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 IntelliMains through LAI LOAD CONTROL: **ANEXT BASELOAD**, see IntelliMains 1010 Global Guide.

**Example:** 2x Genset in Load Sharing, 2x BESS in Balancing (#Gen P Min = 20%), 1x PV.



**Note:** The **Import/Export Limitation (page 1)** 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 IntelliMains, 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 IntelliMains. However, it is not possible to ensure the **Import/Export Limitation (page 1)** function.

## Import/Export

The grid power is controlled to a constant value.



Load Control	
Load Control PTM Mode	Import/Export ▼
Load Request Source	Setpoint ▼
#System Load Control PTM	IM Request ▼
Import Load	20 kW
#System Baseload	20 kW
Import/Export Limitation	Disabled ▼

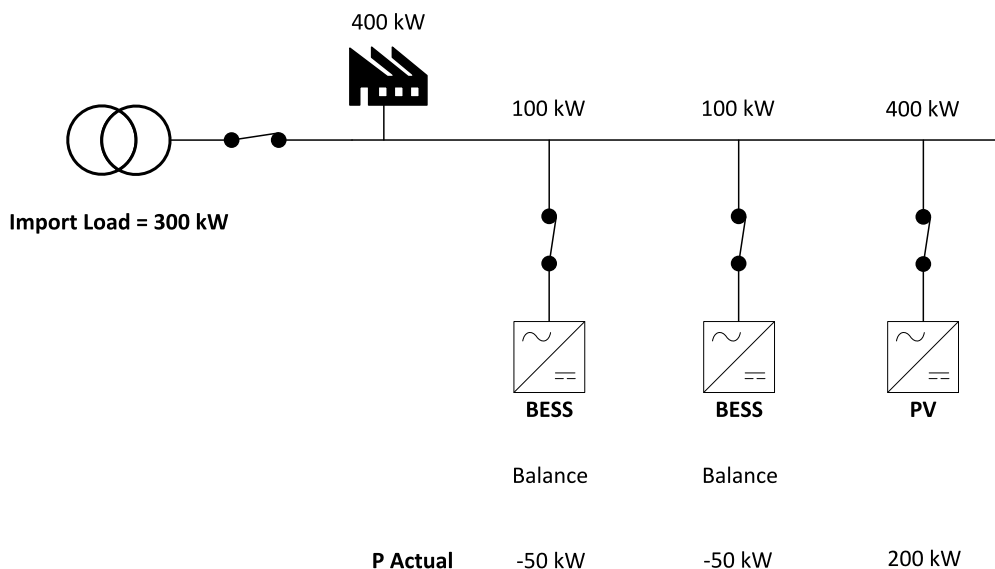
**#System Load Control PTM** must be set to the value **IM Request**.

**Load Control PTM Mode (page 1)** = Import/Export. The setpoint determines that the chosen control strategy is Import/Export.

**Import Load (page 1)** 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 IntelliMains through **LAI LOAD CONTROL: ANEXT IMP/EXP LOAD**, see *IntelliMains 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. IntelliMains 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 (page 1)** 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

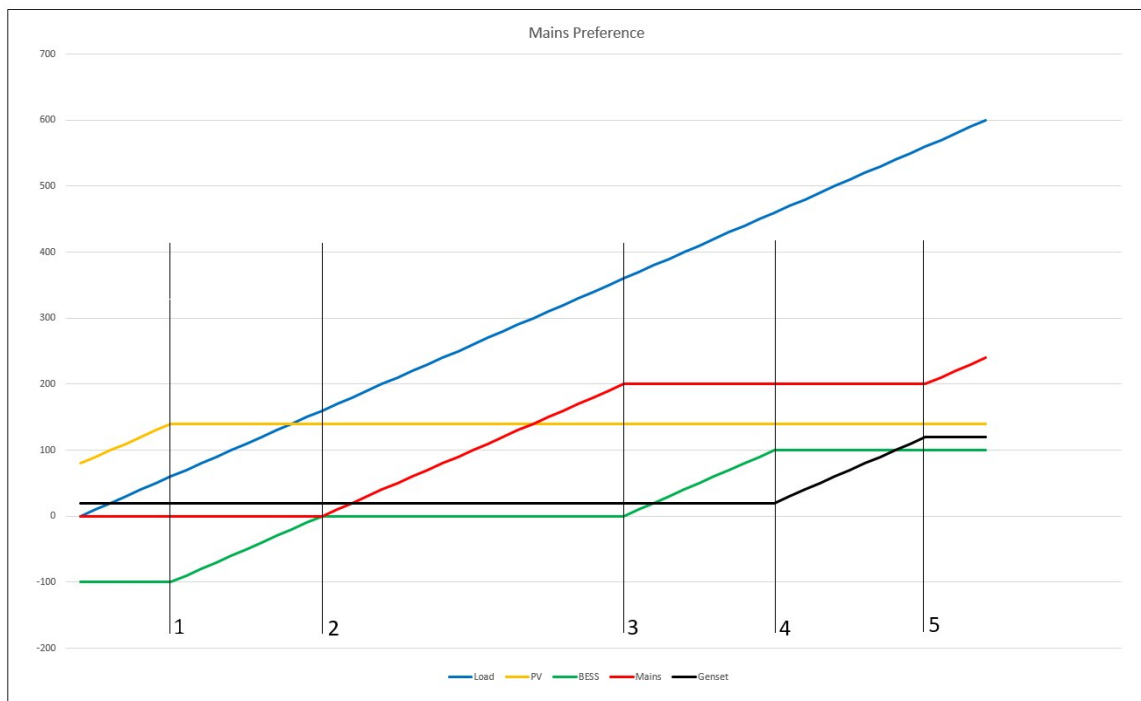
Grid import is constant and equal to the value of **Mains Import Max**.

## 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.

## **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.

## 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 IntelliMains 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 IntelliMains controller. For more information, refer to the [IntelliMains 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 IntelliMains controller, and in certain situations, even without it. We will primarily focus on the application of Multiple Parallel Operation driven by IntelliMains.

The value of the required Q power of all sources in the group generated by the IntelliMains controller can be monitored as the value **Required Q** in IntelliMains.

### 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. IntelliMains 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 IntelliMains.

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 (page 1)** in ComAp1 format, see **Formats of Power Factor** and transformed into the value **PV Power Factor Request (page 1)** 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 IntelliNeo controller), this requirement is common for all PV inverters included in this system. For other PV systems integrated by another IntelliNeo 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:**

IntelliNeo 6000	v. 2.0.0
IntelliNeo 5500	v. 2.0.0
IntelliNeo 530	v. 2.0.0
IntelliGen 1000	v. 3.3.0
IntelliMains 1010	v. 3.3.0
IntelliSys 2000	v.1.6.0
IntelliGen 500 G2	v.2.4.0.
IntelliMains 510	v 1.2.0
IntelliGen 4 200	v 2.3.0
IntelliMains 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 IntelliMains controller, though without the benefits provided by the IntelliMains 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 (page 1)**.

### 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 (page 1)** see [InteliNeo 6000 Global Guide](#).
- 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**).

## Load reserve

The power management is based on the load reserve concept. The load reserve is defined as a difference of the running nominal power of the group within power management and the total load of the system. In the InteliNeo 530 BESS controller the running nominal power is given by the actual power of the renewables (if they are used) and by the nominal power of the BESS. There are two ways how to determine the load reserve. The absolute power management allows the system to keep the load reserve higher or equal to value in kW given by a relevant setpoint. The relative power management assures that load reserve is kept higher or equal to relative portion in % of the nominal power of the group given by a relevant setpoint. Depending of the situation, load reserves are calculated differently in two cases:



## Island operation

Reserve	Actual Reserve	Start condition	Stop condition
Absolute kW	$AR_{strt} = \sum Pg_{Nom} - \sum Pg_{Act}$ $AR_{stp} = \sum Pg^*_{Nom} - \sum Pg_{Act}$	$AR_{strt} < \#LoadResStrt$	$AR_{stp} > \#LoadResStop$
Relative %	$RR_{strt} = [(\sum Pg_{Nom} - \sum Pg_{Act}) / \sum Pg_{Nom}] \cdot 100\%$ $RR_{stp} = [(\sum Pg^*_{Nom} - \sum Pg_{Act}) / \sum Pg^*_{Nom}] \cdot 100\%$	$RR_{strt} < \# \%LdResStrt$	$RR_{stp} > \# \%LdResStop$

## Parallel to Mains operation

Reserve	Actual Reserve	Start condition	Stop condition
Absolute kW	$AR_{strt} = \sum Pg_{Nom} - BaseLoad$ $AR_{stp} = \sum Pg^*_{Nom} - BaseLoad$	$AR_{strt} < \#LoadResStrt$	$AR_{stp} > \#LoadResStop$
Relative %	$RR_{strt} = [(\sum Pg_{Nom} - BaseLoad) / \sum Pg_{Nom}] \cdot 100\%$ $RR_{stp} = [(\sum Pg^*_{Nom} - BaseLoad) / \sum Pg^*_{Nom}] \cdot 100\%$	$RR_{strt} < \# \%LdResStrt$	$RR_{stp} > \# \%LdResStop$

List of abbreviations:

- $AR_{strt}$  .. Actual Absolute reserve in kW or kVA - for BESS start calculation.
- $AR_{stp}$  .. Actual Absolute reserves in kW or kVA - for BESS stop calculation.
- $RR_{strt}$  .. Actual Relative reserve in % - for BESS start calculation.
- $RR_{stp}$  .. Actual Relative reserves in % - for BESS stop calculation.
- $\sum Pg_{Nom}$  .. Sum of Nominal power of all Mains on the bus.
- $\sum Pg^*_{Nom}$  .. Sum of Nominal power of all Mains on the bus apart of the one, which is going to be stopped.
- $\sum Pg_{Act}$  .. Sum of Actual power of all Mains on the bus = system load.
- $BaseLd$  .. Baseload is given by the setpoint **#System Baseload**

**Note:** System starting sequences may be very different due to their complexity (i.e. Mains which do not take part in power management, various nominal powers etc.). Each system should be considered individually.

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## Dynamic Spinning Reserve

The values **Dynamic Spinning Reserve** and **Dynamic Spinning Reserve Offset** are used to affect power management operation in case of anticipated output drop of a renewable source of energy. It enables to shift the load reserve start level and load reserve stop level for power management. 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). 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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## Starting sequence

As written above, power management is based on the load evaluation in order to provide enough available running power. An additional BESS starts when the load of the system increases above a certain level to keep



the load reserve big enough. The following figure depicts the situation where an additional BESS is requested to join the already running BESS(s) to the bus.

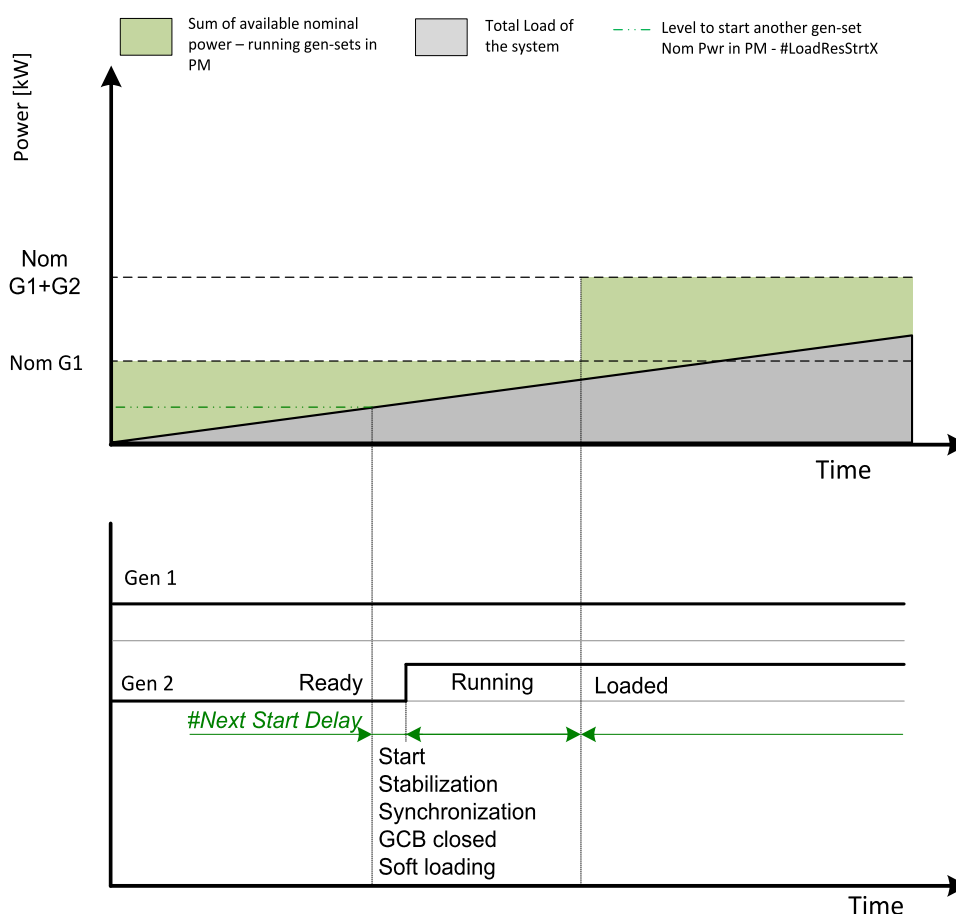


Image 5.119 Start sequence of power management

As shown above, the load of the system has increased above the level defined by the start condition – i.e. the load reserve is not sufficient as required by the appropriate setpoint. Further explanation is provided in chapters **Absolute power management** and **Relative power management**.

The level is illustrated by the green dashed line. If the load reserve remains insufficient for a longer time than defined by the setpoint **#Next Engine Start Delay**, the next BESS will be started. The standard starting sequence follows. Once the synchronization procedure is done, the BCB breaker is closed and the BESS power is ramping up. Once loaded, the system load reserve is raised and becomes sufficient again. Please note the sum of nominal power of all BESSs on the bus is increased by the nominal power of the additional BESS.

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## Stopping sequence

As it is written above, the power management is based on the load evaluation in order to provide enough of available running power. An additional BESS stops when the load of the system drops below certain level to avoid inefficient run of the BESS. Following figure depicts the situation when a BESS is requested to stop due to the power management.



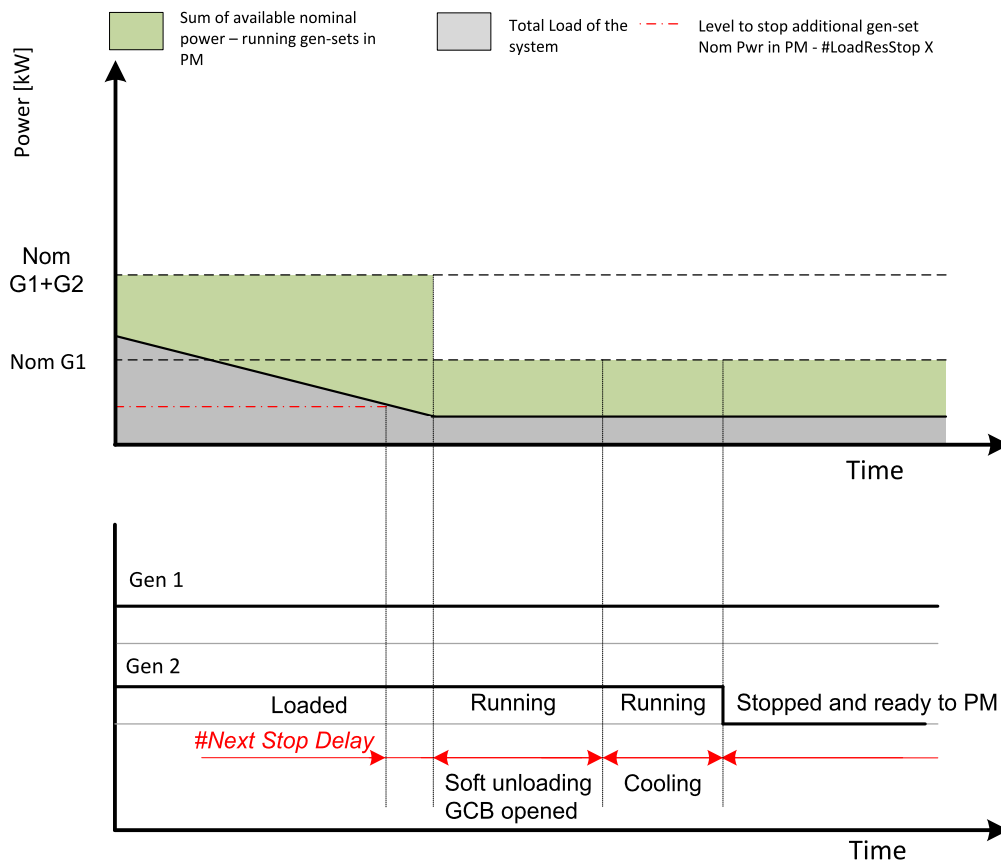


Image 5.120 Stopping sequence of power management

As shown above, the system load has decreased below the level defined by the stop condition – i.e. the load reserve is over a limit given by the appropriate setpoint. Further explanation is provided in chapters **Absolute power management** and **Relative power management**.

The level is illustrated by the red dashed line. If the load reserve keeps over this limit for longer time than defined by setpoint **#Next Engine Stop Delay**, the next BESS is actually requested to stop. Once the BESS is unloaded, the BCB breaker is opened. Please note the sum of nominal power of all BESSs on the bus is decreased by the nominal power of the stopped BESS. The cooling sequence follows before the BESS is actually stopped. The BESS is ready to be started if the system load increases again.

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## Absolute power management

The power management based on absolute load reserves can be successfully used in cases the load portions are similar to the BESS capacity or even bigger. The goal of the absolute reserve mode is to provide the same load reserve all the time independently on how many BESSs are currently running. The mode perfectly fits for industrial plants with large loads.

The absolute power management guarantees adjustable load reserve in kW. This mode is active when **#Power Management Mode** is set to ABS [kW] mode.



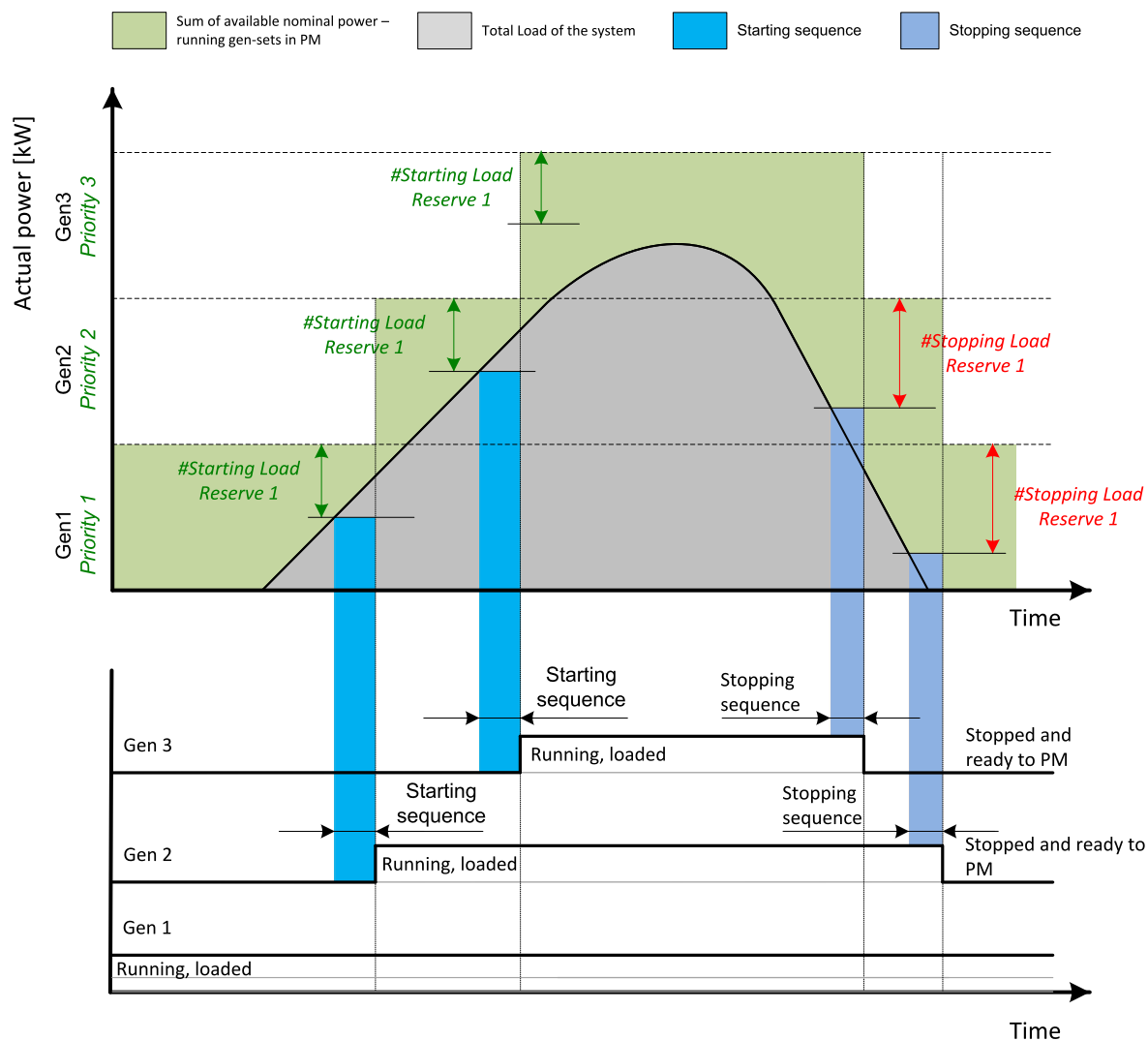


Image 5.121 Power management based on absolute load reserve

**Example:** An example of absolute power management is shown on the figure below. There are three BESSs with following choice of setpoints:

BESS	Nominal power	Power management	#Power management mode	#Priority Auto Swap	#Starting Load Reserve X	#Stopping Load Reserve X
BESS #1	200 kW	Enabled	ABS (kW)	Disabled	100 kW	125 kW
BESS #2	500 kW	Enabled	ABS (kW)	Disabled	100 kW	125 kW
BESS #3	1 000 kW	Enabled	ABS (kW)	Disabled	100 kW	125 kW



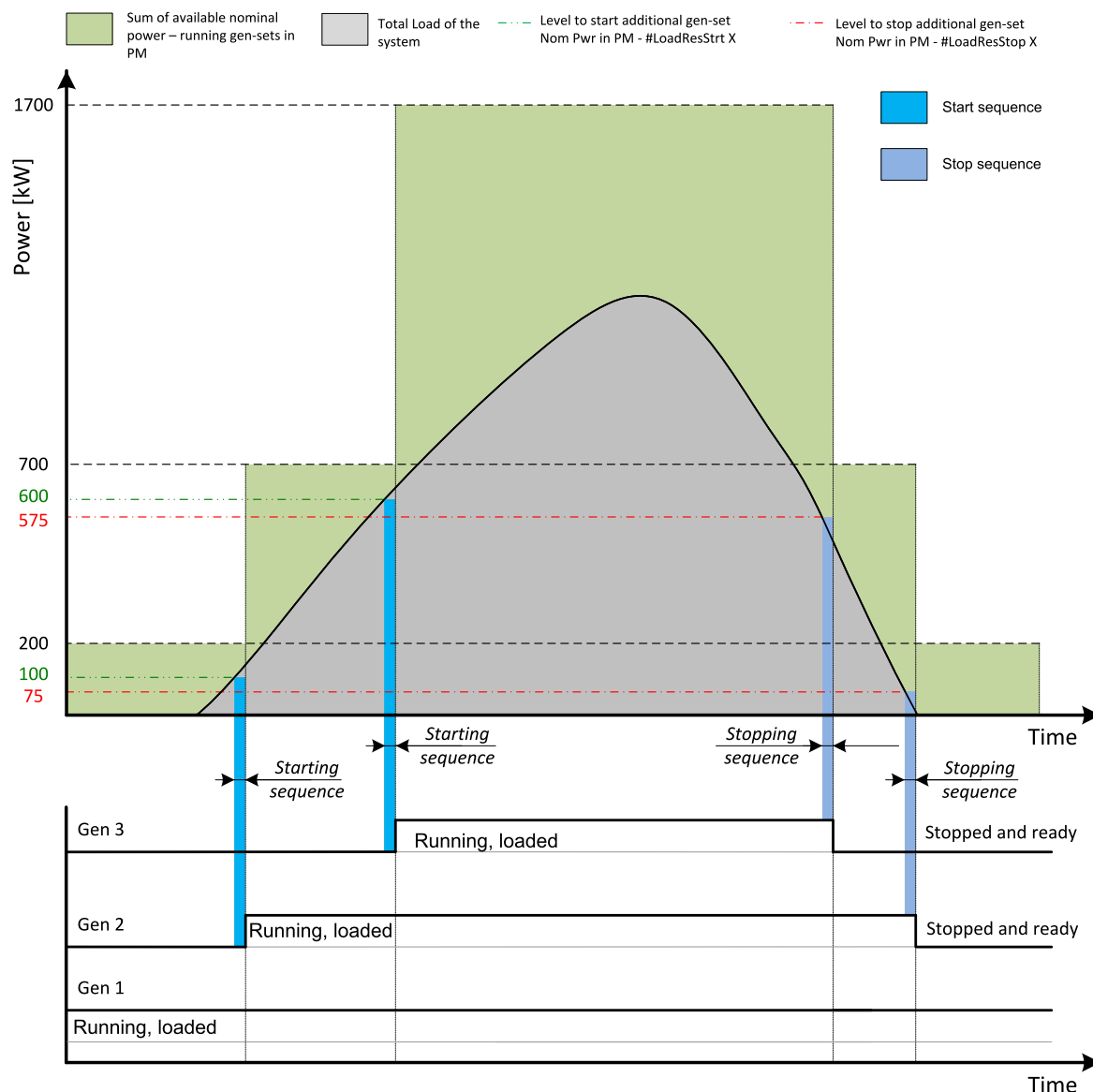


Image 5.122 Absolute power management example

As it is shown on both figures above, the additional BESS is added once the actual load reserve is below the level given by the appropriate setpoint of load reserve. The additional BESS is removed once the actual load reserve is above the level set by appropriate setpoint of load reserve.

The green dashed line depicts the value of load at which the additional BESS is requested to start. This value of the load value is linked with the setpoint **#Starting Load Reserve 1** (or other selected reserve set) in following way:

Sum of nominal power for start - **#Starting Load Reserve 1** (or other selected reserve set) = value of load when additional BESS requested to start (e.g.: 700 kW – 100 kW = 600 kW).

The red dashed line depicts the value of load at which the additional BESS is requested to stop. This value of the load value is linked with the setpoint **#Stopping Load Reserve 1** (or other selected reserve set) in following way:

Sum of nominal power for stop - **#Stopping Load Reserve 1** (or other selected reserve set) = value of load when additional BESS requested to stop (e.g.: 700 kW – 125 kW = 575 kW).



There are 2 sets of setpoints for starting and stopping BESSs in absolute power management.

- > **#Starting Load Reserve 1** and **#Stopping Load Reserve 1**
- > **#Starting Load Reserve 2** and **#Stopping Load Reserve 2** considered if binary input **LOAD RES 2 ACTIVE** is activated

**Note:** All controllers cooperating together in Power management must have the same load reserve set selected.

## Relative power management

The power management based on relative load reserves perfectly fits to those applications with such load portions connected to the group at once are much lower than the BESS nominal power. This mode helps to achieve the maximal lifetime of the BESS, as they can be operated within optimal load range. The maximal size of the load connected at once depends on number of actually working BESS. The more BESS are connected to the bus bar the bigger load portion can be connected at once.

The relative power management guarantees that the sources are not continuously loaded more than to a certain level. This mode is active when **#Power Management Mode** is set to REL [%] mode.

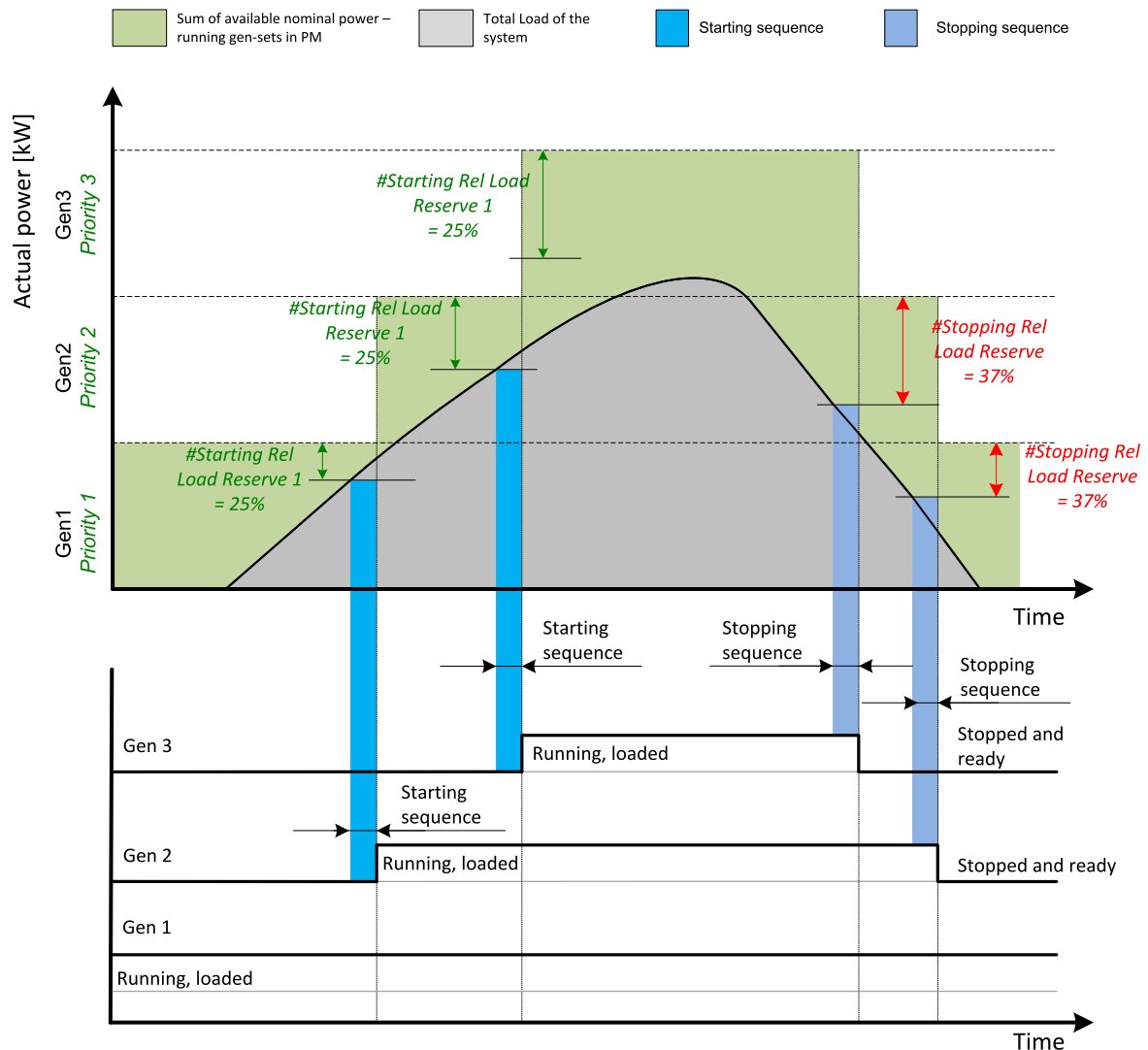


Image 5.123 Power management based on relative load reserve

**Example:** An example of relative power management is shown on the figure below. There are three BESSs with following choice of setpoints:



BESS	Nominal power	Power management	#Power management mode	#Priority Auto Swap	#Starting Rel Load Reserve X	#Stopping Rel Load Reserve X
BESS #1	200 kW	Enabled	REL (%)	Disabled	35 %	40 %
BESS #2	500 kW	Enabled	REL (%)	Disabled	35 %	40 %
BESS #3	1 000 kW	Enabled	REL (%)	Disabled	35 %	40 %

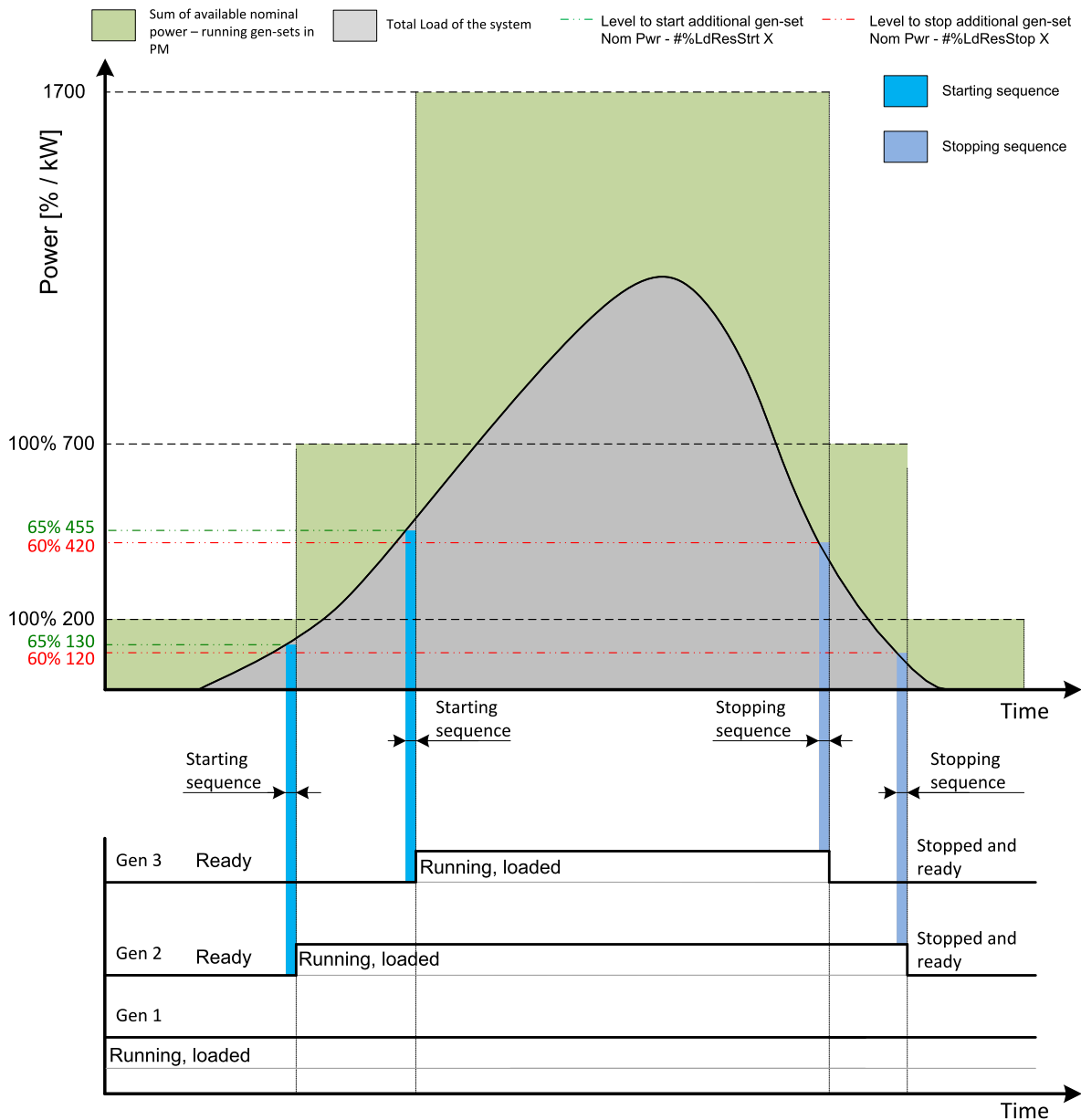


Image 5.124 Relative power management example

As it is shown on both figures above, the additional BESS is added once the actual load reserve is below the level given by the appropriate setpoint of load reserve. The additional BESS is removed once the actual load reserve is above the level set by appropriate setpoint of load reserve.

The green dashed line depicts the value of load at which the additional BESS is requested to start. This value of the load value is linked with the setpoint **#Starting Rel Load Reserve 1** (or other selected reserve set) in following way:



$(100\% - \text{\#Starting Rel Load Reserve 1 (or other selected reserve set)}) * \text{Sum of Nominal power} = \text{Value of load when additional BESS requested to start in kW (in \% of nominal power)}$ , e.g.:  $(100\% - 35\%) * 700 \text{ kW} = 455 \text{ kW}$  (65 % of nominal power).

The red dashed line depicts the value of load at which the additional BESS is requested to stop. This value of the load value is linked with the setpoint **\#Stopping Rel Load Reserve 1** (or other selected reserve set) in following way:

$(100\% - \text{\#Stopping Rel Load Reserve 1 (or other selected reserve set)}) * \text{Sum of Nominal power} = \text{Value of load when additional BESS requested to stop in kW (in \% of nominal power)}$ , e.g.:  $(100\% - 40\%) * 700 \text{ kW} = 420 \text{ kW}$  (60 % of nominal power).

There are 2 sets of setpoint for starting and stopping BESSs in relative power management.

- **\#Starting Rel Load Reserve 1 and \#Stopping Rel Load Reserve 1**
- **\#Starting Rel Load Reserve 2 and \#Stopping Rel Load Reserve 2** considered if binary input **LOAD RES 2 ACTIVE** is activated

**Note:** All controllers cooperating together in Power management must have the same load reserve set selected.

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## Priorities

The Priority for the BESS is always the highest and will start if the criteria allow it to start. Other sources will wait to start once the BESS is connected to the AC Bus line and has finished energizing the DC part of the system.

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## Minimal running power

Minimum Running Power function is used to adjust a minimum value of the sum of nominal power of all running Controllers. If the function is active, then the Controllers would not be stopped, although the reserve for stop is fulfilled. Function is activated via logical binary input **MIN RUN POWER ACT 1**, **MIN RUN POWER ACT 2** and **MIN RUN POWER ACT 3**.



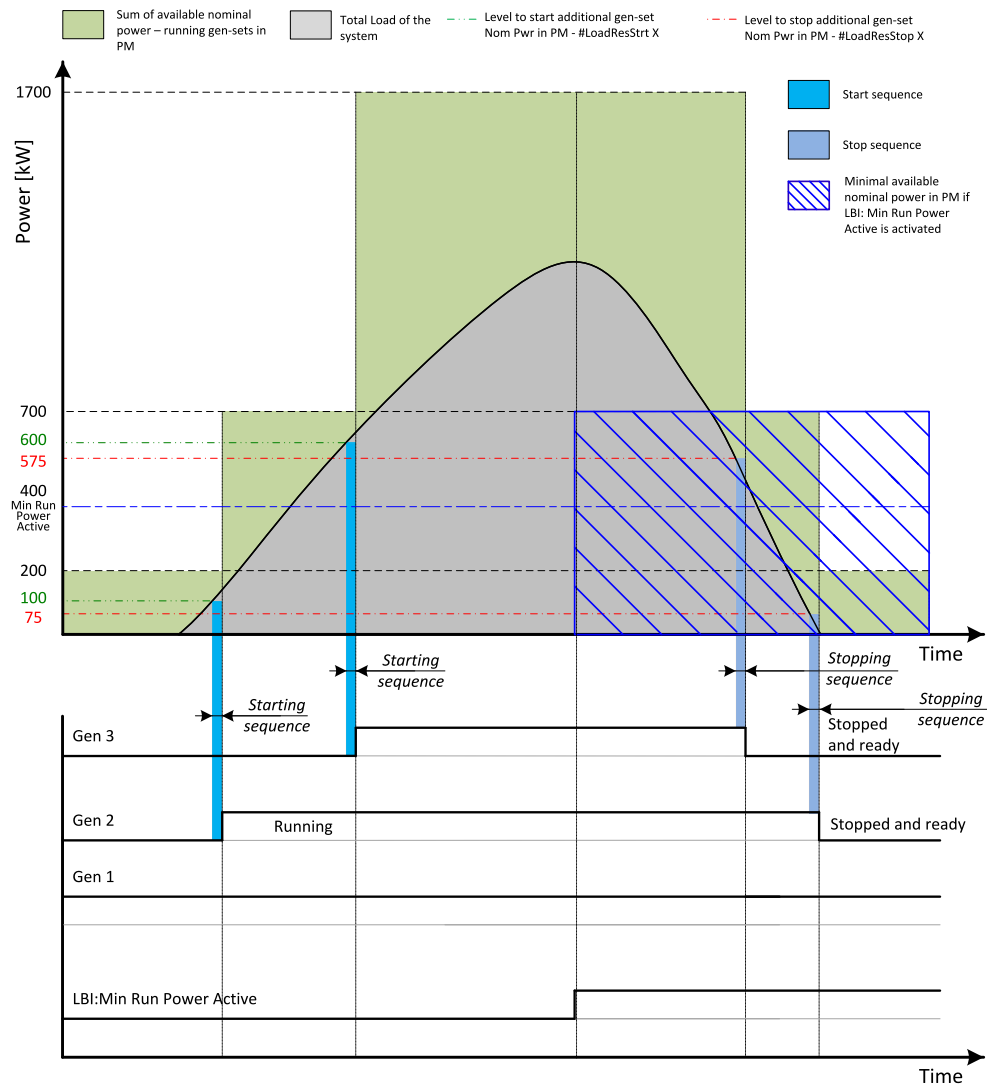


Image 5.125 Minimal running power

Setpoints **#Min Run Power 1**, **#Min Run Power 2** or **#Min Run Power 3** are adjusted to 400 kW. Once the **#Min Run Power 1**, **#Min Run Power 2** or **#Min Run Power 3** is activated, the available nominal running power has to be equal or higher to 400 kW. Even if the load reserve is big enough to stop the Controller #2 (nominal power 500 kW), the Controller keeps running as at least 400 kW has to be available. The Controller#1 (nominal power 200 kW) is not enough.

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## 5.5.36 Regulation Loops

### Regulation loops overview

Loop type	Related applications	Related setpoints	Scenario
Frequency	MINT	Frequency Gain Frequency Int	Unloaded Run Synchronization Single Island
Voltage	MINT	Voltage Gain Voltage Int	Unloaded Run Synchronization Single Island
Angle regulation	MINT	Angle Gain	Phase Match Synchronization
Load	MINT	Load Gain Load Int	Parallel To Mains
PF control	MINT	PF Gain PF Int	Parallel To Mains
Load sharing	MINT	Load Sharing Gain Load Sharing Int	Multiple Island
VAr sharing	MINT	VAr Sharing Gain VAr Sharing Int	Multiple Island

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
<b>Frequency</b>	<p>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 <b>Frequency Regulation Loop</b>.</p> <p>The frequency regulation loop can be active after the <b>Minimal Stabilization Time</b> elapsed in case of start with opened BCB or after BESS is loaded in case of start with closed BCB to energized bus.</p>
<b>Voltage</b>	The voltage regulation loop is active while the BESS is running unloaded or during synchronization. The Voltage loop take control after <b>Minimal Stabilization Time</b> has elapsed.
<b>Angle regulation</b>	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.
<b>Load</b>	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.
<b>PF control</b>	The PF/Q regulation loop is active anytime BESS is running in parallel with Mains.
<b>Load sharing</b>	<p>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.</p> <p>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 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 <b>Frequency Balancing Weight</b>. 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.</p>
<b>VAr sharing</b>	<p>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 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 <b>Voltage Balancing Weight</b>. 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.</p>

## 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.



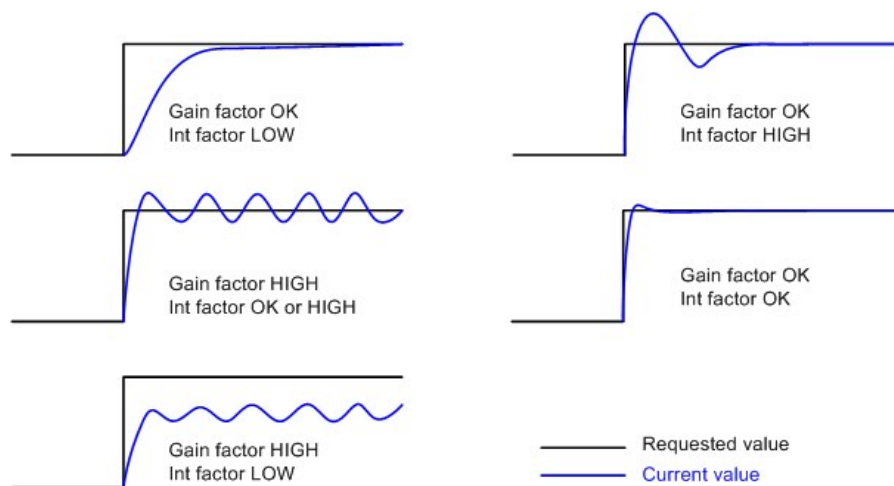


Image 5.126 Typical responses of PI regulator

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.**



### 5.5.37 Inverse Definite Minimum Time

ComAp controllers provide the option to utilize the Inverse Definite Minimum Time (IDMT) for certain protections specifically evaluated by the current and in power. The IDMT protection evaluates the true root mean square (RMS) value of the current/power independently in any of the 3 phases. For instance it is activated if the overcurrent is detected in only one of the phases. Depending on the setting of setpoint **Connection type** will the evaluation be adjusted accordingly based on the wiring of the application being used. The relation between the time and current/power is set by an IDMT Curve. Such a curve is shown on the example below.

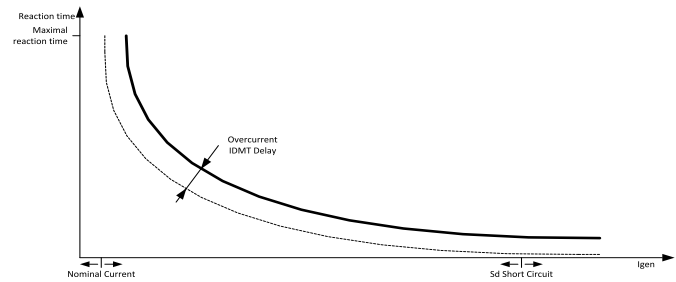


Image 5.127 IDMT Overcurrent Delay

For the calculation of the reaction time it takes into account the IDMT curve. This indicates that reaction time is not constant but depends on the measured/received value and the set nominal setting. According to the following formula can the user obtain the potential reaction time:

$$\text{Reaction time} = \frac{\text{IDMT BESS} > A \text{ Delay} \times \text{Nominal Current}}{I_{\text{BESS}} - \text{Nominal Current}}$$

Important to emphasize that the inputs to the reaction time formula differ depending on the system and type of protection that will be utilized with the IDMT delay. Further details are provided in the individual protections.

**Note:** Reaction time is limited to 3600 s = 60 minutes. IDMT protection is not active for reaction time values longer than 60 minutes.

Table 5.1 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

**IMPORTANT:** Please note that the controller current measurement terminal inputs range is 5 A with over range up to 9 A. This range provides possibility of utilizing the curves calculation up to 1,8x in case of setup for 5A CT secondary current being used. To allow evaluation of higher currents and appropriate delays according to the set curves, a recommendation of using lower secondary rating of the current transformers (other option 1A) and then setting the current ratio accordingly. Setting to a lower ratio can decrease the accuracy of the measurement, which is designed for the 5A CT secondary current by default.

### IDMT Curve options

There are multiple IDMT curves that can be set based on the needs of the reaction. The setpoint **IDMT Curve**



sets what curve will be utilized for all the protections supporting IDMT reaction time. Each curve is unique and has a different characteristic. Changing the setting of the setpoint **IDMT Curve** will make the reaction time be different.

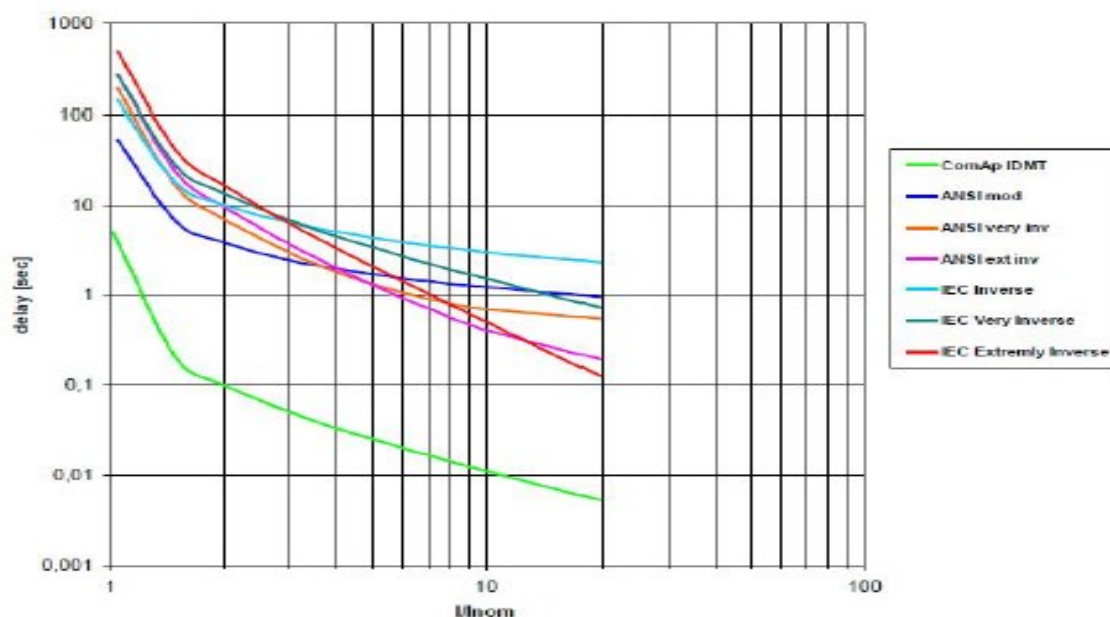


Image 5.128 IDMT Curves (applied to current measurement)

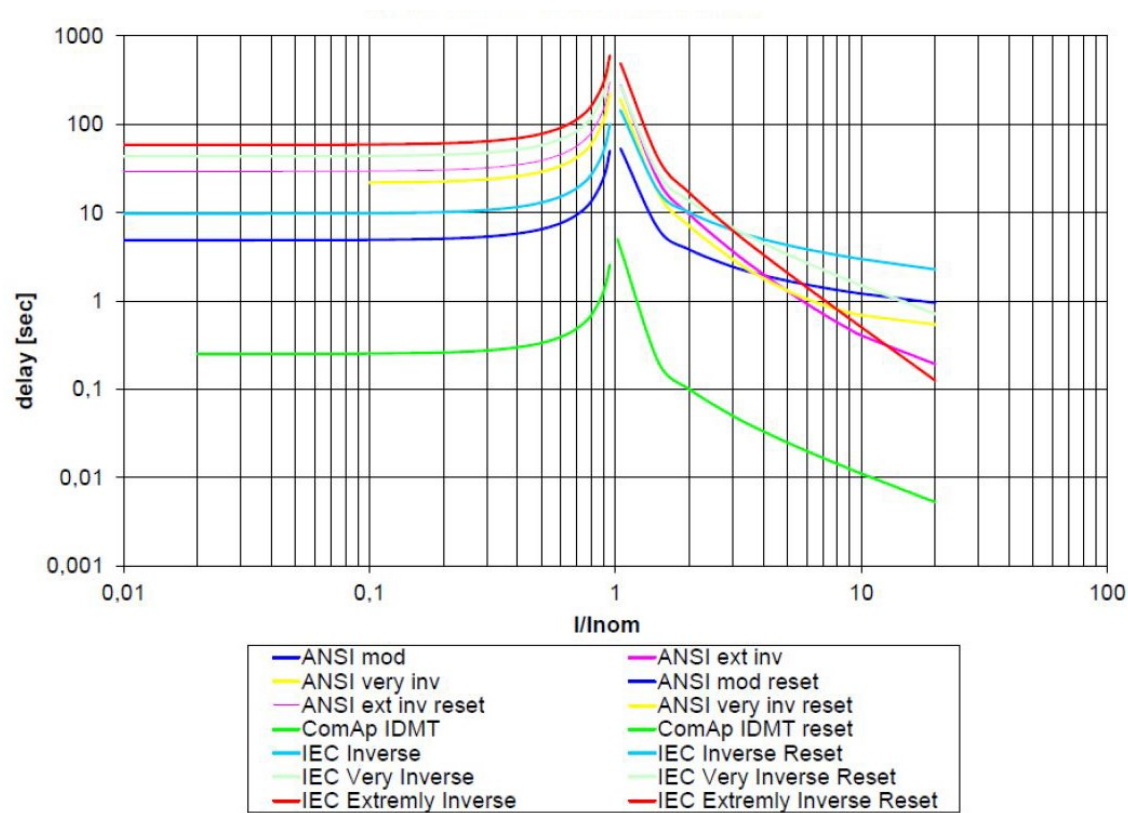
**Note:** By default the option that is used is the ComAp IDMT curve. The controller also offers pre-set curves according to ANSI and IEC standards. Where the characteristics that can be chosen for the ANSI and IEC standards is Inverse (mod or SIT), Very Inverse (very Inv or VIT) and Extremely Inverse (ext Inv or EIT).

## Reset time

The IDMT protections provide also the mechanism of time-dependent resetting curves after the value decreases to or below the nominal setting. This mechanism respects the cooling characteristics of the protected device. The IDMT tripping curve and resetting curve depends on the conditions to which the controller was exposed, as the unit requires some time to recover after being subjected to for instance overcurrent. The reset time does not depend on the magnitude of the overcurrent, but it depends on how long the overcurrent was present before the circuit breaker was opened and the alarms were activated.



See the picture below for the complete curves shape including the reset characteristics

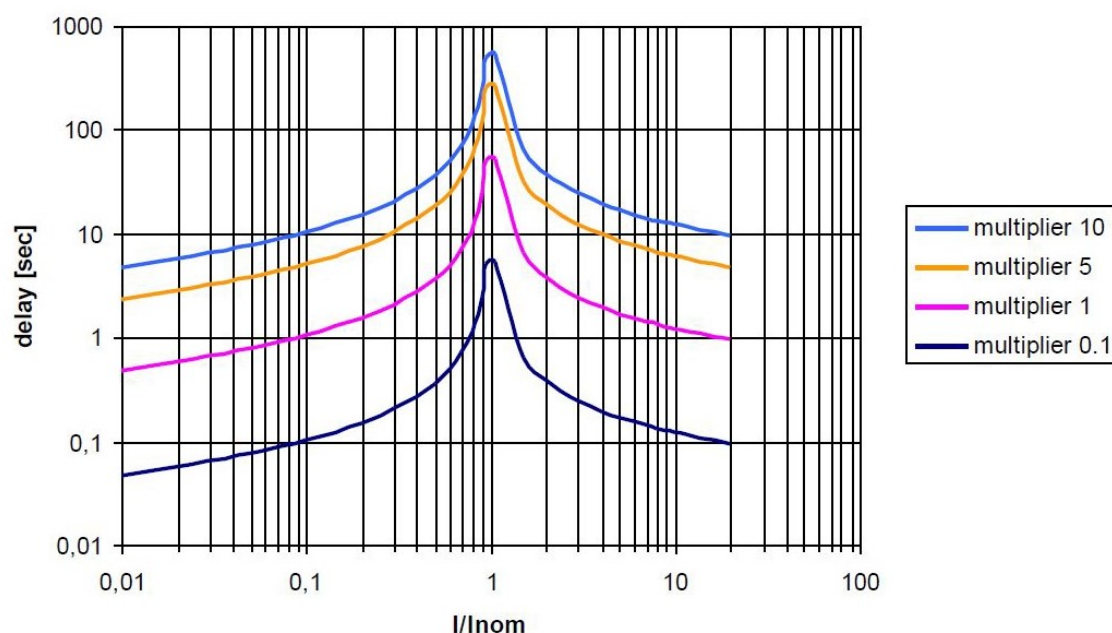


### Multiplier for reaction time and reset time

The curves shapes are multiplied by a time multiplier, set by a dedicated delay setpoint. Each protection can have its own multiplier. This way, the final shape of the tripping curve is calculated with also the multiplier. See the image example of the ANSI Moderately Inverse curve multiplied by a time multiplier:



### Time multiplier - ANSI Moderately Inverse



## 5.5.38 Overcurrent Protection

The controller provides 3 ANSI protective current relay functions. ANSI 51, ANSI 51V and ANSI 51C can be used in power systems to safeguard equipment against overcurrent conditions. Each of the ANSI protection differ in how they detect and respond to faults: ANSI 51 is time-overcurrent protection, ANSI 51V is voltage restrained time overcurrent, and ANSI 51C is voltage controlled time overcurrent. Together, these functions provide a layered defense against overcurrent conditions, ensuring reliability and selectivity in power system protection.

### Time Overcurrent protection

Time-overcurrent protection (ANSI 51) is a widely used protective function in power systems. This function detects sustained overcurrents and short-circuit faults, providing selective activation of protections through Inverse Definite Minimum Time (IDMT) characteristics.

Typical applications to using this function can be utilized in feeders, transformers, motors, bus-bars, and generators, ensuring equipment safety and system stability when primary protections (like differential or distance relays) fail.

#### Principle of function operation

Based on the actual current values received by measurement or via communication and the set nominal current of the application will the controller evaluate the Time Overcurrent protection. In a situation where the current is above the set threshold given by the setpoint **BESS Nominal Current** will the protection **Sd IDMT BESS >A** activate after the reaction time has elapsed.

**BESS Current L1 or BESS Current L2 or BESS Current L3 > BESS Nominal Current ==> Sd IDMT BESS >A** activates after reaction time.

The function of the **Sd IDMT BESS >A** protection evaluates each of the current independently. Meaning that the protection can be activated if the overcurrent is only in one phase.



**Note:** Depending on the setting of setpoint **Connection type** will the evaluation of the protection be adjusted accordingly based on the wiring of the application being used.

The IDMT characteristic establishes a reaction time that is inversely proportional to the magnitude of the measured fault current above the set nominal current. The greater the fault current, the faster the trip time. This ensures that severe faults sets the controller to no longer have the application source be connected to the grid. **Inverse Definite Minimum Time** chapter provides a better explanation about the reaction time and reset time being used in the ComAp controllers. The evaluation of the reaction time for the Time Overcurrent protection is taken from setpoints **IDMT BESS >A Delay** and **IDMT Curve**. This protection activation can be blocked by the setting of the setpoint **BESS IDMT >A Protection**

## Voltage Controlled Time Overcurrent Protection

The ANSI 51C refers to Time Overcurrent Protection Controlled by voltage (also known as Voltage-Constrained). It is a variation of the time overcurrent protection (ANSI 51) where the relays operation is enabled or blocked depending on the system voltage. This ensures reliable tripping during faults near the source or in weak networks, where fault current may be reduced due to voltage collapse.

### Principle of function operation

The protection **Sd I>V Time Overcurrent** is the result of the evaluation for this function. The activation of the protection takes place if the voltage of the system is below the limit set by setpoint **I>V Control** and overcurrent above the limit set by setpoint **I>V Control Current Level**.

Values **BESS Voltage L1-N** or **BESS Voltage L2-N** or **BESS Voltage L3-N** is smaller than setpoint **I>V Control** will enable the activation of the protection **Sd I>V Time Overcurrent**.

Once the condition mentioned prior is true the protection activates when **BESS Current L1** or **BESS Current L2** or **BESS Current L3** is larger than setpoint **I>V Control Current Level** after the reaction time has elapsed. The function of the **Sd I>V Time Overcurrent** protection evaluates each of the current independently.

For a single phase setup the protection evaluation is as follows: **BESS Voltage L1-N** is smaller than **I>V Control** and **BESS Current L1** is larger than **I>V Control Current Level** the protection **Sd I>V Time Overcurrent** activates after reaction time has elapsed.

**Note:** Depending on the setting of setpoint **Connection type** will the evaluation of the protection be adjusted accordingly based on the wiring of the application being used.

The IDMT characteristic establishes a reaction time that is inversely proportional to the magnitude of the measured fault current above the setting of the setpoint **I>V Control Current Level**. The greater the fault current above the setting of the setpoint, the faster the trip time. This ensures that severe faults sets the controller to no longer have the application source be connected to the grid. **Inverse Definite Minimum Time** chapter provides a better explanation about the reaction time and reset time being used in the ComAp controllers. The evaluation of the reaction time for the Voltage Controlled Time Overcurrent protection is taken from setpoints **I>V Delay** and **IDMT Curve**. This protection activation can be enabled or blocked by the setting of the setpoint **I>V Protection**. In order for this function to take place the setpoint **I>V Restraint** must be set to Disabled.

When voltage is considered healthy the protection evaluation is blocked from tripping even if current exceeds the threshold.



## Voltage Restrained Time Overcurrent Protection

The ANSI 51 V designates Time Overcurrent Protection restrained by voltage. This function is a sophisticated, dynamic overcurrent evaluation typically used for a energy source protection. It is an advancement over the ANSI 51 C as it provides continuous adjustment of sensitivity based on voltage. For application this can be important since by lowering the trip threshold during severe voltage sag, the protection guarantees detection of fault where the energy sources contribution has decayed, thereby eliminating the "non-detection zone" associated with high impedance or remote internal faults.

### Principle of function operation

The ANSI 51V function constantly monitors the measured or received voltage and uses it to dynamically restrain (adjust) the current pickup setting. A defined voltage restrain curve exists in the controller based on which the restraint current pickup changes.

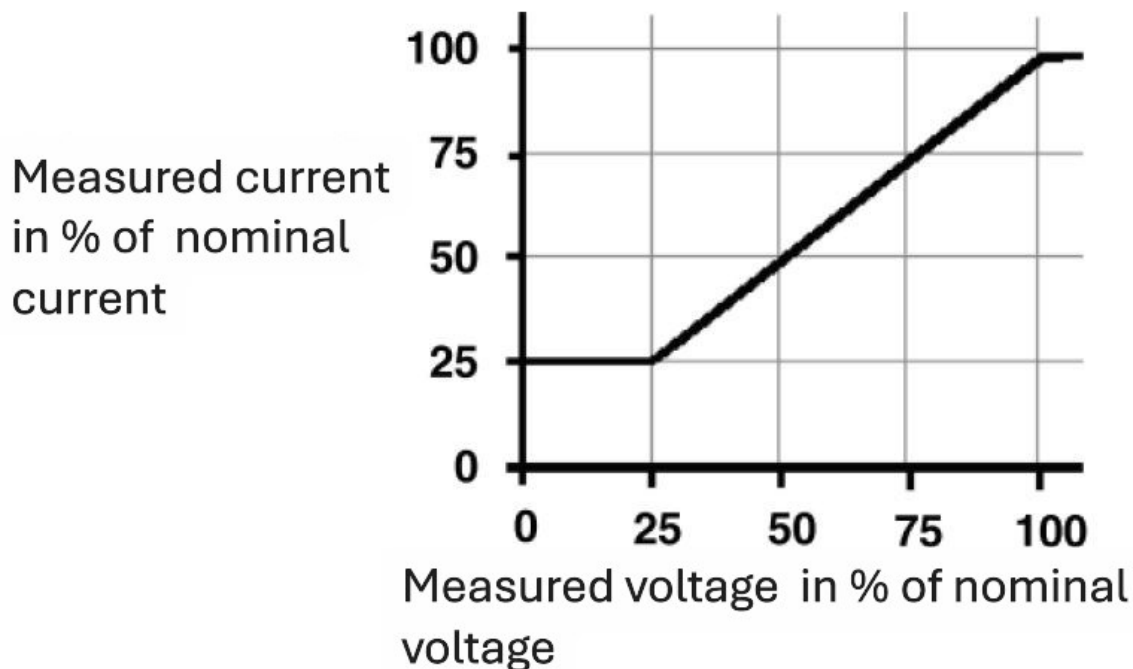


Image 5.129 Predefined voltage restraint curve

From the restraining curve it can be seen that the current pickup (IDMT Current Limit ) is inversely proportional to the measured voltage. Near nominal voltage the pickup is at its highest setting, ensuring security against tripping during nominal conditions. As the voltage of the system drops (indicating a severe fault) the current pickup setting decreases linearly which makes the system become more sensitive.

The protection **Sd I>V Time Overcurrent** is the result of the evaluation for the ANSI 51V function. The starting point from which the protection **Sd I>V Time Overcurrent** starts to be evaluated is defined by the **I>V Control** setpoint. This setpoint establishes a voltage pickup setting from which the protection is evaluated. Any voltage that is above the limit of the setpoint will activate the protection if the current of the system exceeds the current pickup threshold set by the curve. For better understanding the next image shows what is the area of the protection evaluation (green area) when the setpoint **I>V Control** is set to 50 %.



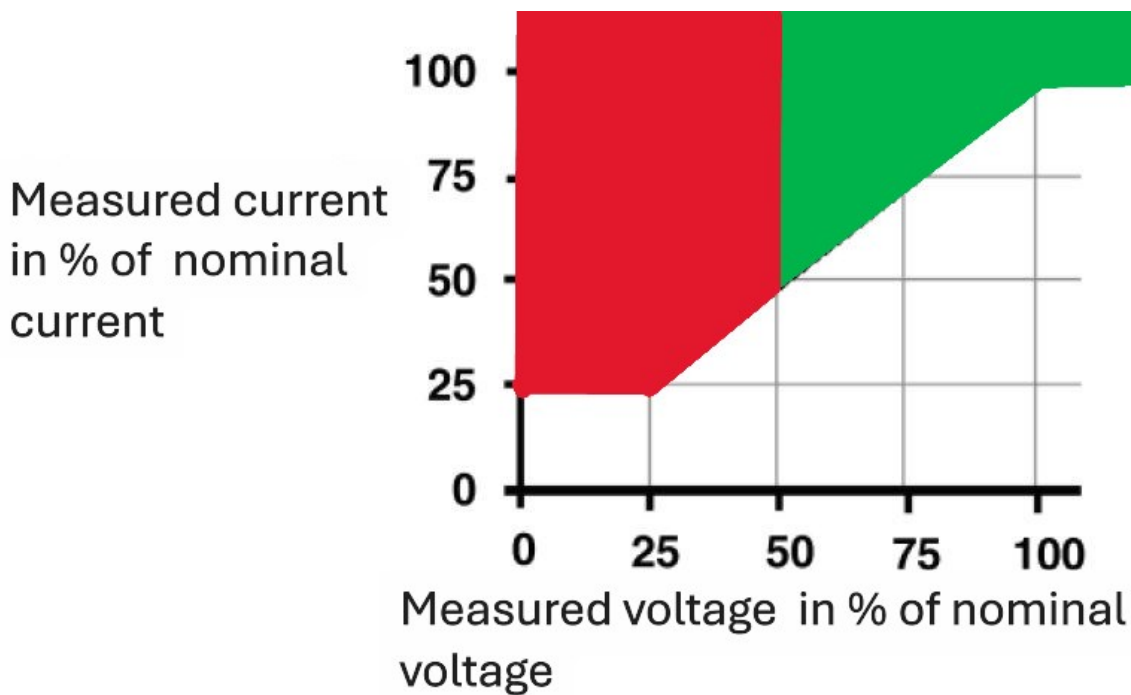


Image 5.130 Predefined voltage restraint curve with setpoint I>V Control being set to 50 %.

Having the setpoint **I>V Control** set at 50 % the trip current pickup threshold is set to 50% of nominal current. The activation of the protection can occur only in the green area of the defined voltage restrain curve.

**Note:** In order to utilize the voltage restraint curve evaluation fully it is recommended to set the setpoint **I>V Control** to the setting of 1 %. This will ensure that the protection activates always.

Values **BESS Voltage L1-N** or **BESS Voltage L2-N** or **BESS Voltage L3-N** is larger than setpoint **I>V Control** will enable the activation of the protection **Sd I>V Time Overcurrent**.

Once the condition mentioned prior is true the protection activates when **BESS Current L1** or **BESS Current L2** or **BESS Current L3** is larger than current pickup threshold from the redefined voltage restraint curve after the reaction time has elapsed. The function of the **Sd I>V Time Overcurrent** protection evaluates each of the current independently.

For a single phase setup the protection evaluation is as follows: **BESS Voltage L1-N** is larger than **I>V Control** and **BESS Current L1** is larger than current pickup threshold the protection **Sd I>V Time Overcurrent** activates after reaction time has elapsed.

**Note:** Depending on the setting of setpoint **Connection type** will the evaluation of the protection be adjusted accordingly based on the wiring of the application being used.

The IDMT characteristic establishes a reaction time that is inversely proportional to the magnitude of the measured fault current above the current pickup threshold from the predefined voltage restraint curve. The greater the fault current to the current pickup, the faster the trip time. This ensures that severe faults sets the controller to no longer have the application source be connected to the grid. **Inverse Definite Minimum Time** chapter provides a better explanation about the reaction time and reset time being used in the ComAp controllers. The evaluation of the reaction time for the Voltage Restrained Time Overcurrent protection is taken from setpoints **I>V Delay** and **IDMT Curve**. This protection activation can be enabled or blocked by the setting of the setpoint **I>V Protection**. In order for this function to take place the setpoint **I>V Restraint** must be set to Enabled. The red color indication in the last image shows the area in which the protection does not



activate. So any measured voltage below the setpoint **I>V Control** setting will be considered as not a reason to activate the protection **Sd I>V Time Overcurrent**.

### 5.5.39 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 Longitude** 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 **Real Sunrise Time**, **Real Sunset Time**, **Time To Sunrise**, **Time To Sunset** are calculated from setpoints **Sunrise/Sunset Latitude** and **Sunrise/Sunset Longitude**. LBO **DAY/NIGHT** is active during the day (between Sunrise and Sunset Time).

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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

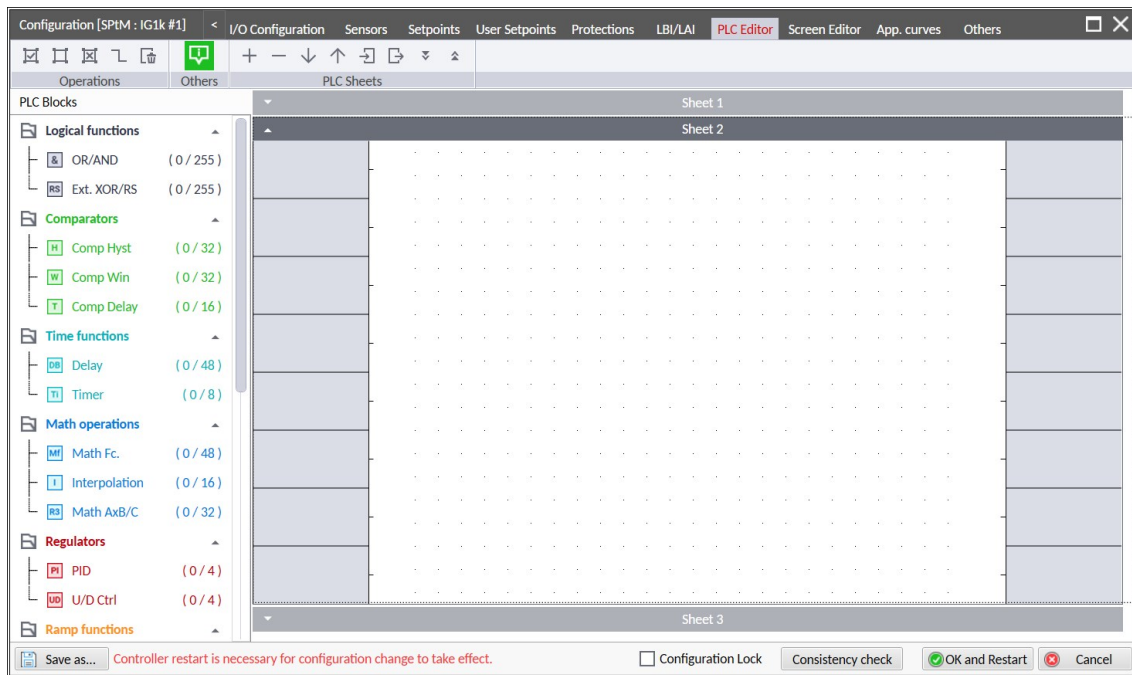


Image 5.131 PLC Editor - main page



## 6.1 List of available PLC blocks

In the table below you can find all available PLC blocks.

Group	PLC blocks	Number of blocks
Logical	OR/AND	128
	XOR/RS	64
Comparators	Comp Delay	8
	Comp Hyst	16
	Comp Win	16
Time functions	Delay	24
	Timer	8
Math Operations	AxB/C±D	16
	Interpolation8	8
	Math Fc.	24
Regulators	PID	4
	Up/Down Ctrl Block	4
Ramp functions	Inc/Dec	4
	LowPassFilt	4
	Mov Avg	4
	Ramp	8
	Up/Down	4
Others	Analog Switch	8
	Analog Switch 8	16
	Bit Sum 16	4
	Circuit Breaker	4
	Comp. 4	8
	Comp. 16	8
	Convert	32
	Counter	8
	Decomp. 4	8
	Decomp. 16	8
	Differ	4
	Heartbeat	8
	Hold	4
	PF Conv	4
	Poly Appx	4
	PWR Calc	4
	Integration	4
	Validator	16

For more information about PLC blocks go to the chapter **PLC**



## 6.2 PLC Editor

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The PLC Editor is available in IntelliConfig Control tab: use Control → Controller Configuration → PLC Editor.

### 6.2.1 Toolbar

In the upper part of the PLC editor panel there is a toolbar with buttons for working with PLC blocks and PLC sheets.



#### Operations

- > Select all elements in sheets
- > Unselect all selected elements
- > Delete all selected elements
- > Rerote selected items - wiring optimization
- > Delete whole content of currently selected sheet

#### PLC Sheets

- > Add and remove sheets
- > Move selected sheet down and up
- > Import sheet
- > Export selected sheet
- > Expand and Colapse all sheets

#### Others

- > Enable/Disable hints

[back to PLC Editor](#)

### 6.2.2 Working with sheets

PLC editor supports working with multiple sheets. You can add or delete sheets and move them up and down. Every sheet can be also renamed by double-click on sheet name "Sheet 1". Each sheet can be re-sized according to your needs by dragging the sheet edges. IntelliConfig also supports importing and exporting of the individual sheet.

**Note:** The number of PLC blocks on one PLC sheet is limited to 30 blocks.



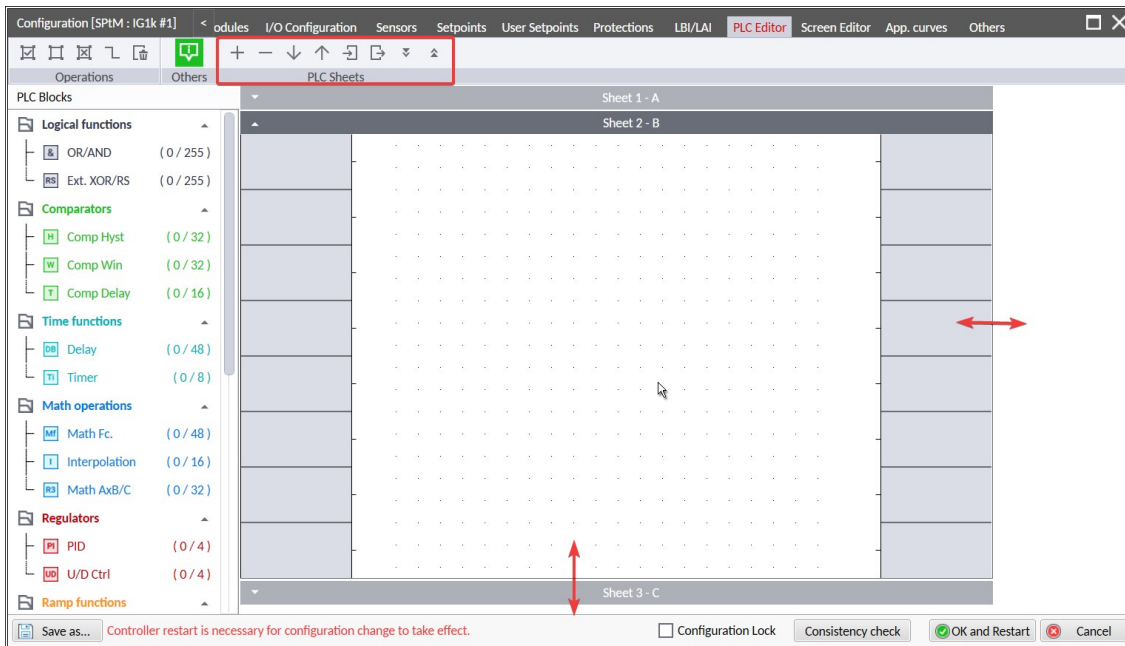


Image 5.132 Adjusting PLC sheet

🔍 back to PLC Editor

## 6.2.3 Blocks Selection Tree

On the left side of PLC Editor panel is available 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 indicated in brackets.

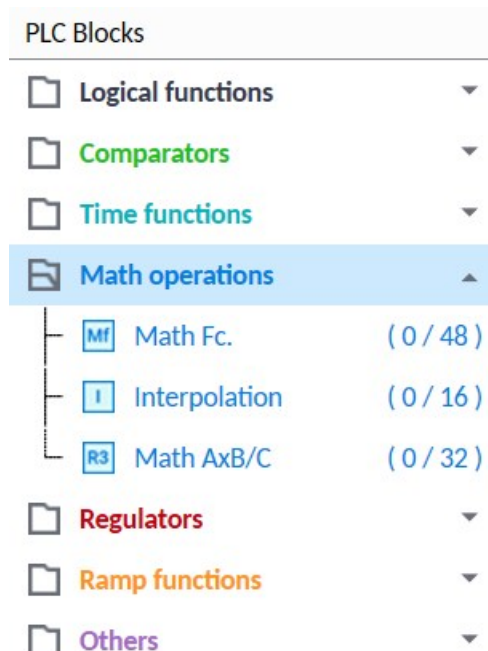


Image 5.133 Blocks selection tree

🔍 back to PLC Editor



# 6.2.4 Adding PLC blocks

Adding PLC block is using simple and intuitive drag and drop system. Follow the procedure below to add PLC block.

- Select required PLC block by LMB (left mouse button) from the list of available PLC blocks on the left side and drag it into the sheet.
- Connect the block inputs and outputs by drawing wires in the sheet. It is also possible to connected inputs and outputs via properties of selected PLC block.

**Note:** To delete PLC block just click on it and press delete button. Also delete selection function can be used.

**Note:** To see context help for selected PLC block just press F1 button.

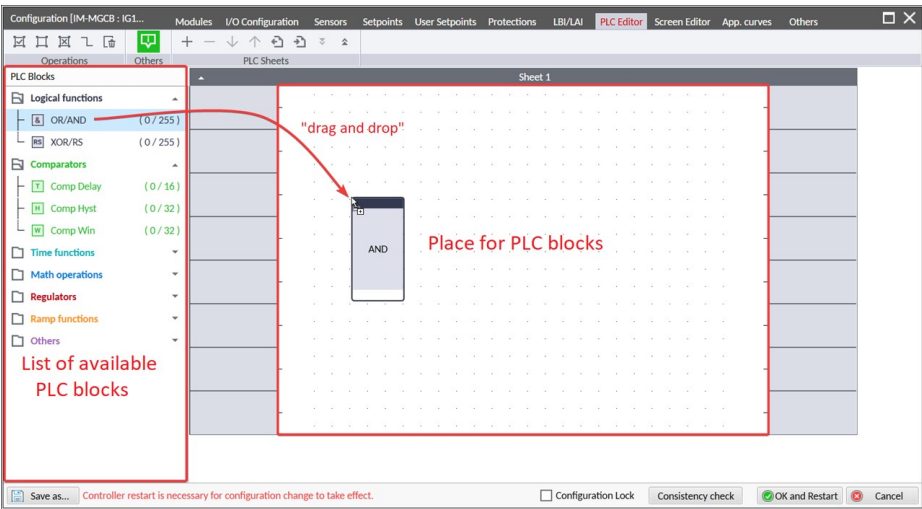
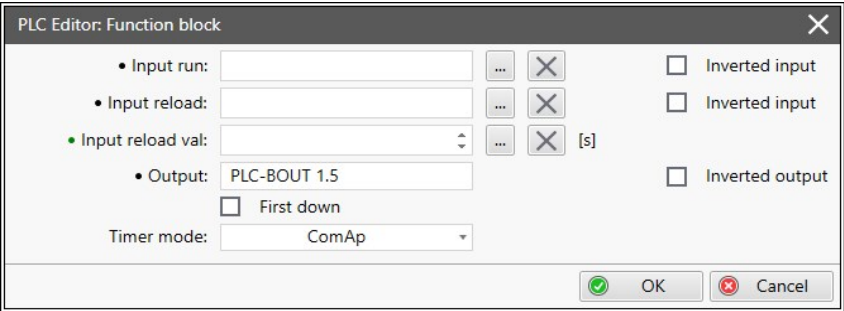


Image 5.134 Adding PLC blocks

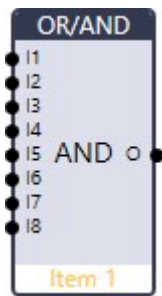
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# 6.2.5 PLC Block Configuration

Double-click on the block by LMB (left mouse button) 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. See PLC for more information about blocks.







PLC Editor: Function block

No.	Input	...	X	Inv.
1				<input type="checkbox"/>
2				<input type="checkbox"/>
3				<input type="checkbox"/>
4				<input type="checkbox"/>
5				<input type="checkbox"/>
6				<input type="checkbox"/>
7				<input type="checkbox"/>
8				<input type="checkbox"/>

• Output: PLC-BOUT 1.8 ☐ Inverted output

Function type: AND

OK Cancel

- Selecting the **Inverted input** check box 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.
- The 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 (list box, check box).
- 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:** If the constants are used (i.e. set by block configuration dialog) they cannot be changed dynamically during PLC execution.

⬅ back to PLC Editor



## 6.2.6 Define inputs and outputs

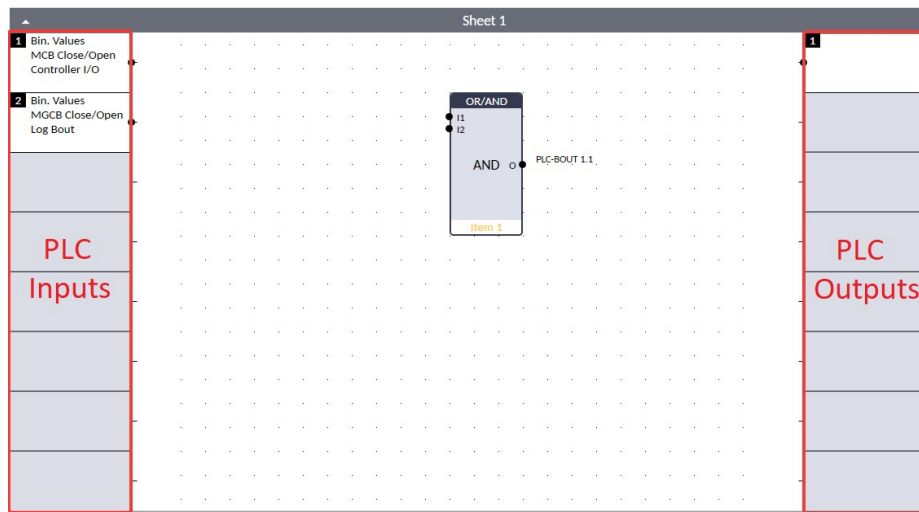


Image 5.135 PLC Inputs and Outputs

### 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 or existing input to add new input or edit the existing one.
- 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 Outputs - You can connect any PLC Output to another PLC 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 PLC setpoints. Names, resolutions and dimensions of these setpoints can not be modified.



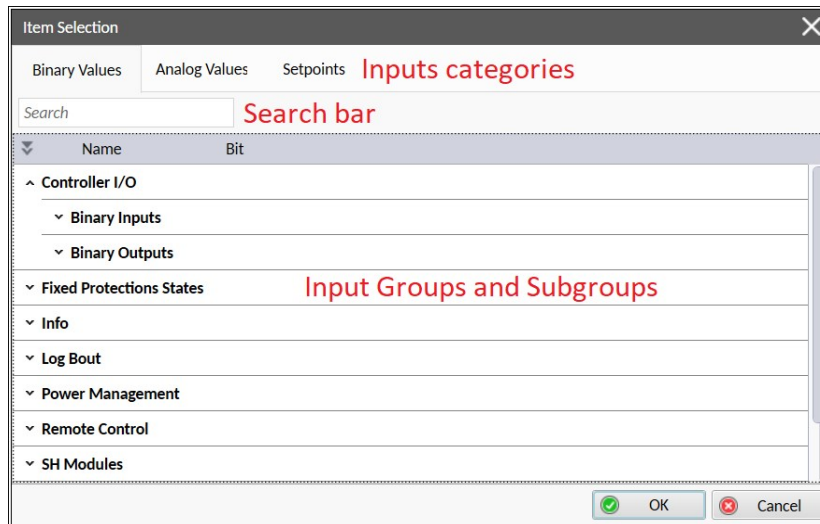


Image 5.136 PLC Inputs

## Outputs

Sheet outputs are located at the right side of a sheet. Follow the procedure below to add or edit an output.

- Double-click on a free output position to add new sheet output (binary or analog).
- Draw the wire from the PLC block output to the PLC output on the right side of the sheet.
- Doubleclick on an already created output to open it's configuration.
- Use the button **+ Connect** to connect the PLC output onto a controller output terminal or a logical binary input.
- Use the button **- Disconnect** to disconnect the PLC output from a controller output terminal or a logical binary input.

**Note:** PLC block output has to be connected to the PLC output to enable configuration of the PLC output.

**Note:** It is necessary to click on the **Connect** button after selecting the output. Otherwise PLC output is not connected to output.



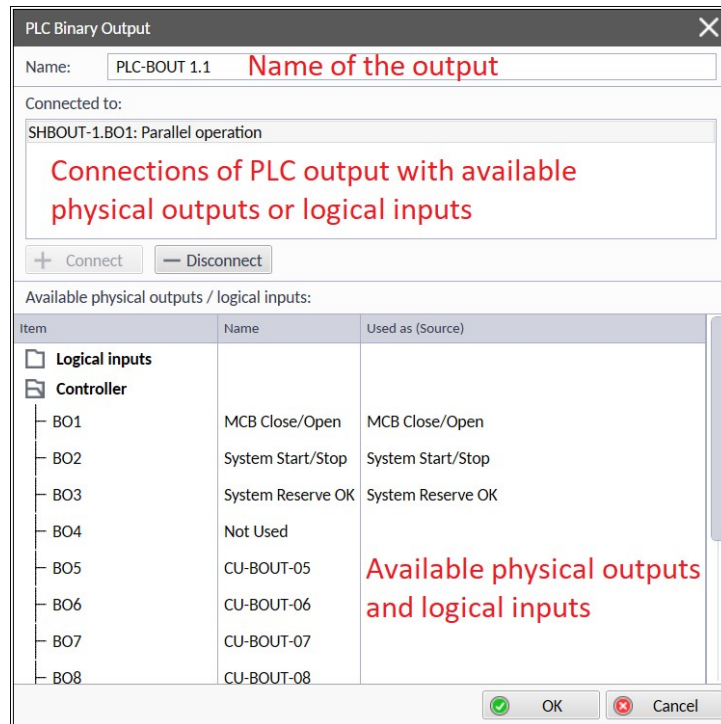


Image 5.137 PLC Outputs

🔍 back to PLC Editor

## 6.2.7 Creating wires

Wires can be created between PLC inputs and PLC block inputs, PLC block outputs and PLC block inputs, or PLC block outputs and PLC outputs.

Follow the procedure below to create wire.

- Locate the mouse pointer over the starting point of the wire (dot). If the area under the mouse pointer is a connection point, the connection point changes to bold dot.
- Press and hold the left mouse button and drag the wire to the destination of required connection point (from dot to dot connection). If you point over a valid connection point, the connection point changes to bold dot.
- Release the left mouse button to create a wire between the two points (dots). The wire is routed automatically.

**Note:** It is possible to make connection only between the outputs and inputs with the same type of value (binary or analog). Binary values are marked by black dot, analog values are marked with green dot.

**Note:** To delete wire just click on it and press delete button. Also delete selection function can be used.

**IMPORTANT:** In case that values on inputs have different decimal numbers than the values are converted and the name of block is displayed as red in the PLC Monitor. It is strongly recommended to fix the configuration = use the signals/values with the same range and decimal numbers.



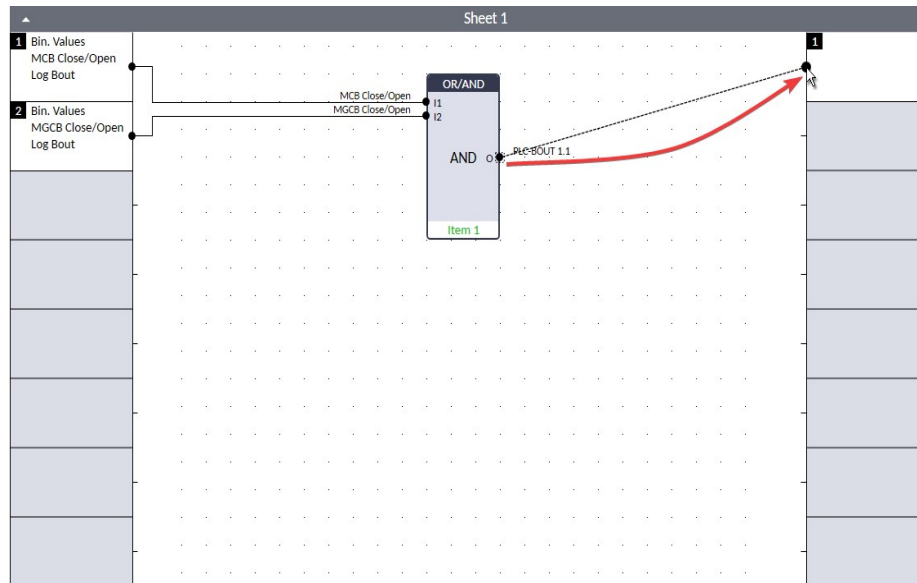


Image 5.138 Wiring PLC blocks

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## 6.3 PLC logic execution rules

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 initial values for PLC inputs are given by the respective signals (e.g. actual power value) or determined by the specific PLC block settings.

PLC 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.

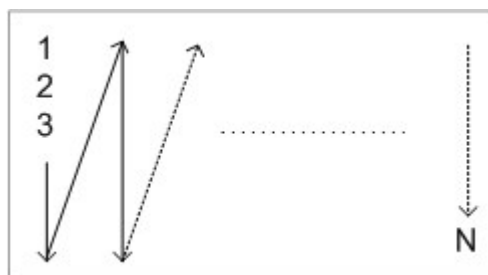
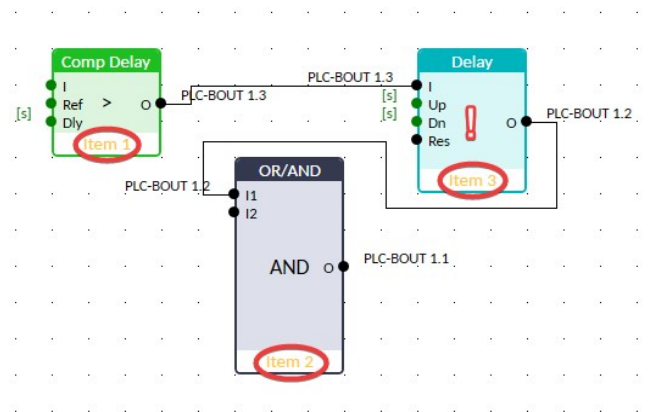
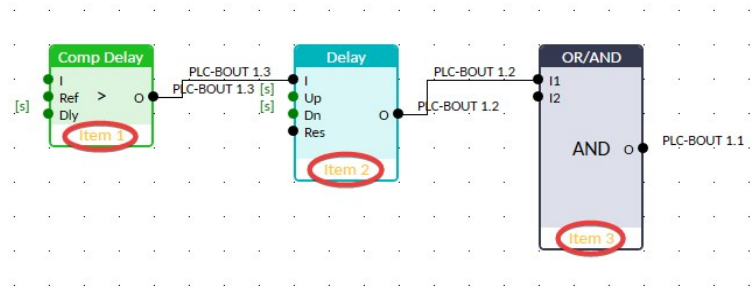


Image 5.139 PLC execution logic

**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.

## 6.4 PLC monitor

PLC monitor is a powerful tool for monitoring your PLC. Just click on PLC Monitor button on main IntelliConfig page to see you PLC in the run time. The refresh rate is given by the system integration. The PLC Monitor is available in IntelliConfig Control tab.

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.

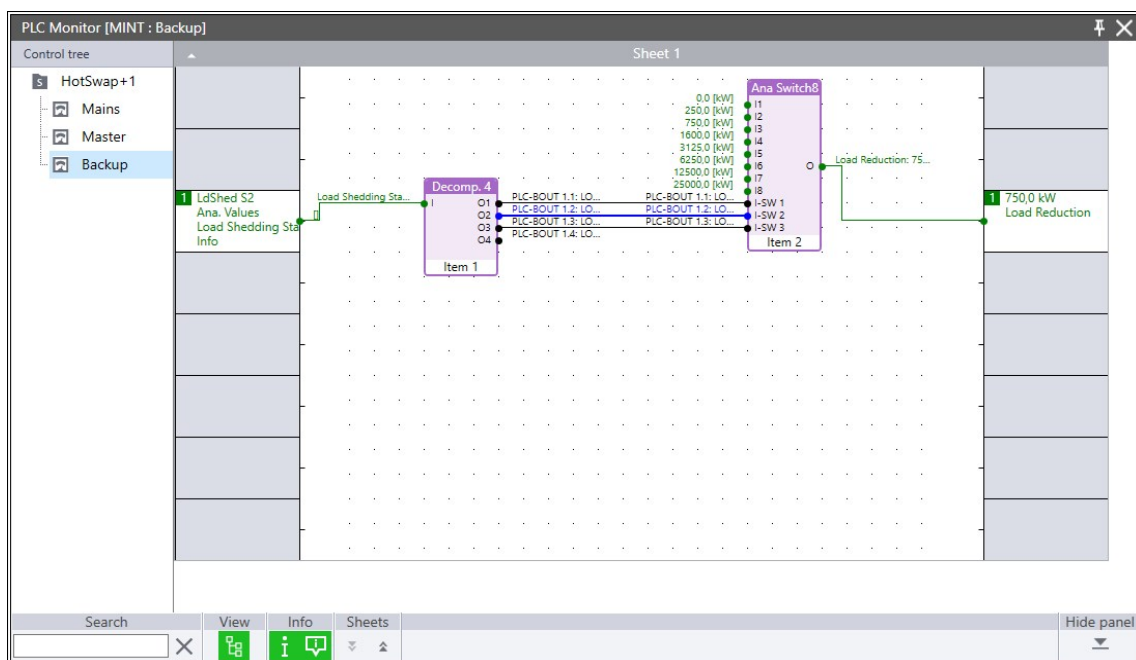




Image 5.140 PLC Monitor panel with multiple controllers

**Note:** 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.

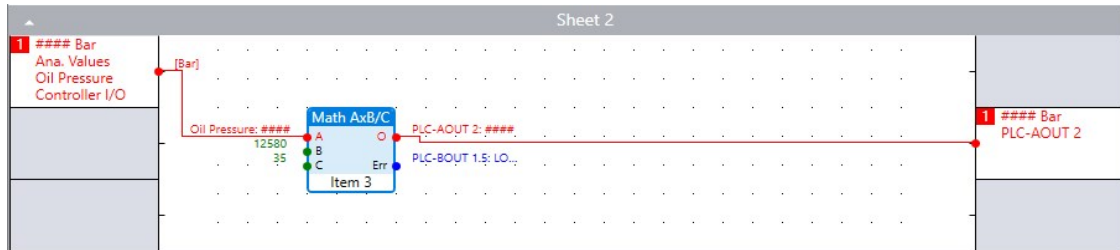


Image 5.141 PLC Monitor sheet with invalid value

**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.

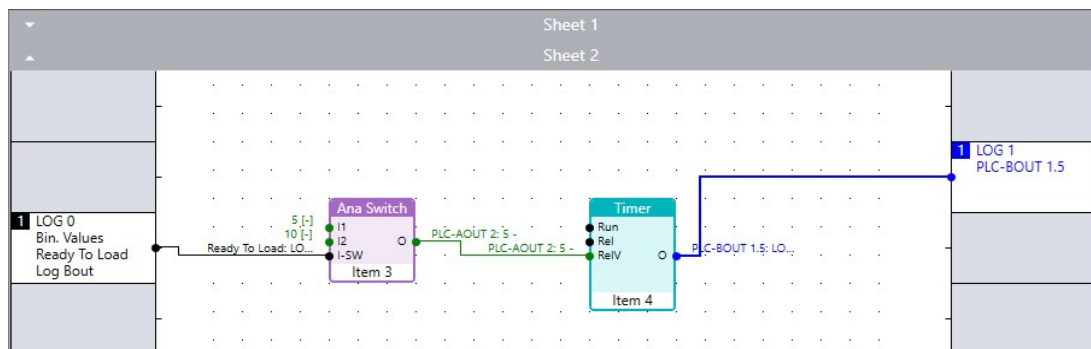


Image 5.142 PLC Monitor with multiple sheets

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## 6.5 Other functions

### 6.5.1 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
- for the consistency of the dimensions (setting attribute Dimension) and the number of decimal place (setting attribute Resolution) at both ends of the interconnection wire



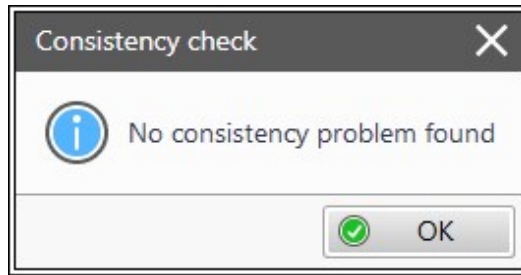


Image 5.143 Consistency Check valid output

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.

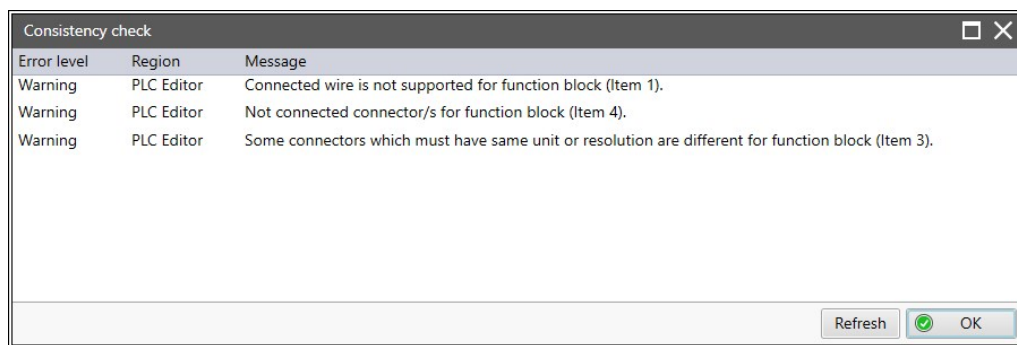


Image 5.144 Consistency Check report output

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 checks whole configuration so it can report findings outside the PLC configuration.



## 6.5.2 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 or Redo button)!

## 6.5.3 Hints

Use this function to enable or disable quick hints for blocks (controller help is not affected by this function).

**Note:** Each PLC block has help which is opened by selecting the block and pressing "F1".



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## 7.1 PC

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### 7.1.1 Direct communication

Computer can be connected to IntelliNeo 530 BESS via USB, RS485 or ethernet interface.

#### Connection via USB

USB A to B cable can be used for communication via USB ports. The IntelliNeo 530 BESS 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.

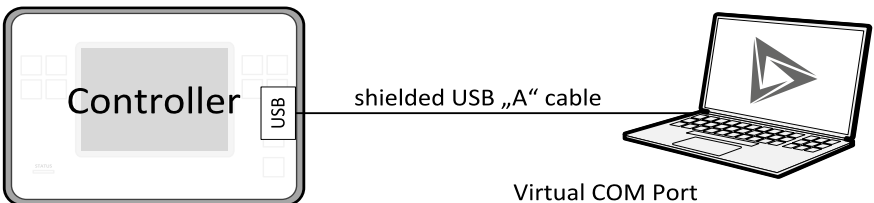


Image 6.1 Shielded USB type A cable is used

#### 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.

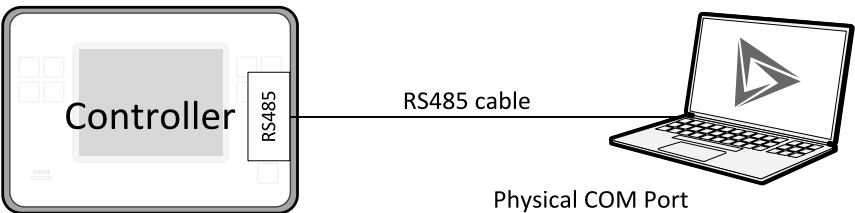


Image 6.2 Built-in RS485 is used



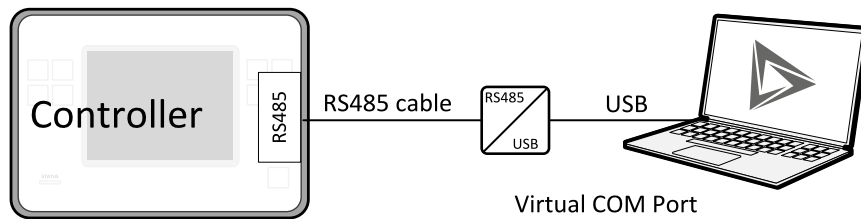


Image 6.3 RS485 and USB is used

## 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 by IntelConfig PC tool. For the direct connection it is recommended to use **User Management And Data Access Control** 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.

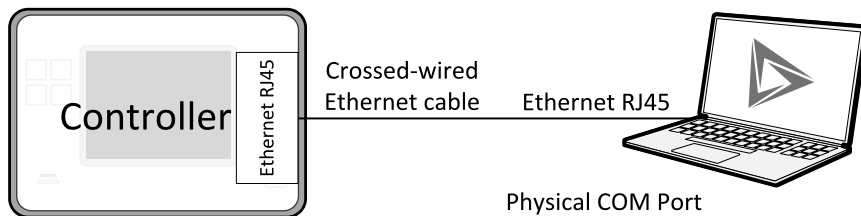


Image 6.4 Ethernet cable is used

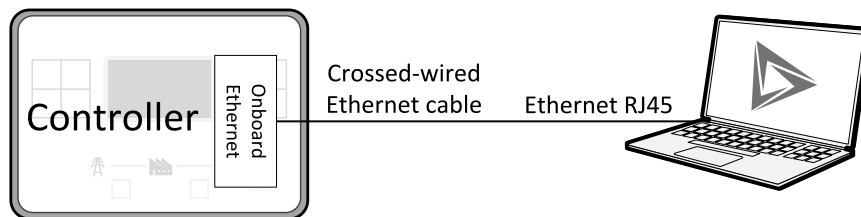


Image 6.5 Onboard Ethernet cable is used

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## 7.1.2 Remote communication

The IntelNeo 530 BESS can be connected also remotely via built-in ethernet ports. For remote connection the **User Management And Data Access Control** interface which is in default configured to port **Ethernet** 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 **User Management And Data Access Control** 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.



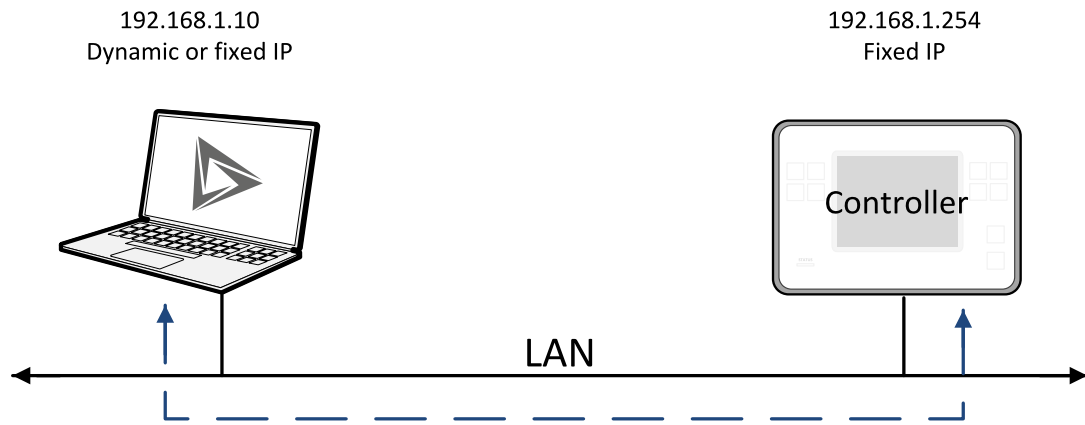


Image 6.6 Ethernet LAN connection

## Setting-up static IP address

This settings is related to , **Group: Ethernet** .

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.

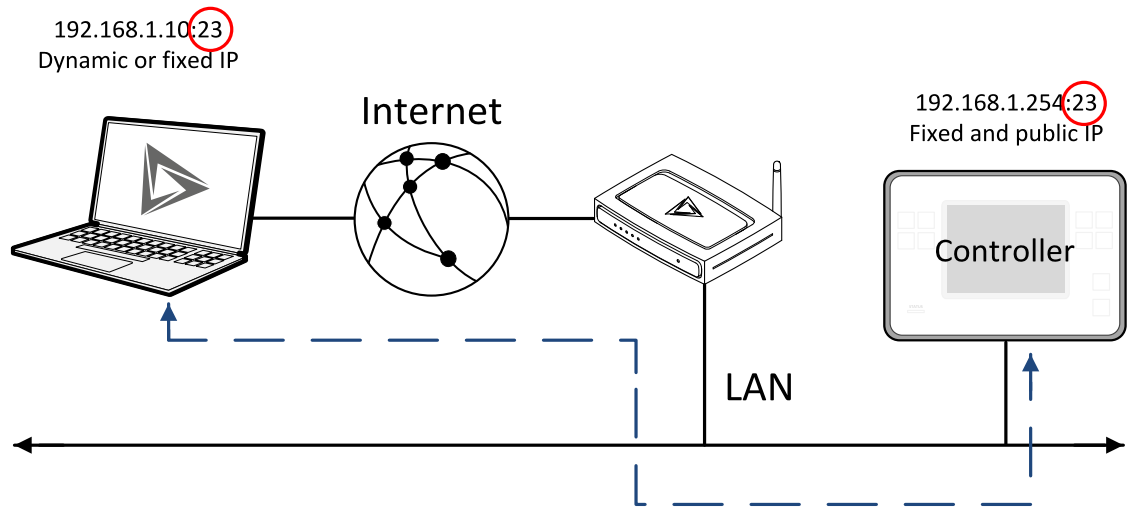


Image 6.7 Ethernet WAN connection

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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7.2 Connection to 3rd party systems

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7.2.1 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 IntelliConfig
- 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 IntelliLite 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 IntelliConfig 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: Ethernet** 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.

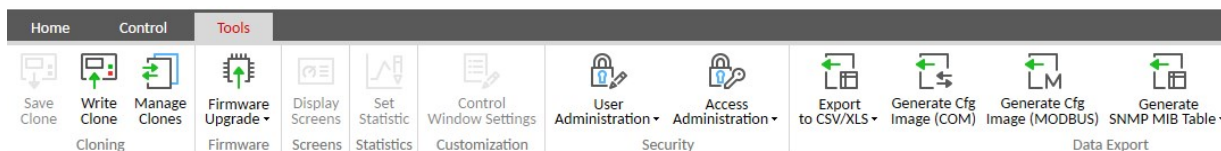
## Operational events

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

## 7.2.2 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 . 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 / 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 *Communication peripherals*.

**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.

**IMPORTANT:** The IntelliNeo 530 BESS is using same MAC address for all Ethernet ports so it is not possible to use more than one Ethernet port in the same network. If you connect for example Ethernet 1 and 2 to the same network the communication will breakdown.

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

**Note:** IntelliVision 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 IntelliConfig. 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.

**Note:** The amount of configurable analog inputs that can be read via communication from the 3rd party system is limited in total to 400. Please be aware that if all 400 configurable analog inputs are used only for one 3rd party system than none will be left for other important functions of other systems.

## 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 mapping
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



Data type	Meaning	Number of registers	Data mapping
			MSB2 = value, byte 1 LSB2 = value, byte 0 (LSB)
Unsigned32	4-byte unsigned integer	2	MSB1 = value, byte 3 (MSB) 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



Data type	Meaning	Number of registers	Data mapping
			MSB2 = Alarm level *) LSB2 = Alarm status **) MSB3 = alarm string ***) 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 successfully.

The controller responds with the error codes in as follows:

- 01 – Illegal 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 erroneous 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



Register addresses	Number of registers	Access	Data type	Meaning
4010	1	-	-	Not implemented
4211	1	write	Unsigned16	Password
4212 - 4213	2	read	Unsigned32	Communication status
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: Supplements 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	<b>RemoteControl2B 1</b>
5001	1	read/write	Int16	<b>RemoteControl2B 2</b>
5002	1	read/write	Int16	<b>RemoteControl2B 3</b>
5003	1	read/write	Int16	<b>RemoteControl2B 4</b>
5004	1	read/write	Int16	<b>RemoteControl2B 5</b>
5005	1	read/write	Int16	<b>RemoteControl2B 6</b>
5006	1	read/write	Int16	<b>RemoteControl2B 7</b>
5007	1	read/write	Int16	<b>RemoteControl2B 8</b>
5100 - 5101	2	read/write	Int32	<b>RemoteControl4B 1</b>



Register addresses	Number of registers	Access	Data type	Meaning
5102 - 5103	2	read/write	Int32	<b>RemoteControl4B 2</b>
5104 - 5105	2	read/write	Int32	<b>RemoteControl4B 3</b>
5106 - 5107	2	read/write	Int32	<b>RemoteControl4B 4</b>
5200	1	read/write	Binary16	<b>RemoteControlBin</b>

## 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 IntelliConfig (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 IntelliConfig

Table: Values									
Allowed MODBUS functions: 03, 04									
Register (s)	Com.Obj.	Name	Dimension	Type	Len	Dec	Min	Max	Group
<b>01036</b>	8213	<b>BatteryVoltage</b>	<b>V</b>	Integer	2	<b>1</b>	0	400	Controller I/O

Request: (Numbers in Hex)							
01	03	04	1D	00	01	15	3C
Controller address	Modbus function	Register address 041D <sub>hex</sub> <b>1053<sub>dec</sub></b>		Number of registers		CRC	

Response: (Numbers in Hex)						
01	03	02	00	F0	B8	00
Controller address	Modbus function	Length of data 02 <sub>hex</sub> 2 bytes read	Data 00F0 <sub>hex</sub> <b>240<sub>dec</sub></b>		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 IntelliConfig

Table: Values									
Allowed MODBUS functions: 03, 04									
Register (s)	Com.Obj.	Name	Dimension	Type	Len	Dec	Min	Max	Group
<b>01228</b>	9018	<b>Nominal Power</b>	<b>kW</b>	Integer	2	<b>0</b>	0	32767	Basic Settings

Request: (Numbers in Hex)							
01	03	04	CC	00	01	45	05
Controller address	Modbus function	Register address 04CC <sub>hex</sub> 1228 <sub>dec</sub>		Number of registers		CRC	

Response: (Numbers in Hex)							
01	03	02	00	C8	B9	D2	
Controller address	Modbus function	Length of data 02 <sub>hex</sub> 2 bytes read	Data 00C8 <sub>hex</sub> 200 <sub>dec</sub>		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
<b>01068</b>	8235	<b>Binary Inputs</b>		Binary#2	2	<b>0</b>	-	-	Controller I/O

Request: (Numbers in Hex)							
01	03	04	2C	00	01	44	F3
Controller address	Modbus function	Register address 042C <sub>hex</sub> 1068 <sub>dec</sub>		Number of registers		CRC	

Response: (Numbers in Hex)						
01	03	02	00	12	38	49
Controller address	Modbus function	Length of data 02 <sub>hex</sub> 2 bytes read	Data 0012 <sub>hex</sub> <b>00010010</b> <sub>bin</sub>		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 <sub>hex</sub> 0001 <sub>dec</sub>		Number of registers		CRC	

Response: (Numbers in Hex)					
01	01	01	01	90	48
Controller address	Modbus function	Length of data 01 <sub>hex</sub> 1 byte read		Data 01 <sub>hex</sub> 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 <b>Reserved registers</b>				
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 <b>List of commands and arguments</b>			
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 $10_{\text{hex}} = 16_{\text{dec}}$	Register address $106F_{\text{hex}} = 4207_{\text{dec}}$	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
<b>03008</b>	8276	<b>Nominal Power</b>	<b>kW</b>	Unsigned	2	<b>0</b>	1	5000	Basic Settings

Request: (Numbers in Hex)							
01	06	0B	C0	00	64	8A	39
Controller address	Modbus function	Register address 0BC0 <sub>hex</sub> = <b>3008</b> <sub>dec</sub>		Data 0064 <sub>hex</sub> = <b>100</b> <sub>dec</sub>		CRC	

Response: (Numbers in Hex)							
01	06	0B	C0	00	00	8B	D2
Controller address	Modbus function	Register address 0BC0 <sub>hex</sub> = <b>3008</b> <sub>dec</sub>		Allways zero		CRC	

Written 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.lammertbries.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<sub>hex</sub>

🔍 back to Connection to 3rd party systems



# 8 Technical data



## Power supply

Power supply range	8-36 V DC
Power consumption (without modules)	6 W
RTC battery	Replaceable, 3V
Fusing power	5 A / 6 × 0.5 A BOUT
Fusing ESTOP	2 A
Max. Heat Dissipation	10 W

## Operating conditions

Protection degree	IP65
Operating temperature	-30 °C to +70 °C (-40 °C to +70 °C)*
Storage temperature	-30 °C to +80 °C
Operating humidity	95 % non-condensing (EN 60068-2-30)
Vibration	5-25 Hz, ± 1.6 mm 25-100 Hz, a = 4 g
Shocks	a = 500 m/s <sup>2</sup>
Surrounding air temperature rating 70 °C.	
Suitable for pollution degree 2.	

## Voltage measurement

Measurement inputs	3ph-n BESS voltage , 3ph-n BUS
Measurement range	277 V AC / 480 V AC (EU)
	346 V AC / 600 V AC (US/Canada)
Linear measurement and protection range (maximal voltage)	350 V AC Ph-N / 660 V AC Ph-Ph
Accuracy	1 %
Frequency range	30-70 Hz (accuracy 0.01 Hz, resolution 0.001 Hz)
Input impedance	0.72 MΩ ph-ph , 0.36 MΩ ph-n

## AOut1/VRO

Isolation	Isolated
Type	max ±10 V DC

## Aout2/SRO

Isolation	Non-isolated
Type	±10 V DC PWM selectable by jumper

## Display

Type	Build-in colour TFT 5"
Resolution	800 × 480 px

## Communications

USB device	Non-isolated, USB type B
USB host	Non-isolated, USB type A
RS 485	Isolated
Ethernet	10/100 Mbit
CAN 1A	Isolated, 250/50 kbps
CAN 2A	Terminator impedance 120Ω
Protocols	Modbus RTU/TCP SunSpec
	SNMP v1/v2c/v3 , J1939



## Current measurement

Measurement inputs	3ph BESS current 1ph Mains current
Measurement range	5 A
Max. allowed current	10 A
Accuracy	$\pm 20$ mA for 0-2 A; 1 % of value for 2-5 A
Input impedance	0.68 M $\Omega$ ph-ph , 0.34 M $\Omega$ ph-n

## E-Stop

Dedicated terminal for safe Emergency Stop input.
Physical supply for binary outputs 1 & 2.

## Binary inputs

Number	8, non-isolated
Close/Open indication	0-2 V DC close contact 6-36 V DC open contact

## Binary outputs

Number	8, non-isolated
Max. current	BO 1-8 = 0.5 A
Switching to	Positive supply terminal

## Analog inputs

Number	4, switchable (R/U/I)
Range	R = 0-2500 $\Omega$ ; U = 0-10 V; I = 0-20 mA
Accuracy	R: $\pm 2$ % from value $\pm 5$ $\Omega$ in range 0-250 $\Omega$ R: $\pm 4$ % from value in range 250 $\Omega$ -2500 $\Omega$ U: 1 % from value $\pm 100$ mV I: 1 % from value $\pm 0.2$ mA

## +5 V Power supply output

Max. current	100 mA
--------------	--------

**Note:** \* If the device is powered on above -30 °C



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## 9.1 Controller objects

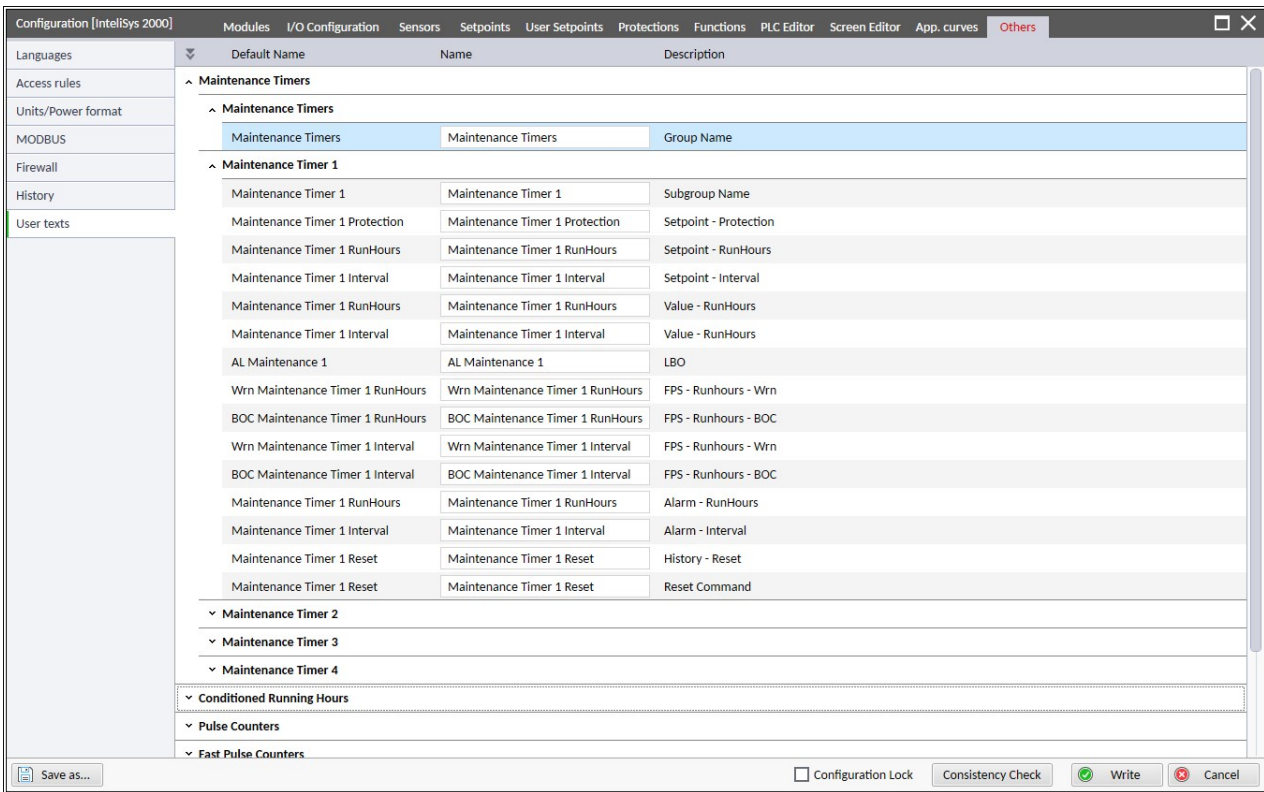
### 9.1.1 List of controller objects types

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## 9.1.2 Renameable controller objects

It is possible to rename some controller objects in IntelliConfig 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.



## 9.1.3 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

Group: Process Control .....	359
Group: Basic settings .....	365
Group: Communication Settings .....	390
Group: Ethernet .....	396
Group: BESS settings .....	418



Group: BESS Protections .....	445
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Group: Frequency/Load Control .....	506
Group: Voltage/PF Control .....	518
Group: Synchronization .....	525
Group: Power Management .....	534
Group: Grid Codes .....	558
Group: Load Shedding .....	561
Group: User Buttons .....	571
Group: Analog Switches .....	579
Group: Scheduler .....	589
Group: Maintenance Timers .....	605
Group: Geo-Fencing .....	611
Group: Plug-In Modules .....	615
Group: CM-RS232-485 .....	616
Group: CM-4G-GPS .....	620
Group: CM-Ethernet .....	641
Group: EM-BIO8-EFCP .....	663



## List of setpoints

Group: Process Control .....	359	Mains/Bus Nominal Voltage Ph-N .....	374
Subgroup: Load Control .....	359	Bus Nominal Voltage Ph-Ph .....	375
Load Request Source .....	359	BESS VT Ratio .....	375
#System Load Control PTM .....	360	BESS Voltage Input Range Select .....	375
#System Baseload .....	361	Mains/Bus VT Ratio .....	376
Subgroup: PF/Q Control .....	362	Mains/Bus Voltage Input Range .....	376
PF/Q Request Source .....	362	Bus Dead Level .....	377
#System PF Control PTM .....	363	Subgroup: Phase Rotation .....	377
#System Power Factor .....	364	Phase Rotation .....	377
#System Base Q .....	364	Subgroup: Frequency settings .....	378
Subgroup: Bus Meas Error Protection .....	365	Nominal Frequency .....	378
Bus Meas Error Delay .....	365	Subgroup: Controller settings .....	378
Group: Basic settings .....	365	Controller Mode .....	378
Subgroup: Name .....	365	Power On Mode .....	379
Controller Name .....	365	Fault Reset To Manual .....	379
Subgroup: Power settings .....	366	Horn Timeout .....	380
Samax .....	366	Fail Safe Binary State .....	380
BESS Nominal power .....	366	Run Hours Source .....	381
PCS Efficiency .....	367	SW Key .....	381
Subgroup: AC Measurement .....	367	User Logging Record .....	382
AC BESS P/Q/A Measurement .....	367	Force Value Logging .....	382
Bus AC Measurement .....	368	System Use Notification Text .....	382
AC Meas Sensing Fail To .....	368	Subgroup: Power Supply Protection .....	383
Subgroup: Current settings .....	369	Power Supply <V .....	383
ES Nominal Current .....	369	Power Supply >V .....	383
BESS Nominal Current .....	369	Power Supply <> Delay .....	383
BESS CT Ratio Prim .....	370	Subgroup: Shared Setpoints .....	384
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## Group: Process Control

### Subgroup: Load Control

#### Load Request Source

Setpoint group	Process Control	Related FW	2.1.0
Range [units]	Setpoint / Analog External Value [-]		
Default value	Setpoint	Force value	YES
Step	[-]		
Comm object	20727	Related applications	MINT
Config level	Standard		
Setpoint visibility	Always		
Description			
This setpoint adjusts source type of requested load control.			
➤ Active Application = 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	2.1.0
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	Always		

### 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 <b>#System Baseload</b> . 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 <b>#System Baseload</b> 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 <b>#System Baseload</b> ) 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	<p>This mode must be used to ensure the full compatibility of IntelliNeo and the other controllers like IntelliGen 1000 and Inteli Mains 1010.</p> <p>This mode is introduced in the system starting version 2.0.0 for IntelliNeo and 3.3.0 for IntelliGen 1000 and InteliMains 1010.</p> <p>Refer the chapter <b>Active Power Control in On-grid application</b>.</p>

**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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## #System Baseload

Setpoint group	Process Control	Related FW	2.1.0
Range [units]	0 .. 32 000 [kW] (depends on the selected <b>Power Formats And Units</b> )		
Default value	1 000 kW (depends on the selected <b>Power Formats And Units</b> )	Force value	NO
Step	1 kW (depends on the selected <b>Power Formats And Units</b> )		
Comm object	8775	Related applications	MINT
Config level	Standard		
Setpoint visibility	Always		
<b>Description</b>			
Required total active power of the controller group in parallel to Mains operation in Baseload mode.			
<b>Import/Export Limitation:</b>			
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 <b>Disabled</b> :			
➤➤ The system does not limit the baseload request, so the Mains Import is not restricted.			
➤ If Import/Export Limitation is set to <b>Enabled</b> :			
➤➤ The system limits the baseload request to keep the Mains Import within the range defined by <b>Mains Import Min</b> and <b>Mains Import Max</b> , it will be clamped to stay within this range. This ensures that the grid power remains within safe and predefined boundaries.			
<b>Note:</b> The <b>Import/Export Limitation</b> only works if the <b>Baseload Control</b> is done by the <b>InteliMains</b> . The Setpoint <b>#System Load Control PTM</b> must be set as <b>IM-LoadSharing</b> or <b>IM_Request</b> .			
<b>Note:</b> The <b># setpoints</b> with <b>#</b> at the beginning are shared with all ComAp controllers on site via Intercontroller communication line.			

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## Subgroup: PF/Q Control

### PF/Q Request Source

Setpoint group	Process Control	Related FW	2.1.0
Range [units]	Setpoint / Analog External Value [-]		
Default value	Setpoint	Force value	YES
Step	[-]		
Comm object	16130	Related applications	MINT
Config level	Standard		
Setpoint visibility	Always		
Description			
This setpoint adjust the source type requested of PF/Q control.			
➤ Active Application = 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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## #System PF Control PTM

Setpoint group	Process Control	Related FW	2.1.0
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	Always		
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 <b>#System Power Factor</b> .		
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 <b>#System Base Q</b> .		
IM Request	This mode must be used to ensure the full compatibility of IntelliNeo and the other controllers like IntelliGen 1000 and Inteli Mains 1010.		
	This mode is introduced in the system starting version 2.0.0 for IntelliNeo and 3.3.0 for IntelliGen 1000 and InteliMains 1010.  Refer the chapter <b>Reactive Power Control in On-grid application</b> .		

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## #System Power Factor

Setpoint group	Process Control	Related FW	2.1.0
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	Always		

**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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## #System Base Q

Setpoint group	Process Control	Related FW	2.1.0
Range [units]	-32 000 .. 32 000 [kVAr] (depends on the selected <b>Power Formats And Units</b> )		
Default value	0 kVAr (depends on the selected <b>Power Formats And Units</b> )	Force value	NO
Step	1 kVAr (depends on the selected <b>Power Formats And Units</b> )		
Comm object	16407	Related applications	MINT
Config level	Standard		
Setpoint visibility	Always		
<b>Description</b>			
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 <b>#System PF Control PTM</b> = Base Q			
<b>Note:</b> The # setpoints are shared with all ComAp controllers on site via intercontroller communication line.			

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## Subgroup: Bus Meas Error Protection

### Bus Meas Error Delay

Setpoint group	Process Control	Related FW	2.1.0
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 <b>Bus Meas Error</b> protection.			

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## Group: Basic settings

### Subgroup: Name

#### Controller Name

Setpoint group	Basic settings	Related FW	2.1.0
Range [units]	0 .. 15 characters [-]		
Default value	InteliNeo 530 BESS	Force value	NO
Step	[-]		
Comm object	8637	Related applications	MINT
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	2.1.0
Range [units]	OFF; 0 .. 32000 [kVA] (depends on the selected <b>Power Formats And Units</b> )		
Default value	200 kVA (depends on the selected <b>Power Formats And Units</b> )	Force value	YES
Step	1 kVA (depends on the selected <b>Power Formats And Units</b> )		
Comm object	13208	Related applications	MINT
Config level	Standard		
Setpoint visibility	Always		
Description			
Maximal apparent power of the BESS.			

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### BESS Nominal power

Setpoint group	Basic settings	Related FW	2.1.0
Range [units]	1 .. 32 000 [kW] (depends on the selected <b>Power Formats And Units</b> )		
Default value	200 kW (depends on the selected <b>Power Formats And Units</b> )	Force value	YES
Step	1 kW (depends on the selected <b>Power Formats And Units</b> )		
Comm object	8276	Related applications	MINT
Config level	Standard		
Setpoint visibility	Always		
Description			
Nominal power of the BESS.			
BESS protections/functions such as <b>BESS IDMT Overload Protection</b> and <b>BESS 2POverload Evaluation Level</b> , etc are related to this setpoint.			

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## PCS Efficiency

Setpoint group	Basic settings	Related FW	2.1.0
Range [units]	80,0 .. 100,0 %		
Default value	98 %	Force value	YES
Step	0,1 %		
Comm object	19051	Related applications	MINT
Config level	Standard		
Setpoint visibility	Always		
Description			
Efficiency of the Power Conversion System defines ratio between input and output of the PCS. The controller regulates charging and discharging power based on measurement on the AC bus side. This setpoints is used to prevent overloading of the Energy Storage during discharging and limiting the charging process during charging.			

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## Subgroup: AC Measurement

### AC BESS P/Q/A Measurement

Setpoint group	Basic settings	Related FW	2.1.0
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
Config level	Standard		
Setpoint visibility	Always		
Description			
This setpoint is related to the function of <b>BESS AC values measurement over modbus</b> .More information can be read in <b>BESS AC values measured over LAIs</b>			
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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## Bus AC Measurement

Setpoint group	Basic settings	Related FW	2.1.0
Range [units]	Onboard CU Measurement / Voltage Analog Input / No Voltage Sensing[-]		
Default value	Onboard CU Measurement	Force value	YES
Step	[-]		
Comm object	17719	Related applications	MINT
Config level	Advanced		
Setpoint visibility	Always		
Description			
This setpoint determines what type of BUS AC measurement will be used. More information can be read in <b>BUS AC values measured over LAIs</b>			
Onboard CU Measurement		BUS AC Voltage will be measured directly via the controller unit terminals. See <b>Terminal Diagram</b> .	
Voltage Analog Input		BUS AC Voltage will be read over Modbus and connected to LAIs, see <b>AC BUS VOLTAGE L1</b> .	
No Voltage Sensing		BUS AC Voltage sensing will be ignored.	
<b>IMPORTANT: BUS AC Measurement selection has a direct impact on synchronization and protection functions, see BUS AC values measured over LAIs.</b>			

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## AC Meas Sensing Fail To

Setpoint group	Basic settings	Related FW	2.1.0
Range [units]	OFF; 0.0 .. 600.0 [s]		
Default value	5	Force value	YES
Step	0.1		
Comm object	17753	Related applications	MINT
Config level	Advanced		
Setpoint visibility	Always		
Description			
This setpoint determines the length of time that BUS AC values (read over Modbus to LAIs) can be lost before a ‘Sd AC Meas Sensing Fail’ alarm will be triggered.			

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## Subgroup: Current settings

### ES Nominal Current

Setpoint group	Basic settings	Related FW	2.1.0
Range [units]	1 .. 10000 [A]		
Default value	350 A	Force value	YES
Step	1 [A]		
Comm object	19615	Related applications	MINT
Config level	Standard		
Setpoint visibility	Always		
Description			
Current limit for PCS/ES IDMT current protection and maximal continuous current.			

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### BESS Nominal Current

Setpoint group	Basic settings	Related FW	2.1.0
Range [units]	1 .. 10000 [A]		
Default value	350A	Force value	YES
Step	1 A		
Comm object	8275	Related applications	MINT
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	2.1.0
Range [units]	1 .. 15000 [A]		
Default value	500A	Force value	NO
Step	1 A		
Comm object	8274	Related applications	MINT
Config level	Standard		
Setpoint visibility	Always		
Description			
This setpoint defines the primary range of the current transformer used for the BESS current measurement.			
<b>Note:</b> The setpoint is applied on all three phases of the BESS current.			
<b>Note:</b> The CT is usually described by this definition: <b>CT Ratio Prim / CT Ratio Sec</b> : Example: 100/5, 500/5, 1000/1			

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## BESS CT Ratio Sec

Setpoint group	Basic settings	Related FW	2.1.0
Range [units]	/5A or /1A [-]		
Default value	/5A	Force value	NO
Step	[-]		
Comm object	10556	Related applications	MINT
Config level	Standard		
Setpoint visibility	Always		
Description			
This setpoint defines the secondary range of the current transformer used for the BESS current measurement.			
<b>Note:</b> <i>This setpoint is applied on all three phases of the BESS current.</i>			
<b>Note:</b> <i>The CT is usually described by this definition: <b>CT Ratio Prim / CT Ratio Sec</b>: Example: 100/5, 500/5, 1000/1</i>			

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## Aux CT Ratio Prim

Setpoint group	Basic settings	Related FW	2.1.0
Range [units]	1 .. 15000 [A]		
Default value	300 A	Force value	YES
Step	1 A		
Comm object	8566	Related applications	MINT
Config level	Standard		
Setpoint visibility	Always		
Description			
This setpoint defines the primary range of the current transformer used for the AUX current measurement			
<b>Note:</b> The CT is usually described by this definition: <b>CT Ratio Prim / CT Ratio Sec:</b> Example: 100/5, 500/5, 1000/1			

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## Aux CT Ratio Sec

Setpoint group	Basic settings	Related FW	2.1.0
Range [units]	/1A or /5A [-]		
Default value	/5A	Force value	YES
Step	[-]		
Comm object	10557	Related applications	MINT
Config level	Standard		
Setpoint visibility	Always		
Description			
This setpoint defines the secondary range of the current transformer used for the AUX current measurement.			
<b>Note:</b> The CT is usually described by this definition: <b>CT Ratio Prim / CT Ratio Sec:</b> Example: 100/5, 500/5, 1000/1			

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## 3Ph CT Location

Setpoint group	Basic settings	Related FW	2.1.0
Range [units]	BESS/Mains		
Default value	BESS	Force value	YES
Step	[-]		
Comm object	11625	Related applications	
Config level	Advanced		
Setpoint visibility	Always		



### Description

This setpoint is used to switch measurement of 3 phase current between BESS/Mains.

**Note:** The controller has to be power cycled after changing this setpoint.

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## Subgroup: Voltage settings

### ES Nominal Voltage

Setpoint group	Basic settings	Related FW	2.1.0
Range [units]	1 .. 1500 [V]		
Default value	1000 [V]	Force value	YES
Step	1 [V]		
Comm object	19632	Related applications	MINT
Config level	Standard		
Setpoint visibility	Always		
Description			
The setting of this setpoint provides information to the controller on what is the nominal voltage of the Energy storage and the DC bus.Dependent on the setting of this setpoint certain dc energy storage voltage protections and functions (such as DC String Coupling, ES Voltage Rel, ...) are evaluated and influenced.			

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## Connection type

Setpoint group	Basic settings	Related FW	2.1.0						
Range [units]	3ph4Wire / High Leg D / 3ph3Wire / SplitPhase / MonoPhase [-]								
Default value	3Ph4Wire [-]	Force value	NO						
Step	[-]								
Comm object	11628	Related applications	MINT						
Config level	Standard								
Setpoint visibility	Always								
Description									
This setpoint defines connection type of the installation.									
<table><tr><td>3Ph4Wire</td><td>Grounded Star (Grounded Wye) connection – 3PY Three phase voltage measurement L1,L2,L3 with 120° phase shift 3x CT (Current Transformer)</td></tr><tr><td>High Leg D</td><td>High Leg Delta connection Three phase voltage measurement L1,L2,L3 3x CT (Current Transformer)</td></tr><tr><td>3Ph3Wire</td><td>Ungrounded Delta connection Open Delta</td></tr></table>				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
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

<b>Setpoint group</b>	Basic settings	<b>Related FW</b>	2.1.0
<b>Range [units]</b>	Both / Phase-Phase / Phase-Neutral [-]		
<b>Default value</b>	Both [-]	<b>Force value</b>	NO
<b>Step</b>	[-]		
<b>Comm object</b>	10647	<b>Related applications</b>	MINT
<b>Config level</b>	Standard		
<b>Setpoint visibility</b>	Only in case Setpoint <b>Connection type</b> 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	2.1.0
Range [units]	10 .. 34641 [V]		
Default value	231 V	Force value	YES
Step	1 V		
Comm object	8277	Related applications	MINT
Config level	Standard		
Setpoint visibility	Only ifConnection 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	2.1.0
Range [units]	10 .. 60000 [V]		
Default value	400 V	Force value	YES
Step	1 V		
Comm object	11657	Related applications	MINT
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	2.1.0
Range [units]	10 .. 34641 [V]		
Default value	231 V	Force value	YES
Step	1 V		
Comm object	9888	Related applications	MINT
Config level	Standard		
Setpoint visibility	Only ifConnection type != High Leg D or Connection type != MonoPhase		
Description			
Nominal Mains/Bus voltage (phase to neutral).			

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## Bus Nominal Voltage Ph-Ph

Setpoint group	Basic settings	Related FW	2.1.0
Range [units]	10 .. 60000 [V]		
Default value	400 V	Force value	YES
Step	1 V		
Comm object	9907	Related applications	MINT
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	2.1.0
Range [units]	0.001 .. 500.00 [V/V]		
Default value	1.00 V/V	Force value	YES
Step	0.001 V/V		
Comm object	9579	Related applications	MINT
Config level	Advanced		
Setpoint visibility	Always		
Description			
This setpoint adjusts the converting ratio of the voltage meas transformer used on			
<b>Note:</b> <i>This setpoint is applied on all three phases of BESS voltage.</i>			
<b>Example:</b>			
➤ No VT is in use - voltage conversion is 1/1 BESS VT Ratio = 1.00			
➤ VT 22kV/100V - voltage conversion is 22000/100 BESS VT Ratio = 220.00			
➤ VT 3.3kV/110V - voltage conversion is 3300/110 BESS VT Ratio = 30.00			

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## BESS Voltage Input Range Select

Setpoint group	Basic settings	Related FW	2.1.0
Range [units]	200V / 400V / 600V [-]		
Default value	400 V	Force value	YES
Step	[-]		
Comm object	10662	Related applications	MINT
Config level	Standard		



<b>Setpoint visibility</b>	Always
<b>Description</b>	
This setpoint adjusts the range of Ph-Ph <b>AC Voltage measurement settings</b> on the .	
<b>Note:</b> 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.	
<b>Note:</b> If MonoPhase wiring is used the ranges are approximately corresponding to 116 V, 231 V, and 346 V Ph-N.	
<b>IMPORTANT:</b> 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	2.1.0
Range [units]	0.01 .. 500.00 [V/V]		
Default value	1.00 V/V	Force value	YES
Step	0.01 V/V		
Comm object	9580	Related applications	MINT
Config level	Advanced		
Setpoint visibility	Always		
Description			
This setpoint adjusts the converting ratio of the voltage meas transformer used on ② MAINS/BUS VOLTAGE			
<b>Note:</b> This setpoint is applied on all three phases of Mains/Bus voltage.			
<b>Example:</b>			
<div>➤ No VT is in use - voltage conversion is 1/1 Bus VT Ratio = 1.00</div>			
<div>➤ VT 22kV/100V - voltage conversion is 22000/100 Bus VT Ratio = 220.00</div>			
<div>➤ VT 3.3kV/110V - voltage conversion is 3300/110 Bus VT Ratio = 30.00</div>			

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## Mains/Bus Voltage Input Range

<b>Setpoint group</b>	Basic settings	<b>Related FW</b>	2.1.0
<b>Range [units]</b>	200V / 400V / 600V [-]		
<b>Default value</b>	400 V	<b>Force value</b>	YES
<b>Step</b>	[-]		
<b>Comm object</b>	10663	<b>Related applications</b>	MINT
<b>Config level</b>	Advanced		



<b>Setpoint visibility</b>	Always
<b>Description</b>	
This setpoint adjusts the range of Ph-Ph <b>AC Voltage measurement settings</b> on the <b>② MAINS/BUS VOLTAGE</b> .	
<p><b>Note:</b> 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.</p>	
<p><b>Note:</b> If MonoPhase wiring is used the ranges are approximately corresponding to 116 V, 231 V, and 346 V Ph-N.</p>	
<p><b>IMPORTANT:</b> The range has to be set to fit the expected range of the AC voltage.</p>	

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## Bus Dead Level

Setpoint group	Basic settings	Related FW	2.1.0
Range [units]	0.0 .. 13.0 [%]		
Default value	6.5 %	Force value	NO
Step	0.1 %		
Comm object	14473	Related applications	MINT
Config level	Advanced		
Setpoint visibility	Always		
Description			
This setpoint defines the percentage voltage level below which is Bus considered as dead. Evaluation is taken from setpoint Bus Nominal Voltage Ph-N or Bus Nominal Voltage Ph-Ph. Having the Bus/BESS voltage below the setting of the setpoint the LBO Deadbus will activate			

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## Subgroup: Phase Rotation

### Phase Rotation

Setpoint group	Basic settings	Related FW	2.1.0
Range [units]	Clockwise / Counterclockwise [-]		
Default value	Clockwise	Force value	YES
Step	[-]		
Comm object	15122	Related applications	MINT
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	2.1.0
Range [units]	45.00 .. 125.00 [Hz]		
Default value	50,00 Hz	Force value	YES
Step	0.01 Hz		
Comm object	8278	Related applications	MINT
Config level	Standard		
Setpoint visibility	Always		
Description			
Nominal frequency of system (usually 50 or 60 Hz).			
<b>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.</b>			

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## Subgroup: Controller settings

### Controller Mode

Setpoint group	Basic settings	Related FW	2.1.0
Range [units]	OFF / MAN / AUTO [-]		
Default value	OFF	Force value	NO
Step	[-]		
Comm object	8315	Related applications	MINT
Config level	Advanced		
Setpoint visibility	Always		
Description			
This setpoint can be used for changing the controller's mode remotely, e.g. via Modbus.			
Intelliconfig: 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	2.1.0				
Range [units]	Previous / OFF [-]						
Default value	Previous	Force value	NO				
Step	[-]						
Comm object	13000	Related applications	MINT				
Config level	Advanced						
Setpoint visibility	Always						
Description							
This setpoint adjusts controller mode after power on of controller.							
<table><tr><td>Previous</td><td>Controller is switched into the last mode before power off.</td></tr><tr><td>OFF</td><td>Controller is switched into OFF mode.</td></tr></table>				Previous	Controller is switched into the last mode before power off.	OFF	Controller is switched into OFF mode.
Previous	Controller is switched into the last mode before power off.						
OFF	Controller is switched into OFF mode.						
<b>Note:</b> 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	2.1.0
Range [units]	Disabled / Enabled [-]		
Default value	Disabled	Force value	YES
Step	[-]		
Comm object	9983	Related applications	MINT
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.			
<div>Example:</div> Controller is in AUTO mode, there is red inactive unconfirmed alarm, and fault reset button is pressed. The BESS will start automatically if LBI <b>REMOTE START/STOP</b> is active.			

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## Horn Timeout

<b>Setpoint group</b>	Basic settings	<b>Related FW</b>	2.1.0						
<b>Range [units]</b>	Disabled = 0; 1 .. 600; Horn Reset [s]								
<b>Default value</b>	10 s	<b>Force value</b>	NO						
<b>Step</b>	1 s								
<b>Comm object</b>	8264	<b>Related applications</b>	MINT						
<b>Config level</b>	Advanced								
<b>Setpoint visibility</b>	Always								
<b>Description</b>									
This setpoint affects horn's behavior.									
<table><tr><td>Disabled</td><td>Horn sound is disabled e.g. LBO <b>HORN</b> is never activated</td></tr><tr><td>1 .. 600 [s]</td><td>Timeout for LBO <b>HORN</b>. Output opens after this time elapses</td></tr><tr><td>Horn Reset</td><td>LBO <b>HORN</b> is active until button Horn Reset is pressed.</td></tr></table>				Disabled	Horn sound is disabled e.g. LBO <b>HORN</b> is never activated	1 .. 600 [s]	Timeout for LBO <b>HORN</b> . Output opens after this time elapses	Horn Reset	LBO <b>HORN</b> is active until button Horn Reset is pressed.
Disabled	Horn sound is disabled e.g. LBO <b>HORN</b> is never activated								
1 .. 600 [s]	Timeout for LBO <b>HORN</b> . Output opens after this time elapses								
Horn Reset	LBO <b>HORN</b> is active until button Horn Reset is pressed.								
<b>Note:</b> 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

<b>Setpoint group</b>	Basic settings	<b>Related FW</b>	2.1.0
<b>Range [units]</b>	Log0 / Log1 / Last Valid State [-]		
<b>Default value</b>	Last Valid State	<b>Force value</b>	YES
<b>Step</b>	[-]		
<b>Comm object</b>	21215	<b>Related applications</b>	MINT
<b>Config level</b>	Standard		
<b>Setpoint visibility</b>	Always		
<b>Description</b>			
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	2.1.0
Range [units]	AUTO / ECU / INTERNAL [-]		
Default value	AUTO	Force value	YES
Step	[-]		
Comm object	13345	Related applications	MINT
Config level	Advanced		
Setpoint visibility	Always		
Description			
This setpoint adjusts source for <b>Running Hours</b> .			
AUTO	Source is selected automatically between INTERNAL and ECU. ECU source is prioritized.		
ECU	Source is forced to be always ECU. ECU provides <b>Running Hours</b> .		
INTERNAL	Source is forced to be always INTERNAL. Controller provides <b>Running Hours</b> .		

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## SW Key

Setpoint group	Basic settings	Related FW	2.1.0
Range [units]	31 characters [-]		
Default value	AUTO	Force value	NO
Step	[-]		
Comm object	24258	Related applications	MINT
Config level	Advanced		
Setpoint visibility	Always		
Description			
This setpoint is designed for SW Key which unlocks premium features.			
<b>Note:</b> 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	2.1.0
Range [units]	Enabled / Disabled		
Default value	Enabled	Force value	NO
Step	[-]		
Comm object	23885	Related applications	MINT
Config level	Basic		
Setpoint visibility	Always		
Description			
This setpoint enables recording of user login in/out to the controller history.			
<div><b>Example:</b> The fallowing records will be shown in the history if enabled: User with user index (0) loegged in via ETH.</div>			

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## Force Value Logging

Setpoint group	Basic settings	Related FW	2.1.0
Range [units]	Enabled/Disabled		
Default value	Enabled	Force value	NO
Step	-		
Comm object	18724	Related applications	MINT
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	2.1.0
Range [units]	31 characters [-]		
Default value	AUTO	Force value	NO
Step	[-]		
Comm object	23810	Related applications	MINT
Config level	Advanced		
Setpoint visibility	Always		
Description			
This setpoint is adjusts text which is visible during login in IntelConfig. When this setpoint is empty, no additional text is displayed.			
<div>Example: Authorize person only, etc.</div>			

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## Subgroup: Power Supply Protection

### Power Supply <V

Setpoint group	BESS settings	Related FW	2.1.0
Range [units]	8.0 V .. Power Supply >V [V]		
Default value	18.0 V	Force value	NO
Step	0.1 V		
Comm object	8387	Related applications	MINT
Config level	Standard		
Setpoint visibility	Always		
Description			
Warning threshold for low power supply voltage.			

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### Power Supply >V

Setpoint group	BESS settings	Related FW	2.1.0
Range [units]	Power Supply <V .. 40.0 [V]		
Default value	36.0 V	Force value	NO
Step	0.1 V		
Comm object	9587	Related applications	MINT
Config level	Standard		
Setpoint visibility	Always		
Description			
Warning threshold for high power supply voltage.			

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### Power Supply <> Delay

Setpoint group	BESS settings	Related FW	2.1.0
Range [units]	0 .. 600 [s]		
Default value	5 s	Force value	NO
Step	1 s		
Comm object	8383	Related applications	MINT
Config level	Standard		
Setpoint visibility	Always		
Description			
Delay for which power supply voltage can be out of range given by setpoints <b>Power Supply &lt;V</b> and <b>Power Supply &gt;V</b> . After this delay elapses, appropriate alarm ( <b>Wrn Battery Undervoltage</b> or <b>Wrn Battery Overvoltage</b> ) is activated.			

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## Subgroup: Shared Setpoints

### #SUS Min Power 1

Setpoint group	Basic settings	Related FW	2.1.0
Range [units]	1 .. 65000 [kW]		
Default value	100 kW	Force value	NO
Step	1 kW		
Comm object	14013	Related applications	MINT
Config level	Standard		
Setpoint visibility	Only if <b>SUS Sequence</b> = 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 **BESS Nominal power** of gen-sets needed to activate the **LBO Ready To Excite**.

Every Gen-set in SUS sequence which activates **LBO Ready To Excite** is counted. When sum of **BESS 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	2.1.0
Range [units]	1 .. 65000 [kW]		
Default value	100 kW	Force value	NO
Step	1 kW		
Comm object	16414	Related applications	MINT
Config level	Standard		
Setpoint visibility	Only if <b>SUS Sequence</b> = 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 **BESS Nominal power** of gen-sets needed to activate the **LBO Ready To Excite**.

Every Gen-set in SUS sequence which activates **LBO Ready To Excite** is counted. When sum of **BESS 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	2.1.0
Range [units]	1 .. 65000 [kW]		
Default value	100 kW	Force value	NO
Step	1 kW		
Comm object	16415	Related applications	MINT
Config level	Standard		
Setpoint visibility	Only if <b>SUS Sequence</b> = 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 **BESS Nominal power** of gen-sets needed to activate the **LBO Ready To Excite**.

Every Gen-set in SUS sequence which activates **LBO Ready To Excite** is counted. When sum of **BESS 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	2.1.0
Range [units]	0 .. 600 [s] / No Timeout		
Default value	10 s	Force value	NO
Step	1 s		
Comm object	14104	Related applications	MINT
Config level	Standard		
Setpoint visibility	Only if <b>SUS Sequence</b> = Enabled		
Description			
<b>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.</b>			
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.			
<b>IMPORTANT: This setpoint is shared via Intercontroller Communication line. Change of this setpoint will be reflected in all controllers on site.</b>			
<b>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.</b>			
<b>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.</b>			

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## #Emergency Droop On Delay

Setpoint group	Basic settings	Related FW	2.1.0
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			
<b>IMPORTANT:</b> 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.			
<p>This setpoint adjusts the delay for switching from isochronous regulation to droop regulation.</p> <p>When number of controllers detected by the controller on <b>CAN2A</b> / <b>CAN2B</b> is lower than the number in the setpoint <b>#Number Of Units On CAN2</b>.</p> <p><i><b>Note:</b> This function is available only if <b>Load/Var Sharing Regulation Type</b> = Emrg Droop</i></p> <p><b>IMPORTANT:</b> This setpoint is shared via Intercontroller Communication line. Change of this setpoint will be reflected in all controllers on site.</p> <p><b>IMPORTANT:</b> 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.</p> <p><b>IMPORTANT:</b> 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.</p>			

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## #Emergency Droop Off Delay

Setpoint group	Basic settings	Related FW	2.1.0
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			
<div><div>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.</div></div>			
<p>This setpoint adjusts the delay for switching from droop regulation to isonchronous regulation.</p> <p>When number of controllers detected by the controller on <b>CAN2A</b> / <b>CAN2B</b> is lower than the number in the setpoint <b>#Number Of Units On CAN2</b>.</p> <div><div><i><b>Note:</b> This function is available only if <b>Load/Var Sharing Regulation Type</b> = Emrg Droop</i></div></div>			
<div><div>IMPORTANT: This setpoint is shared via Intercontroller Communication line. Change of this setpoint will be reflected in all controllers on site.</div></div>			
<div><div>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.</div></div>			
<div><div>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.</div></div>			

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## Group: Communication Settings

### Subgroup: Controller Address

#### ICC Address

Setpoint group	Communication Settings	Related FW	2.1.0
Range [units]	1 .. 32 [-]		
Default value	1 [-]	Force value	NO
Step	1 [-]		
Comm object	23999	Related applications	MINT
Config level	Standard		
Setpoint visibility	Always		
Description			
<p>This setpoint adjusts Controller's CAN Address which is used for CAN Intercontroller communication (page 1). <b>CAN Intercontroller Communication</b></p> <p>This type of communication is used to share information between other ComAp controllers via CAN interface <b>Communication peripherals</b>.</p> <p><b>Note:</b> Each controller connected via CAN has to have unique address, i.e. maximally 32 controllers can be connected together.</p>			

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#### Terminal Comm Address

Setpoint group	Communication Settings	Related FW	2.1.0
Range [units]	1 .. 32 [-]		
Default value	1 [-]	Force value	NO
Step	1 [-]		
Comm object	24019	Related applications	MINT
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 ( <b>Communication peripherals</b> ). 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	2.1.0
Range [units]	1 .. 247 [-]		
Default value	1	Force value	NO
Step	[-]		
Comm object	24188	Related applications	MINT
Config level	Standard		
Setpoint visibility	Always		
Description			
This setpoint is used for definition of the IntelliNeo modbus address if it is used in Modus Server mode.			

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## Subgroup: Intercontroller Settings

### CAN ICC Mode

Setpoint group	Communication Settings	Related FW	2.1.0																				
Range [units]	32C / 16C / 8C / [-]																						
Default value	32C	Force value	NO																				
Step	[-]																						
Comm object	24499	Related applications	MINT																				
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 InteliNeo 530 BESS and older controllers such as IGS-NT, IG2GSC, IG200, IG500.																							
<table><tr><th>Mode</th><th>Arbitration Bit-Rate</th><th>Data Bit-Rate</th><th>Maximal Bus Length</th><th>Max Bus Length With Repeater</th></tr><tr><td>32C</td><td>250 kbit</td><td>250 kbit</td><td>200 m</td><td>800 m</td></tr><tr><td>16C</td><td>125 kbit</td><td>125 kbit</td><td>400 m</td><td>1600 m</td></tr><tr><td>8C</td><td>50 kbit</td><td>50 kbit</td><td>900 m</td><td>3600 m</td></tr></table>				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
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																			
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 ICC Mode, alarm ALI ICC Mode Inconsistency is activated.																							

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## #Number Of Units On ICC

Setpoint group	Communication Settings	Related FW	2.1.0
Range [units]	1 .. 32 [-]		
Default value	1	Force value	NO
Step	1		
Comm object	13953	Related applications	MINT
Config level	Standard		
Setpoint visibility	Always		
Description			
This setpoint defines the minimum number of units supposed to be connected to CAN2. Controller counts itself as well, the number is always 1 or higher, it is never 0. This setpoint is also used for <b>#ICC Units Missing Protection</b> .			

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## #Number Of Units On ICC Check

Setpoint group	Communication Settings	Related FW	2.1.0
Range [units]	Enable / Disabled [-]		
Default value	Disabled [-]	Force value	NO
Step	[-]		
Comm object	17463	Related applications	MINT
Config level	Standard		
Setpoint visibility	Always		
Description			
This setpoints enabled/disabled protection which checks number of units on CAN2 communication line. When number of detected unit is lower than value adjusted by setpoint <b>#Number Of Units On ICC</b> , alarm <b>Wrn ICC Units Missing</b> or <b>SD ICC Units Missing</b> is activated. Type of alarm is adjusted via setpoint <b>#ICC Units Missing Protection</b> .			

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## #ICC Units Missing Protection

Setpoint group	Communication Settings	Related FW	2.1.0
Range [units]	HistRecOnly / Wrn / Sd / BOC [-]		
Default value	HistRecOnly [-]	Force value	NO
Step	[-]		
Comm object	17503	Related applications	MINT
Config level	Standard		
Setpoint visibility	Always		
Description			
This setpoint adjusts type of protection for alarm <b>Wrn ICC Units Missing</b> .			
<div>&gt;</div> <div>HistRecOnly = ICC Units Missing</div>			
<div>&gt;</div> <div>Wrn = Wrn ICC Units Missing</div>			
<div>&gt;</div> <div>Sd = Sd ICC Units Missing</div>			
<div>&gt;</div> <div>BOC = Sd ICC Units Missing</div>			

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## Subgroup: RS485 Settings

### RS485 Mode

Setpoint group	Communication Settings	Related FW	2.1.0				
Range [units]	Direct / MODBUS [-]						
Default value	Direct	Force value	NO				
Step	[-]						
Comm object	24134	Related applications	MINT				
Config level	Standard						
Setpoint visibility	Always						
Description							
Communication protocol switch for on-board RS485.							
<table><tr><td>Direct</td><td>InteliConfig communication protocol via serial cable.</td></tr><tr><td>MODBUS</td><td>MODBUS protocol.</td></tr></table>				Direct	InteliConfig communication protocol via serial cable.	MODBUS	MODBUS protocol.
Direct	InteliConfig communication protocol via serial cable.						
MODBUS	MODBUS protocol.						

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## RS485 Communication Speed

Setpoint group	Communication Settings	Related FW	2.1.0
Range [units]	9600 / 19200 / 38400 / 57600 / 115200 [bps]		
Default value	57600 bps	Force value	NO
Step	[-]		
Comm object	24135	Related applications	MINT
Config level	Standard		
Setpoint visibility	Always		
Description			
If the direct mode is selected on on-board RS485, 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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## RS485 Modbus Speed

Setpoint group	Communication Settings	Related FW	2.1.0
Range [units]	9600 / 19200 / 38400 / 57600 / 115200 [bps]		
Default value	9600 bps	Force value	NO
Step	[-]		
Comm object	24141	Related applications	MINT
Config level	Standard		
Setpoint visibility	Always		
Description			
This setpoint adjusts communication speed of <b>Modbus-RTU, Modbus/TCP</b> .			

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## RS485 Modbus Mode

Setpoint group	Communication Settings	Related FW	2.1.0
Range [units]	8N1 / 8N2 / 8E1 [-]		
Default value	8N1	Force value	NO
Step	[-]		
Comm object	24020	Related applications	MINT
Config level	Standard		
Setpoint visibility	Always		
Description			
This setpoint adjusts communication mode of <b>Modbus-RTU, Modbus/TCP</b> .			
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: Modbus/TCP Master Settings

### Modbus/TCP Master Link

Setpoint group	Communication Settings	Related FW	2.1.0
Range [units]	Ethernet/CM-Ethernet [-]		
Default value	Ethernet	Force value	NO
Step	[-]		
Comm object	23837	Related applications	MINT
Config level	Standard		
Setpoint visibility	Always		
Description			
This setpoint adjust ethernet communication line for Modbus TCP master/client function.			
<b>Note:</b> Sending and receiving output/input data via the plug-in module creates a delay from which certain functions in the controller can be influenced or inaccurate, such as protections, regulations outputs, ....			

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## Group: Ethernet

### Subgroup: Ethernet Port Configuration

#### Ethernet port

Setpoint group	Ethernet Port Configuration	Related FW	2.1.0
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
Config level	Standard		
Setpoint visibility	Always		
Description			
This setpoint is used to select the interface type on ethernet port.			
<b>Trusted Interface</b> - 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.			
<b>Untrusted Interface</b> - 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.			
<b>Note:</b> If setpoint is adjusted the alarm <b>ALI Ethernet Port Inconsistency</b> and <b>ALI CU Restart Required</b> will appear and be still displayed until a CU restart is occurred.			

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## Subgroup: TCP/IP Settings

### IP Address Mode

Setpoint group	Ethernet Ethernet	Related FW	2.1.0
Range [units]	Manual / Automatic / Disabled [-]		
Default value	Automatic	Force value	NO
Step	[-]		
Comm object	24259	Related applications	MINT
Config level	Standard		
Setpoint visibility	Always		
Description			
This setpoint is used to select the method how the ethernet connection is adjusted on <b>Ethernet</b> .			
Manual:	The Ethernet connection is fixed by means of the setpoints <b>IP Address</b> , <b>Subnet Mask</b> , <b>Gateway IP</b> , <b>DNS IP Address 1</b> , <b>DNS IP Address 2</b> . 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 <i>000.000.000.000</i> are shown.		
Disabled:	The Ethernet terminal is disabled.		
<b>IMPORTANT:</b> 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	Ethernet	Related FW	2.1.0
Range [units]	0 .. 15 characters [-]		
Default value	192.168.2.254	Force value	NO
Step	[-]		
Comm object	24376	Related applications	MINT
Config level	Standard		
Setpoint visibility	Only if IP Address Mode = Manual		
Description			
<p>The setpoint is used to select the method how the IP Address is adjusted on <b>Ethernet</b>.</p> <p>If <b>IP Address Mode</b> = Manual, this setpoint is used to adjust the IP address of the <b>Ethernet</b> interface of the controller. Ask your IT specialist for help with this setting.</p> <p>If <b>IP Address Mode</b> = Automatic this setpoint is inactive. The IP address is assigned by the DHCP server.</p>			
<b>Note:</b> Only valid IP address can be inserted.			

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## Subnet Mask

Setpoint group	Ethernet	Related FW	2.1.0
Range [units]	0 .. 15 characters [-]		
Default value	255.255.255.0	Force value	NO
Step	[-]		
Comm object	24375	Related applications	MINT
Config level	Standard		
Setpoint visibility	Only if IP Address Mode = Manual		
Description			
<p>The setpoint is used to select the method how the Subnet Mask is adjusted on <b>Ethernet</b>.</p> <p>If <b>IP Address Mode</b> = Manual this setpoint is used to adjust the Subnet Mask. Ask your IT specialist for help with this setting.</p> <p>If <b>IP Address Mode</b> = Automatic this setpoint is inactive. The Subnet Mask is assigned by the DHCP server.</p> <p><b>Note:</b> Only valid IP address can be inserted.</p>			

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## Gateway IP

Setpoint group	Ethernet	Related FW	2.1.0
Range [units]	0 .. 15 characters [-]		
Default value	192.168.2.1	Force value	NO
Step	[-]		
Comm object	24373	Related applications	MINT
Config level	Standard		
Setpoint visibility	Only if <b>IP Address Mode</b> = Manual		
<b>Description</b>			
<p>This setpoint is used to select the method how the Gateway IP is adjusted.</p> <p>If <b>IP Address Mode</b> = Manual, this setpoint is used to adjust the Gateway IP address of the <b>Ethernet</b> interface of the controller. Ask your IT specialist for help with this setting.</p> <p>If <b>IP Address Mode</b> = Automatic this setpoint is inactive. The Gateway IP address is assigned by the DHCP server.</p> <p>A gateway is a device which connects the respective segment with the other segments and/or Internet.</p> <p><b>Note:</b> Only valid IP address can be inserted.</p>			

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## DNS Mode

Setpoint group	Ethernet Ethernet	Related FW	2.1.0
Range [units]	Manual / Automatic [-]		
Default value	Automatic	Force value	
Step	[-]		
Comm object	24101	Related applications	MINT
Config level	Standard		
Setpoint visibility	Only if IP Address Mode = Automatic		
Description			
This setpoint enables to enter DNS server addresses for <b>Ethernet</b> manually, even with the <b>IP Address Mode</b> 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	Ethernet	Related FW	2.1.0
Range [units]	0 .. 15 characters [-]		
Default value	8.8.8.8	Force value	NO
Step	[-]		
Comm object	24362	Related applications	MINT
Config level	Standard		
Setpoint visibility	Only if <b>IP Address Mode</b> = Manual OR ( <b>IP Address Mode</b> = Automatic AND <b>DNS Mode</b> = Manual)		
Description			
This setpoint allows to set DNS IP Address 1 for <b>Ethernet</b> manually.			
<i><b>Note:</b> Only valid IP address can be inserted.</i>			

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## DNS IP Address 2

Setpoint group	Ethernet	Related FW	2.1.0
Range [units]	0 .. 15 characters [-]		
Default value	4.4.4.4	Force value	NO
Step	[-]		
Comm object	24331	Related applications	MINT
Config level	Standard		
Setpoint visibility	Only if <b>IP Address Mode</b> = Manual OR ( <b>IP Address Mode</b> = Automatic AND <b>DNS Mode</b> = Manual)		
Description			
This setpoint allows to set DNS IP Address 2 for <b>Ethernet</b> manually.			
Note: Only valid IP address can be inserted.			

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## IP Firewall

Setpoint group	Ethernet Ethernet	Related FW	2.1.0				
Range [units]	Disabled / Enabled [-]						
Default value	Disabled	Force value	NO				
Step	[-]						
Comm object	24092	Related applications	MINT				
Config level	Standard						
Setpoint visibility	Always						
Description							
This setpoints enables or disables the built-in <b>Firewall</b> functionality for <b>Ethernet</b> .							
<table><tr><td>Disabled:</td><td>The firewall function is switched off</td></tr><tr><td>Enabled:</td><td>The firewall function is switched on.</td></tr></table>				Disabled:	The firewall function is switched off	Enabled:	The firewall function is switched on.
Disabled:	The firewall function is switched off						
Enabled:	The firewall function is switched on.						
<b>IMPORTANT: Loss of connection can happen when enabling the firewall and using remote connection via Internet</b>							

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## Subgroup: AirGate Settings

### AirGate Port

Setpoint group	Ethernet	Related FW	2.1.0
Range [units]	0 .. 65535 [-]		
Default value	54440 [-]	Force value	NO
Step	1 [-]		
Comm object	24096	Related applications	MINT
Config level	Standard		
Setpoint visibility	Always		
Description			
This port is used for TCP communication with the AirGate server.			
<b>Note:</b> Use port 54440 for standard ComAp AirGate service.			

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## AirGate Address

Setpoint group	Ethernet	Related FW	2.1.0
Range [units]	0 .. 31 characters [-]		
Default value	global.airgate.link	Force value	NO
Step	[-]		
Comm object	24364	Related applications	MINT
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 Connection

Setpoint group	Ethernet	Related FW	2.1.0
Range [units]	Disabled / Enabled [-]		
Default value	Enabled	Force value	YES
Step	[-]		
Comm object	24365	Related applications	MINT
Config level	Standard		
Setpoint visibility	Always		
Description			
This setpoint enables or disables <b>AirGate connection</b> function.			

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## Subgroup: ComAp Client Settings

### ComAp Client Inactivity Timeout

Setpoint group	EthernetEthernet	Related FW	2.1.0
Range [units]	0 .. 65535 [s]		
Default value	60 s	Force value	YES
Step	1 s		
Comm object	24098	Related applications	MINT
Config level	Standard		
Setpoint visibility	Always		
Description			
Connection (TCP socket) is closed by controller, if a client (e.g. IntelliConfig) does not communicate for this time. This timeout applies to both direct and AirGate connection.			

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## Direct Connection Port

Setpoint group	Ethernet	Related FW	2.1.0
Range [units]	0 .. 65535 [-]		
Default value	23 [-]	Force value	NO
Step	1 [-]		
Comm object	24374	Related applications	MINT
Config level	Standard		
Setpoint visibility	Always		
Description			
This port is used to listen for an incoming TCP connection on <b>Ethernet</b> .			

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## Direct Connection

Setpoint group	Ethernet	Related FW	2.1.0
Range [units]	Disabled / Enabled [-]		
Default value	Enabled	Force value	NO
Step	[-]		
Comm object	24099	Related applications	MINT
Config level	Standard		
Setpoint visibility	Always		
Description			
Use this setpoint to enable/disable direct connection of a ComAp client (e.g. IntelliConfig) to the IP address of the controller.			
<b>Note:</b> For Direct connection the controller IP address must be reachable from the client IP address.			


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## Subgroup: Modbus Server Settings

### Modbus Server

Setpoint group	Ethernet	Related FW	2.1.0
Range [units]	Disabled / Enabled [-]		
Default value	Disabled	Force value	NO
Step	[-]		
Comm object	24337	Related applications	MINT
Config level	Standard		
Setpoint visibility	Always		
Description			
Enables or disables Modbus communication via <b>Ethernet</b> .			

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### Modbus Client Inactivity Timeout

Setpoint group	Ethernet Ethernet ETH Interface 3 - Modbus	Related FW	2.1.0
Range [units]	0 .. 65535 [s]		
Default value	60 s	Force value	NO
Step	1 s		
Comm object	24097	Related applications	MINT
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.			
<b>Note:</b> This setpoint is shared with other Modbus Client Inactivity Timeout setpoints.			

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## Subgroup: SNMP Settings

### SNMP Agent

Setpoint group	Ethernet	Related FW	2.1.0
Range [units]	Disabled / SNMP v1/v2c / SNMP v3 [-]		
Default value	Disabled	Force value	NO
Step	[-]		
Comm object	24336	Related applications	MINT
Config level	Standard		
Setpoint visibility	Always		
Description			
This setpoints Enables or disables Simple Network Management Protocol (SNMP) Agent.			
<b>Note:</b> <i>SNMP v3 has upgraded encryption, remote configuration, and security (extra setpoints are available).</i>			
<b>Note:</b> <i>It is supported only User-Based security model (USM, RFC-3414). View-based Access Control Model (VACM, RFC-3415) is not supported.</i>			

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### SNMP Trap Format

Setpoint group	Ethernet	Related FW	2.1.0
Range [units]	v1 Trap / v2 Notific / v2 Inform [-]		
Default value	v2 Inform	Force value	NO
Step	[-]		
Comm object	24136	Related applications	MINT
Config level	Standard		
Setpoint visibility	Only if <b>SNMP Agent</b> != 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 Traps IP Address 1

Setpoint group	Ethernet	Related FW	2.1.0
Range [units]	0 .. 63 characters [-]		
Default value	-	Force value	NO
Step	[-]		
Comm object	24095	Related applications	MINT
Config level	Standard		
Setpoint visibility	Only if <b>SNMP Agent</b> != 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	Ethernet	Related FW	2.1.0
Range [units]	Valid IP address [-]		
Default value	-	Force value	NO
Step	[-]		
Comm object	24094	Related applications	MINT
Config level	Standard		
Setpoint visibility	Only if <b>SNMP Agent</b> != 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 RD Community String

Setpoint group	Ethernet	Related FW	2.1.0
Range [units]	0..31 characters [-]		
Default value	public	Force value	NO
Step	[-]		
Comm object	24335	Related applications	MINT
Config level	Standard		
Setpoint visibility	Only if <b>SNMP Agent</b> != Disabled		
Description			
SNMP Community String only for reading.			

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## SNMP WR Community String

Setpoint group	Ethernet	Related FW	2.1.0
Range [units]	0..31 characters [-]		
Default value	private	Force value	NO
Step	[-]		
Comm object	24334	Related applications	MINT
Config level	Standard		
Setpoint visibility	Only if <b>SNMP Agent</b> = SNMP v1/v2c		
Description			
SNMP Community String for writing and reading.			

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## SNMP Engine User Name

Setpoint group	Ethernet	Related FW	2.1.0
Range [units]	0 .. 31 characters [-]		
Default value	-	Force value	NO
Step	[-]		
Comm object	23851	Related applications	MINT
Config level	Standard		
Setpoint visibility	Only if <b>SNMP Agent</b> = SNMP v3		
Description			
Defines SNMP v3 Engine User Name.			

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## SNMP Privacy Protocol

Setpoint group	Ethernet	Related FW	2.1.0
Range [units]	DES / 3DES / AES128 / AES256 [-]		
Default value	AES128	Force value	NO
Step	[-]		
Comm object	23856	Related applications	MINT
Config level	Standard		
Setpoint visibility	Only if <b>SNMP Agent</b> = SNMP v3		
Description			
Selects SNMP v3 Privacy Protocol.			

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## SNMP Authentication Protocol

Setpoint group	Ethernet	Related FW	2.1.0
Range [units]	MD5 / SHA / SHA256[-]		
Default value	SHA	Force value	NO
Step	[-]		
Comm object	23857	Related applications	MINT
Config level	Standard		
Setpoint visibility	Only if <b>SNMP Agent</b> = SNMP v3		
Description			
Selects SNMP v3 Authentication Protocol.			

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## SNMP Security Level

Setpoint group	Ethernet	Related FW	2.1.0
Range [units]	NONE/ AUTH-NOPRIV / AUTH-PRIV [-]		
Default value	NONE	Force value	NO
Step	[-]		
Comm object	23855	Related applications	MINT
Config level	Standard		
Setpoint visibility	Only if <b>SNMP Agent</b> = SNMP v3		
Description			
Selects SNMP v3 security level. If NONE the agent will work in SNMP v2c mode..			

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## Subgroup: E-mail Settings

### SMTP Server Address

Setpoint group	Ethernet	Related FW	2.1.0
Range [units]	0..31 characters [-]		
Default value	global.airgate.link:9925	Force value	NO
Step	[-]		
Comm object	23962	Related applications	MINT
Config level	Standard		
Setpoint visibility	Always		
Description			
<p>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.</p>			
<p><b>Note:</b> You may use also any public SMTP server which does not require connection over SSL/TLS channels.</p>			

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### SMTP Sender Address

Setpoint group	Ethernet	Related FW	2.1.0
Range [units]	0..31 characters [-]		
Default value	[-]	Force value	NO
Step	[-]		
Comm object	23884	Related applications	MINT
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.			
<i><b>Note:</b> It is not needed to enter an existing email address, nevertheless valid email format needs to be followed.</i>			
<b>IMPORTANT:</b> This item is obligatory when emails are configured.			

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## SMTP User Name

Setpoint group	Ethernet	Related FW	2.1.0
Range [units]	0..31 characters [-]		
Default value	[-]	Force value	NO
Step	[-]		
Comm object	23883	Related applications	MINT
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	Ethernet	Related FW	2.1.0
Range [units]	0..15 characters [-]		
Default value	[-]	Force value	NO
Step	[-]		
Comm object	23882	Related applications	MINT
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	Ethernet	Related FW	2.1.0
Range [units]	NONE / SSL/TLS / STARTTLS [-]		
Default value	NONE	Force value	NO
Step	[-]		
Comm object	23965	Related applications	MINT
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	Ethernet	Related FW	2.1.0
Range [units]	0..63 characters [-]		
Default value	[-]	Force value	NO
Step	[-]		
Comm object	24298	Related applications	MINT
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	Ethernet	Related FW	2.1.0
Range [units]	0..63 characters [-]		
Default value	[-]	Force value	NO
Step	[-]		
Comm object	24144	Related applications	MINT
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	Ethernet	Related FW	2.1.0
Range [units]	0..63 characters [-]		
Default value	[-]	Force value	NO
Step	[-]		
Comm object	24145	Related applications	MINT
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	Ethernet	Related FW	2.1.0
Range [units]	0..63 characters [-]		
Default value	[-]	Force value	NO
Step	[-]		
Comm object	24297	Related applications	MINT
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

### E-mail Language

<b>Setpoint group</b>	Ethernet	<b>Related FW</b>	2.1.0
<b>Range [units]</b>	Depends on controller's supported languages. [-]		
<b>Default value</b>	English	<b>Force value</b>	NO
<b>Step</b>	[-]		
<b>Comm object</b>	24299	<b>Related applications</b>	MINT
<b>Config level</b>	Standard		
<b>Setpoint visibility</b>	Always		
<b>Description</b>			
Use this setpoint to set the language of Event, Warning, etc. e-mails.			

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### Event Message

Setpoint group	Ethernet	Related FW	2.1.0
Range [units]	Enabled / Disabled [-]		
Default value	Enabled	Force value	YES
Step	[-]		
Comm object	18971	Related applications	MINT
Config level	Standard		
Setpoint visibility	Always		
Description			
This setpoint enables or disables sending of Event Messages.			

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### Wrn Message

Setpoint group	Ethernet	Related FW	2.1.0
Range [units]	Enabled / Disabled [-]		
Default value	Enabled	Force value	YES
Step	[-]		
Comm object	8482	Related applications	MINT
Config level	Standard		
Setpoint visibility	Always		
Description			
This setpoint enables or disables sending of Warning Messages.			

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## AI Message

Setpoint group	Ethernet	Related FW	2.1.0
Range [units]	Enabled / Disabled [-]		
Default value	Enabled	Force value	YES
Step	[-]		
Comm object	10567	Related applications	MINT
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	Ethernet	Related FW	2.1.0
Range [units]	Enabled / Disabled [-]		
Default value	Enabled	Force value	YES
Step	[-]		
Comm object	10568	Related applications	MINT
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	Ethernet	Related FW	2.1.0
Range [units]	Enabled / Disabled [-]		
Default value	Enabled	Force value	YES
Step	[-]		
Comm object	18993	Related applications	MINT
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	Ethernet	Related FW	2.1.0
Range [units]	Enabled / Disabled [-]		
Default value	Enabled	Force value	YES
Step	[-]		
Comm object	18994	Related applications	MINT
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	Ethernet CM-4G-GPS Ethernet	Related FW	2.1.0
Range [units]	Enabled / Disabled [-]		
Default value	Enabled	Force value	YES
Step	[-]		
Comm object	8484	Related applications	MINT
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	Ethernet CM-4G-GPS Ethernet	Related FW	2.1.0
Range [units]	Enabled / Disabled [-]		
Default value	Enabled	Force value	YES
Step	[-]		
Comm object	11413	Related applications	MINT
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	2.1.0
Range [units]	Enabled/Disabled		
Default value	Enabled	Force value	
Step	[-]		
Comm object	8485	Related applications	MINT
Config level	Standard		
Setpoint visibility	Always		
Description			
This setpoint enables or disables sending of messages.			

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## BP Message

Setpoint group	Ethernet CM-4G-GPS Ethernet	Related FW	2.1.0
Range [units]	Enabled / Disabled [-]		
Default value	Enabled	Force value	YES
Step	[-]		
Comm object	10117	Related applications	MINT
Config level	Standard		
Setpoint visibility	Always		
Description			
This setpoint enables or disables sending of Bus Protection messages.			

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## Subgroup: RTC Synchronization

### Time Zone

Setpoint group	Scheduler; CM-4G-GPS	Related FW	2.1.0
Range [units]	GMT-12:00 .. GMT+13:00 [hours]		
Default value	GMT+1:00	Force value	NO
Step	[-]		
Comm object	24366	Related applications	MINT
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.			
<b>Note:</b> <i>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.</i>			

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### NTP Clock Synchronization

Setpoint group	Ethernet	Related FW	2.1.0
Range [units]	Disabled / Enabled [-]		
Default value	Disabled	Force value	NO
Step	[-]		
Comm object	24075	Related applications	MINT
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	Ethernet	Related FW	2.1.0
Range [units]	0 .. 63 characters [-]		
Default value	pool.ntp.org	Force value	NO
Step	[-]		
Comm object	24074	Related applications	MINT
Config level	Standard		
Setpoint visibility	Always		
Description			
NTP server address for time synchronization.			
<i><b>Note:</b> Only valid IP address or domain can be inserted.</i>			

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Group: BESS settings

Subgroup: BESS Precharge Settings



## Starting Sequence BCB Control

Setpoint group	BESS Settings	Related FW	2.1.0
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
Config level	Standard		
Setpoint visibility	Always		
Description			
This setpoint adjust Controller's behavior during BESS Starting Sequence.			
Starting with BCB Closed	<p>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 <b>Bess State</b> 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 <b>BCB Type</b> 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 <b>BCB Feedback</b> is closed when it is supposed to thus indicating the inverter is connected.</p> <p>After evaluating the state of the LBI <b>BCB feedback</b> the next step is setting up the DC part of the system (depending on the setpoint <b>Precharge sequence</b>). Having the configuration correctly setup will lead to having the <b>BESS State</b> = Loaded.</p> <p>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.</p> <p>Note: This scenario corresponds to the original BESS "Precharge Type = AC" setting found in previous versions.</p> <p>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.</p>		
	Starting with BCB Opened	<p>With Starting with BCB Opened first action of the controller is set up the DC part of the system (depending on the setpoint <b>Precharge sequence</b>) and after wards once the DC system is active (value <b>BESS State</b> = Energized) an attempt to close the BCB breaker to either a <b>deadbus</b> or via attempt for forward <b>Synchronization</b>.</p> <p>This setting corresponds to a BESS with the ability to act as a grid-</p>	




	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 Sequence

Setpoint group	BESS settings	Related FW	2.1.0
Range [units]	Internal/External		
Default value	Internal	Force value	YES
Step	[-]		
Comm object	17667	Related applications	MINT
Config level	Advanced		
Setpoint visibility	Always		
Description			
This setpoint adjust Controller's behavior during BESS Precharge Sequence.			
Internal	The IntelliNEO 530 BESS takes control of the precharge process. Meaning that the Precharge Relay is controlled (via LBO <b>PRECHARGE RELAY</b> ). The energy storage circuit breaker (ESCB) will be receiving signal to close (for instance from LBO <b>ESCB CLOSE/OPEN</b> ) when the difference between <b>ES Voltage Meas</b> and <b>PCS Voltage Meas</b> is inside of the range calculated as a percent set by setpoint <b>DC Voltage Window</b> of <b>ES Nominal Voltage</b> . If voltage difference is not within the range longer then time set in <b>Precharging TO</b> , then the controller interrupts starting sequence and Sd <b>Start Fail</b> will appear.		
	Precharge sequence is controlled by external device (the external device can be the energy storage itself). Precharge Relay is not activated by the IntelliNEO 530 BESS. The controller does not control the closing of the ESCB breaker by activating the designed LBO to activate the contactor. Unless <b>ESCB type</b> = Fuse/Disc., then the system checks that the connection between the ES and PCS is closed. The value BESS State = ES Starting stays until LBI <b>ES Ready To Load</b> = 1. If LBI ES Ready To Load does not activate within the time set in ES Ready To Load TO then Sd Start Fail will appear.		
<b>Note:</b> Sd Wrong Precharge Settings activates if Precharge Sequence= Internal and ESCB type = Fuse/Disc. User should not be able to start with this setting.			

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## Start To Dead Bus

Setpoint group	BESS settings	Related FW	2.1.0
Range [units]	Enabled/Disabled		
Default value	Disabled	Force value	YES
Step	[-]		
Comm object	17661	Related applications	MINT
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.			
<b>Note:</b> The setting of this setpoint corresponds to the setting of setpoint <b>Starting Sequence BCB Control=Start with BCB Closed</b> 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 <b>Starting Sequence BCB Control</b> 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 <b>BESS State = Energized</b> . 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 <b>Starting Sequence BCB Control=Start with BCB Closed</b> . For correct setting if a start command is activated while there is no healthy voltage on the AC BUS, the BESS remains in the <b>BESS State = Ready State</b> and waits until a healthy voltage appears on the AC bus.  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 **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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## Subgroup: BESS Control

### HLC Control Mode

Setpoint group	BESS settings	Related FW	2.1.0
Range [units]	Disabled /Enabled		
Default value	Disabled	Force value	YES
Step	[-]		
Comm object	19134	Related applications	MINT
Config level	Standard		
Setpoint visibility	Always		
Description			
This setpoint sets P/Q (Load and Var) control mode of the control unit. It defines stance of the IntelliNeo 530 BESS towards other ComAp controllers or High Level Controller (HLC). In order for this function to also be active it is important to have active LBI <b>PCS OUTPUT CONTROL MODE U-F/P-Q</b>			
Disabled		The controller is part of ComAp microgrid system and it is communicating directly with other ComAp controllers via CAN. HLC is not used and the P and Q control are done via the controller configuration and settings.	
Enabled		The controller accepts the request from the HLC via LAIs <b>HLC U-F CONTROL: Q REQUEST</b> and <b>HLC U-F CONTROL: P REQUEST</b> . It is not communicating with any other ComAp controller but following the request given by LAIs (-100 .. 100 % related to the <b>BESS Nominal power</b> ).	

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## BESS P Control

Setpoint group	BESS settings	Related FW	2.1.0
Range [units]	Analog/Setpoint/Balance		
Default value	Setpoint	Force value	YES
Step			
Comm object	20269	Related applications	MINT
Config level	Standard		
Setpoint visibility	Always		
Description			
This setpoints defines the source for the BESS power output request.			
Analog	The controller receives a <b>BESS Required P Target</b> from the LAI <b>BESS P REQUEST</b> which is used as direct BESS Power Request.		
Setpoint	The value <b>BESS Required P Target</b> is taken from the setpoint <b>BESS Manual P Request</b> .		
Balance	<b>Balance mode</b> 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. During the balance mode the energy equalization function to be done based on SOC can be enabled by the setpoint. For more information see <b>Energy Equalization based on SOC</b>		

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## BESS Manual P Request

Setpoint group	BESS settings	Related FW	2.1.0
Range [units]	-BESS Nominal power ... BESS Nominal power [kW]		
Default value	100 kW	Force value	YES
Step	1 kW		
Comm object	62689	Related applications	MINT
Config level	Standard		
Setpoint visibility	Always		
Description			
This setpoint defines the required discharge or charge power when the <b>BESS P Control</b> is set to Setpoint. For charging the BESS using this setpoint use negative numbers. For discharging the BESS using this setpoint use positive numbers.			

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## SOC Balance

Setpoint group	BESS settings	Related FW	2.1.0				
Range [units]	Disabled /Enabled						
Default value	Disabled	Force value	YES				
Step	[-]						
Comm object	62713	Related applications	MINT				
Config level	Standard						
Setpoint visibility	Always						
Description							
This setpoint enables function of energy equalization balance based on SOC of the BESS.For more information see the <b>Energy Equalization based on SOC</b> .							
<table><tr><td>Disabled</td><td>System defaults to Proportional Loadsharing for power distribution</td></tr><tr><td>Enabled</td><td>System uses the energy equalization algorithm (SOC Balancing) to distribute power between the BESS.</td></tr></table>				Disabled	System defaults to Proportional Loadsharing for power distribution	Enabled	System uses the energy equalization algorithm (SOC Balancing) to distribute power between the BESS.
Disabled	System defaults to Proportional Loadsharing for power distribution						
Enabled	System uses the energy equalization algorithm (SOC Balancing) to distribute power between the BESS.						
<b>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.</b>							

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## #Gen P Min

Setpoint group	BESS settings	Related FW	2.1.0
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
Config level	Standard		
Setpoint visibility	Always		
Description			
<p>Setpoint <b>#Gen P Min</b> defines the threshold for the power of the genset below which <b>PV curtailment</b> begins to take effect. .</p> <p>Together with setpoint <b>Gen P Optimal</b> 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 <b>Gen P Optimal</b> level.</p> <p><b>Example Use Case:</b></p> <ul style="list-style-type: none"><li>➤ In an islanded system with <b>BESS</b>, <b>Genset</b>, and <b>PV</b></li><li>➤ When the load reserve is fulfilled by BESS, the genset remains off.</li><li>➤ The load is covered by BESS and PV.</li><li>➤ Once BESS reaches its <b>SOC Low Target</b>, it is no longer allowed to discharge further.</li><li>➤ This drop in reserve capacity triggers the <b>start of the genset</b>.</li><li>➤ The genset then operates at <b>Gen P Optimal</b>, covering the load together with PV, while any excess power is used to <b>charge the BESS</b>.</li><li>➤ If PV production increases, BESS charges at its maximum charging rate.</li><li>➤ The genset output begins to decrease as PV production rises or load decreases.</li><li>➤ <b>PV curtailment</b> only occurs when the genset output reaches the <b>#Gen P Min</b> level to keep it on this level.</li></ul>			

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## Gen P Optimal

Setpoint group	BESS settings	Related FW	2.1.0
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
Config level	Standard		
Setpoint visibility	Depends on #System Load Control PTM settings		
Description			
<p><b>Gen P Optimal</b> defines the power level at which all gensets operating in load sharing mode should be maintained. Other sources in the system - specifically <b>BESS</b> and <b>grid</b> adjust their output to ensure that gensets operate precisely at this target level. This behavior applies in control modes such as <i>Mains Preference</i>, <i>BESS Max Charging</i>, and <i>BESS Max Discharging</i>.</p> <p>The setpoint is bounded from below by the value of <b>#Gen P Min</b>.</p> <p>Setpoint <b>#Gen P Min</b> defines the threshold below which <b>PV curtailment</b> begins to take effect.</p> <p>Together, <b>Gen P Optimal</b> and <b>#Gen P Min</b> 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 <b>Gen P Optimal</b> level.</p>			
Example Use Case:			
In an islanded system with <b>BESS</b> , <b>Genset</b> , and <b>PV</b> :			
<div><div>&gt;</div>When the load reserve is fulfilled by BESS, the genset remains off.</div> <div><div>&gt;</div>The load is covered by BESS and PV.</div> <div><div>&gt;</div>Once BESS reaches its <b>SOC Low Target</b>, it is no longer allowed to discharge further.</div> <div><div>&gt;</div>This drop in reserve capacity triggers the <b>start of the genset</b>.</div> <div><div>&gt;</div>The genset then operates at <b>Gen P Optimal</b>, covering the load together with PV, while any excess power is used to <b>charge the BESS</b>.</div> <div><div>&gt;</div>If PV production increases, BESS charges at its maximum charging rate.</div> <div><div>&gt;</div>The genset output begins to decrease as PV production rises or load decreases.</div> <div><div>&gt;</div><b>PV curtailment</b> only occurs when the genset output reaches the <b>#Gen P Min</b> level to keep it on this level.</div>			
<div><div>IMPORTANT:</div>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.</div>			

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## Subgroup: BESS Q Control

### #BESS Q Control

Setpoint group	BESS settings	Related FW	2.1.0
Range [units]	Analog/Balance		
Default value	Balance	Force value	YES
Step			
Comm object	20174	Related applications	MINT
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 <b>BESS Q REQUEST</b> 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 <b>#Genset PF Required</b> .		
VAR Sharing	The reactive power of the system (determined by the load in off-grid applications or the IntelliMains 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	2.1.0
Range [units]	0.001 .. 1.999		
Default value	1.000	Force value	YES
Step	0.001		
Comm object	20173	Related applications	MINT
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.			
<b>Note:</b> This setpoint applies only if the <b>#BESS Q Control</b> = Balance.			

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## Subgroup: Energy Storage

### ESCB Current Open Level

Setpoint group	BESS Settings	Related FW	2.1.0
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Range [units]	0 .. 10 [%]		
Default value	2 %	Force value	YES
Step	1 [%]		
Comm object	19606	Related applications	MINT
Config level	Advanced		
Setpoint visibility	Only if <b>ESCB Type</b> = Breaker		
Description			
This setpoint adjusts the required value threshold of the <b>ES Voltage Meas</b> related to <b>ES Nominal Current</b> for opening the ESCB breaker during stopping of the BESS Once the value is below the threshold the requirement to open the ESCB breaker takes place.			

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## ESCB Current Open Timeout

Setpoint group	BESS Settings	Related FW	2.1.0
Range [units]	0 .. 3600; No Timeout [s]		
Default value	60 s	Force value	YES
Step	1 [s]		
Comm object	19605	Related applications	MINT
Config level	Advanced		
Setpoint visibility	Only if <b>ESCB Type</b> = Breaker		
Description			
<p>This setpoint adjusts the required value of the<b>ES Voltage Meas</b> related to <b>ES Nominal Current</b> for opening the ESCB breaker during stopping of the BESS</p> <p>This setpoint sets a time limit to open the ESCB if the current is consistently below the limit <b>ESCB Current Open Level</b>.</p>			

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## ES Safety Charging Current

Setpoint group	Source Settings	Related FW	2.1.0
Range [units]	1 ..ES Nominal Current [A]		
Default value	1	Force value	YES
Step	1 A		
Comm object	19573	Related applications	MINT
Config level	Standard		
Setpoint visibility	Always		
Description			
In case the communication with BMS is lost (invalid value in the LAI <b>ES MAX CHARGING CURRENT</b> ), the discharging current will be limited by this setpoint.			
Controller switches calculation of value <b>ES Max Charging Power</b> from LAI <b>ES MAX CHARGING CURRENT</b> to setpoint ES Safety Charging Current and activates alarm <b>Wrn Safety mode</b> in these cases:			
LAI <b>ES MAX CHARGING CURRENT</b> has an invalid value or the value is smaller than value in setpoint ES Safety Charging Current while the setpoint Safety Mode = Enabled			

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## ES Safety Discharging Current

Setpoint group	Source Settings	Related FW	2.1.0
Range [units]	1 .. ES Nominal Current [A]		
Default value	1	Force value	YES
Step	1 A		
Comm object	19574	Related applications	MINT
Config level	Standard		
Setpoint visibility	Always		
Description			
In case the communication with BMS is lost (invalid value in the LAI <b>ES MAX DISCHARGING CURRENT</b> ), the discharging current will be limited by this setpoint.			
Controller switches calculation of value <b>ES Max Discharging Power</b> from LAI <b>ES MAX DISCHARGING CURRENT</b> to setpoint ES Safety Discharging Current and activates alarm <b>Wrn Safety mode</b> in these cases:			
LAI ES Max Discharging Current has an invalid value or the value is smaller than value in setpoint ES Safety Discharging Current while the setpoint Safety Mode = Enabled			

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## System Safety Discharging Level

Setpoint group	Source Settings	Related FW	2.1.0
Range [units]	0,0 .. 100,0 [%] of ES Max Charging Power		
Default value	2,0 %	Force value	YES
Step	0,1 %		
Comm object	19048	Related applications	MINT
Config level	Standard		
Setpoint visibility	Always		
Description			
This setpoints is used as threshold for the alarm <b>Wrn Discharging - System Safety</b> .			
<i><b>Note:</b> The percents are related to the ES Max Discharging Power.</i>			

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## Safety Mode

Setpoint group	BESS Settings	Related FW	2.1.0
Range [units]	Enabled/ Disabled		
Default value	Enabled	Force value	YES
Step	[-]		
Comm object	62714	Related applications	MINT
Config level	Advanced		
Setpoint visibility	Always		
Description			
This setpoint enables or disables the controller calculating the value of the <b>ES Max Discharging Power/ES MAX DISCHARGING CURRENT</b> to be given by the setpoints ES Safety Charging Current/ ES Safety Discharging Current when the LAIs <b>ES MAX CHARGING CURRENT/ES MAX DISCHARGING CURRENT</b> have a smaller number than the setting from the setpoints ES Safety Charging Current/ES Safety Discharging Current.			
Disabled	The controller does not activate an alarm <b>Wrn Safety mode</b> and at the same time does not calculate values <b>ES Max Discharging Power/ES MAX DISCHARGING CURRENT</b> from the setpoint <b>ES Safety Charging Current/ ES Safety Discharging Current</b> when the LAIs <b>ES MAX CHARGING CURRENT/ES MAX DISCHARGING CURRENT</b> are smaller than the setting from the setpoints ES Safety Charging Current/ES Safety Discharging Current.		
ES Voltage Rel	The controller activates an alarm <b>Wrn Safety mode</b> and at the same time calculates values <b>ES Max Discharging Power/ES MAX DISCHARGING CURRENT</b> from the setpoint <b>ES Safety Charging Current/ ES Safety Discharging Current</b> when the LAIs <b>ES MAX CHARGING CURRENT/ES MAX DISCHARGING CURRENT</b> are smaller than the setting from the setpoints ES Safety Charging Current/ES Safety Discharging Current..		
<b>Note:</b> If the loss of communication occurs or invalid data is sent to the LAI <b>ES MAX CHARGING CURRENT</b> or <b>ES MAX DISCHARGING CURRENT</b> the safety mode function always takes place.			

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## Subgroup: Target Control

### ES Target Control

Setpoint group	BESS Settings	Related FW	2.1.0
Range [units]	SOC Received/ ES Voltage Rel		
Default value	SOC Received	Force value	NO
Step	[-]		
Comm object	62737	Related applications	MINT
Config level	Advanced		
Setpoint visibility	Always		
Description			
The setting of the setpoint allows the user to choose how they would like to control the charging and discharging of the energy storage. Each setting utilizes a different approach from which the Energy Storage would be operated by. Only one of the given options is in control of the charging or discharging. For more information see <b>Energy Storage Voltage Relative Control</b> .			
SOC Received		The logic for charging and discharging is evaluated from the value ES SOC. For more information see	
ES Voltage Rel		The logic for charging and discharging is evaluated from the value ES Voltage Rel.	
<b>Note:</b> <i>Sd Wrong Precharge Settings activates if Precharge Sequence= Internal and ESCB type = Fuse/Disc. User should not be able to start with this setting.</i>			

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## Subgroup: SOC Control

### SOC High Target

Setpoint group	BESS settings	Related FW	2.1.0
Range [units]	50 .. 100 [%]		
Default value	80 %	Force value	YES
Step	1 %		
Comm object	20266	Related applications	MINT
Config level	Standard		
Setpoint visibility	ES Target Control = ES Voltage Rel		
Description			
This setpoint defines the relative maximal state of charge of the BESS. The value <b>ES SOC</b> cannot exceed this limit.			
See the chapter <b>BESS SOC Control</b> for more information.			

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## SOC High Hysteresis

Setpoint group	BESS settings	Related FW	2.1.0
Range [units]	50 .. 80 [%]		
Default value	70 %	Force value	YES
Step	1 %		
Comm object	20268	Related applications	MINT
Config level	Standard		
Setpoint visibility	ES Target Control = ES Voltage Rel		
Description			
This setpoint defines the relative level under which the value <b>ES SOC</b> must drop so the charging process can be activated again .			
See the chapter <b>BESS SOC Control</b> for more information.			

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## SOC Low Target

Setpoint group	BESS settings	Related FW	2.1.0
Range [units]	0 .. 50 [%]		
Default value	20 %	Force value	YES
Step	1 %		
Comm object	20265	Related applications	MINT
Config level	Standard		
Setpoint visibility	ES Target Control = ES Voltage Rel		
Description			
This setpoint defines the relative minimal state of charge of the BESS. The value <b>ES SOC</b> cannot drop under this limit.			
See the chapter <b>BESS SOC Control</b> for more information.			

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## SOC Low Hysteresis

Setpoint group	BESS settings	Related FW	2.1.0
Range [units]	20 .. 50 [%]		
Default value	30 %	Force value	YES
Step	1 %		
Comm object	20267	Related applications	MINT
Config level	Standard		
Setpoint visibility	ES Target Control = ES Voltage Rel		
Description			
This setpoint defines the relative level under which the value <b>ES SOC</b> must exceed so the discharging process can be activated again .			
See the chapter <b>BESS SOC Control</b> for more information.			

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## Subgroup: V Rel Control

### V Rel High Target

Setpoint group	V Rel Control	Related FW	2.1.0
Range [units]	V Rel Low Target ... 150.00 %		
Default value	80.00 %	Force value	YES
Step	0.01 %		
Comm object	62740	Related applications	MINT
Config level	Standard		
Setpoint visibility	Setpoint <b>ES Target Control</b> = ES Voltage Rel		
Description			
<p>This setpoint defines the relative maximal voltage limit of charge of the BESS. Charging of the BESS no longer takes place, when the value <b>ES Voltage</b> exceeds above the limit set by this setpoint. Once the value <b>ES Voltage</b> &gt;= V Rel High Target the LBO <b>ES V REL CHARGE DISABLED</b> changes from 0 to 1.</p> <p>See the chapter <b>Energy Storage Voltage Relative Control</b> for more information.</p>			
<b>Note:</b> This setpoint setting should be smaller than the setting of the <b>ES &gt;&gt;V</b>			

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## V Rel High Hysteresis

Setpoint group	BESS settings	Related FW	2.1.0
Range [units]	V Rel Low Target... V Rel High Target		
Default value	70.00 %	Force value	YES
Step	0.01 %		
Comm object	62742	Related applications	MINT
Config level	Standard		
Setpoint visibility	ES Target Control = ES Voltage Rel		
Description			
This setpoint defines the relative level under which the value ES Voltage Rel must drop so the charging process can be activated again .			
See the chapter <b>Energy Storage Voltage Relative Control</b> for more information.			

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## V Rel Low Target

Setpoint group	V Rel Control	Related FW	2.1.0
Range [units]	0.00 % ...V Rel High Target		
Default value	60.00 %	Force value	YES
Step	0.01 %		
Comm object	62739	Related applications	MINT
Config level	Standard		
Setpoint visibility	Setpoint <b>ES Target Control</b> = ES Voltage Rel		
Description			
<p>This setpoint defines the relative minimal state of discharge of the BESS. Discharging of the BESS no longer takes place, when the value <b>ES Voltage</b> exceeds below the limit set by this setpoint. Once the value <b>ES Voltage</b> &lt;= setpoint V Rel Low Target the <b>ES V REL DISCHARGE DISABLED</b> changes from 0 to 1</p> <p>The value <b>ES SOC</b> cannot drop under this limit.</p> <p>See the chapter <b>Energy Storage Voltage Relative Control</b> for more information.</p>			
<b>Note:</b> This setpoint setting should be larger than the setting of the <b>ES &lt;&lt;V</b>			

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## V Rel Low Hysteresis

Setpoint group	V Rel Control	Related FW	2.1.0
Range [units]	V Rel Low Target... V Rel High Target		
Default value	65.00 %	Force value	YES
Step	0.01 %		
Comm object	62741	Related applications	MINT
Config level	Standard		
Setpoint visibility	Setpoint <b>ES Target Control</b> = ES Voltage Rel		
Description			
This setpoint defines the relative level over which the value <b>ES Voltage</b> must exceed so the discharging process can be activated again.			
See the chapter <b>Energy Storage Voltage Relative Control</b> for more information.			

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## Subgroup: Battery Cycles

### Max BESS Cycles Per Day

Setpoint group	BESS settings	Related FW	2.1.0
Range [units]	OFF; 1 .. 250 [-]		
Default value	2	Force value	YES
Step	1		
Comm object	20225	Related applications	MINT
Config level	Standard		
Setpoint visibility	Always		
Description			
This setpoint is used to define the maximal daily number of battery cycles from the value <b>BESS Cycles</b> . See the chapter <b>Daily BESS cycles control</b> for more information.			

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## BESS Cycles Evaluation

Setpoint group	BESS settings	Related FW	2.1.0
Range [units]	Analog/ DOD Tracking [-]		
Default value	Analog	Force value	YES
Step			
Comm object	17551	Related applications	MINT
Config level	Standard		
Setpoint visibility	Always		
Description			
Setpoint setting allows to choose between which type of evaluation for value <b>BESS Cycles</b> is wanted. Both setpoint options increment the values <b>BESS CYCLES</b> and <b>BESS Cycles Daily Evaluated</b>			
Analog		Usage of LAI <b>BESS CYCLES</b> to increment the values of <b>BESS Cycles Daily Evaluated</b> and <b>BESS Cycles</b> .	
DOD Tracking		System uses the cumulative Depth of Discharge (DOD) algorithm. Accumulation of DOD until it bypasses the threshold set by the setpoint <b>Cycle DOD Limit</b> The values <b>BESS Cycles Daily Evaluated</b> and <b>BESS Cycles</b> increment by 1 when the threshold is surpassed.	
<b>Note:</b> Invalid data for LAI <b>ES SOC</b> or LAI <b>BESS CYCLES</b> will make the cycle evaluation suspended until no invalid data are not present. Whenever the setpoint <b>BESS Cycles Evaluation</b> is changed the internal calculation does not change and the user must do a statistic reset in order to set the values to wanted number- recommended to check that the switch of the setpoint did not influence the behavior.			
See the chapter <b>Daily BESS cycles control</b> for more information.			

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## Cycle DOD Limit

Setpoint group	BESS settings	Related FW	2.1.0
Range [units]	1 .. 100 [%]		
Default value	100	Force value	YES
Step	1		
Comm object	17550	Related applications	MINT
Config level	Standard		
Setpoint visibility	when <b>BESS Cycles Evaluation</b> = DoD Tracking		
Description			
Sets the threshold of one BESS cycle calculated from the value <b>ES SOC</b> .One BESS cycle is defined as a complete discharge of fully charged BESS or a series of partial discharges equal to the energy storage nominal capacity. Having the default 100 % setting the evaluation is taken as the nominal capacity of the energy storage. Any lower setting of the setpoint is indicating of the usage for partial capacity. The lower the setting of this setpoint the more internally calculated BESS cycles will be evaluated. See the chapter <b>Daily BESS cycles control</b> for more information.			

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## Subgroup: Starting Timers

### Precharging TO

Setpoint group	BESS settings	Related FW	2.1.0
Range [units]	1 .. 600 [s]		
Default value	30 s	Force value	YES
Step	1 s		
Comm object	20246	Related applications	MINT
Config level	Standard		
Setpoint visibility	Only if <b>Precharge Sequence</b>		
Description			
Setpoint for counting down the time during which the measured voltage via LAI <b>ES VOLTAGE MEAS</b> and LAI <b>PCS VOLTAGE MEAS</b> is expected to reach the window given by the setpoint <b>DC Voltage Window</b> .			

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## ES Ready To Load TO

Setpoint group	BESS settings	Related FW	2.1.0
Range [units]	1 .. 600 [s]		
Default value	30 s	Force value	YES
Step	1 s		
Comm object	20786	Related applications	MINT
Config level	Standard		
Setpoint visibility	Always		
Description			
This setpoint adjusts maximal waiting time for LBI <b>ES Ready To Load</b> after LBO <b>ES RUN REQUEST</b> has been activated.			

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## PCS Ready To Start TO

Setpoint group	BESS settings	Related FW	2.1.0
Range [units]	1 .. 3600 [s]		
Default value	30 s	Force value	YES
Step	1 s		
Comm object	19149	Related applications	MINT
Config level	Standard		
Setpoint visibility	Always		
Description			
This setpoint adjusts maximal waiting time for LBI <b>PCS Ready To Start</b> after the connection between the ES and PCS has been closed (for instance LBI <b>ES READY TO LOAD</b> = 1).			

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## PCS Ready To Load TO

Setpoint group	BESS settings	Related FW	2.1.0
Range [units]	0 .. 3600 [s]		
Default value	30 s	Force value	YES
Step	1 s		
Comm object	16478	Related applications	MINT
Config level	Advanced		
Setpoint visibility	Always		
Description			
This setpoint adjusts maximal waiting time for LBI <b>PCS READY TO LOAD</b> .			

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## Minimal Stabilization Time

Setpoint group	BESS settings	Related FW	2.1.0
Range [units]	1 .. Maximal Stabilization Time [s]		
Default value	2 s	Force value	YES
Step	1 s		
Comm object	8259	Related applications	MINT
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.			
<b>Note:</b> This setpoint is relevant only if <b>Starting Sequence BCB Control</b> = Start with Opened BCB.			

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## Maximal Stabilization Time

Setpoint group	BESS settings	Related FW	2.1.0
Range [units]	Minimal Stabilization Time .. 3600 [s]		
Default value	10 s	Force value	YES
Step	1 s		
Comm object	8313	Related applications	MINT
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.			
<b>Note:</b> This setpoint is relevant only if <b>Starting Sequence BCB Control = Start with Opened BCB</b> .			

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Run Only Block Delay 1

Setpoint group	BESS settings	Related FW	2.1.0
Range [units]	0.0 .. 600.0 [s]		
Default value	5.0	Force value	YES
Step	0.1		
Comm object	10023	Related applications	MINT
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.

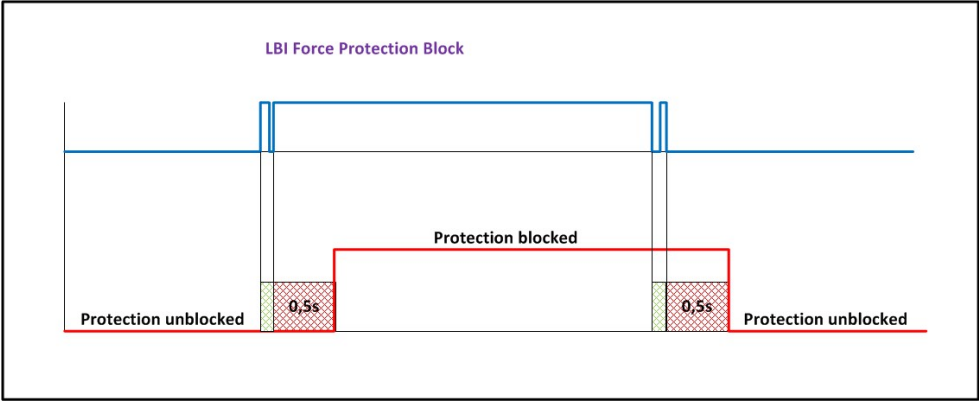


Image 7.1 Run Only Block Delay 1

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Run Only Block Delay 2

Setpoint group	BESS settings	Related FW	2.1.0
Range [units]	0.0 .. 600.0 [s]		
Default value	5.0	Force value	YES
Step	0.1		
Comm object	10024	Related applications	MINT
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.

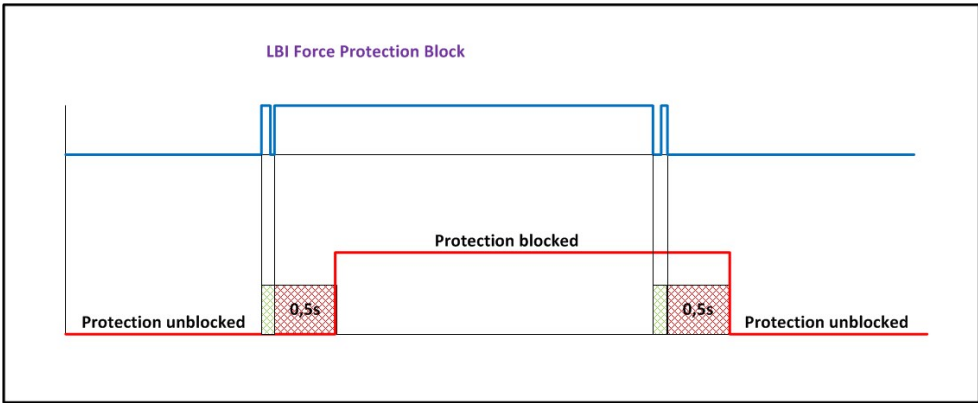


Image 7.2 Run Only Block Delay 2

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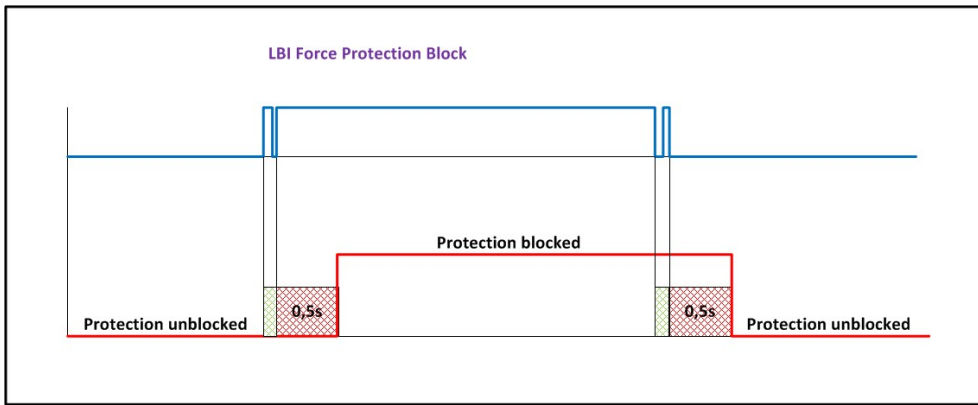


## Run Only Block Delay 3

Setpoint group	BESS settings	Related FW	2.1.0
Range [units]	0.0 .. 600.0		
Default value	5.0	Force value	YES
Step	0.1		
Comm object	10025	Related applications	MINT
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.



The diagram, titled "LBI Force Protection Block", shows a timeline of protection states. A blue line at the top represents the BESS state machine. Below it, a red line indicates the protection status. The protection is initially "Protection unblocked". It then transitions to "Protection blocked" (a red rectangle) after a delay of 0,5s. The "Protection blocked" state lasts for a duration, after which it transitions back to "Protection unblocked" after another 0,5s delay. The transitions are marked with vertical lines and labeled "0,5s".

Image 7.3 Run Only Block Delay 3

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## Subgroup: Stopping Timers

### Stop Time

Setpoint group	BESS settings	Related FW	2.1.0
Range [units]	0 .. 1200 [s]		
Default value	60 s	Force value	YES
Step	1 s		
Comm object	9815	Related applications	MINT
Config level	Advanced		
Setpoint visibility	Always		
Description			
Under normal conditions the BESS must certainly stop within this period otherwise <b>Wrn Stop Fail</b> will appear.			

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## Subgroup: ECU Settings

### Open Param Governor Speed Adjust

Setpoint group	BESS Settings	Related FW	2.1.0
Range [units]	0.000..10.000 [%]		
Default value	5.000 %	Force value	NO
Step	0.001 %		
Comm object	16617	Related applications	MINT
Config level	Standard		
Setpoint visibility	Always		
Description			
<p>This parameter will adjust BESS control characteristics to suit special requirements for stability or transient response.</p> <ul style="list-style-type: none"><li>&gt; Lower values will result in smaller control gains that offer improved steady state stability but decreased transient response.</li><li>&gt; Higher values will provide better transient response but will result in decreased steady state stability.</li></ul> <p><b>Note:</b> Nominal value of 5 provides a good balance for most applications.</p>			

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## Group: BESS Protections

### Subgroup: Overload Protection

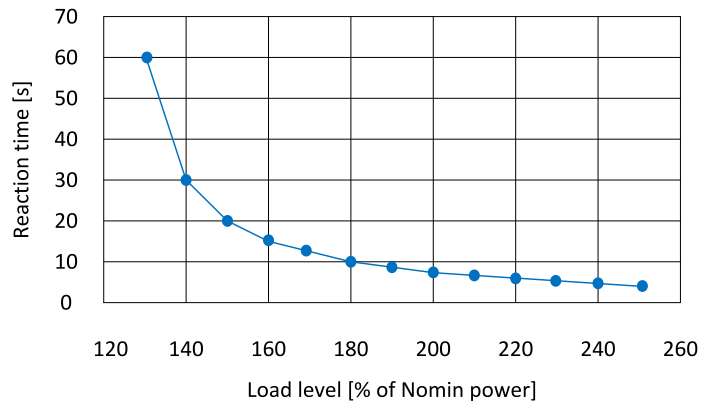
#### BESS 2POverload Evaluation Level

Setpoint group	BESS Protections	Related FW	2.1.0
Range [units]	100 .. 200 [%] of BESS Nominal power		
Default value	150 % of BESS Nominal power	Force value	YES
Step	1 % of BESS Nominal power		
Comm object	8280	Related applications	MINT
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 <b>BESS IDMT Overload Protection</b> for complete explanation of the protection.			
Load level	Reaction time [s]	2POvrldStEvDel	5 s
100	no reaction	OverldStrtEval	150 %
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

$$\text{Reaction time [s]} = \frac{2\text{POvrldStEvDel} * \text{OverldStrtEval}}{\text{GeneratorActivePower [\%]} - \text{OverldStrtEval}}$$



The reaction time of the thermal overload protection is not fixed and is specified by the parameter **BESS 2POverload Evaluation Delay**.

**Note:** Maximum reaction time is 3600 s after this time the protection is tripped.

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## BESS 2POverload Evaluation Delay

Setpoint group	BESS Protections	Related FW	2.1.0
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
Config level	Standard		
Setpoint visibility	Always		

### Description

This setpoint adjusts the default delay for the thermal overload protection. See setpoint **BESS IDMT Overload Protection** for complete explanation of the protection.

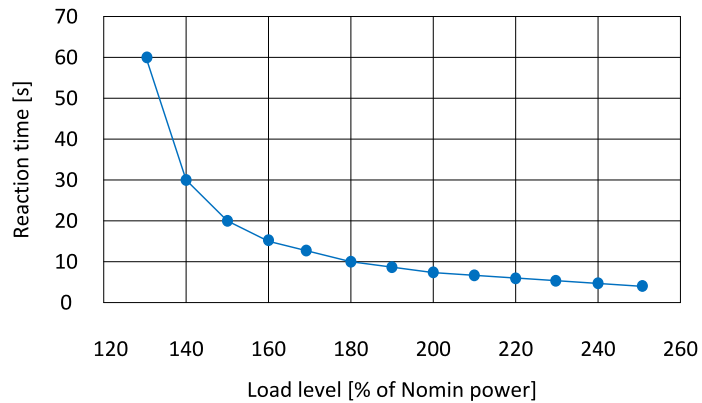
Load level	Reaction time [s]
100	no reaction
110	no reaction
120	3600 (max. value)
130	60
140	30

**2POvrldStEvDel** 5 s  
**OverldStrtEval** 150 %



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

$$\text{Reaction time [s]} = \frac{2\text{POvldStEvDel} * \text{OverldStrtEval}}{\text{GeneratorActivePower [\%]} - \text{OverldStrtEval}}$$



The reaction time of the thermal overload protection is not fixed; it depends on how much is the load above the limit of **BESS 2POverload Evaluation Level**. The higher is the load the shorter the reaction time will be.

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### Subgroup: Current Protection

### BESS Short Circuit

Setpoint group	BESS Protections	Related FW	2.1.0
Range [units]	100 .. 500 [%] of <b>BESS Nominal Current</b>		
Default value	150 % of <b>BESS Nominal Current</b>	Force value	NO
Step	1 % of <b>BESS Nominal Current</b>		
Comm object	8282	Related applications	MINT
Config level	Standard		
Setpoint visibility	Always		
Description			
This setpoint specifies the relative current threshold level for <b>Short Circuit Protection</b> .			

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## BESS Short Circuit Delay

Setpoint group	BESS Protections	Related FW	2.1.0
Range [units]	0.00 .. 10.00 [s]		
Default value	0 s	Force value	NO
Step	0.01 s		
Comm object	9991	Related applications	MINT
Config level	Advanced		
Setpoint visibility	Always		
Description			
This setpoint specifies the delay for <b>Short Circuit Protection</b> .			

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## IDMT BESS >A Delay

Setpoint group	BESS Protections	Related FW	2.1.0
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
Config level	Standard		
Setpoint visibility	Always		

### Description

This setpoint adjusts the delay for **BESS IDMT >A Protection**. For more information see **Inverse Definite Minimum Time**.

IDMT curve shape selection. IDMT Overcurrent Delay is a reaction time of IDMT protection for 200% overcurrent  $I_{BESS} = 2 \times \text{BESS Nominal Current}$

IDMT is “very inverse” over current protection. Reaction time is not constant but depends on over current level according to the following formula:

$$\text{Reaction time} = \frac{\text{IDMT BESS >A Delay} \times \text{Nominal Current}}{I_{BESS} - \text{Nominal Current}}$$

**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 7.1 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



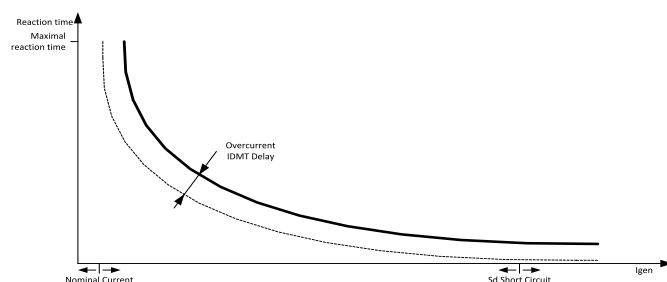


Image 7.4 IDMT Overcurrent Delay

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## BESS Current Unbalance

Setpoint group	BESS Protections	Related FW	2.1.0
Range [units]	1 .. 200 [%] of BESS Nominal power		
Default value	50 % of BESS Nominal power	Force value	NO
Step	1 % of BESS Nominal power		
Comm object	8284	Related applications	MINT
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	2.1.0
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
Config level	Advanced		
Setpoint visibility	Only if <b>Connection type</b> != MonoPhase		
Description			
This setpoint specifies the delay for <b>BESS Current Unbalance Protection</b> .			

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## Subgroup: Voltage Protection

### BESS >V

Setpoint group	BESS Protections	Related FW	2.1.0
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
Config level	Standard		
Setpoint visibility	Always		
Description			
This setpoint specifies the relative voltage threshold level for <b>BESS &gt;V Protection</b> .			
<i><b>Note: BESS Voltage L1-N, BESS Voltage L2-N, BESS Voltage L3-N, BESS Voltage L1-L2, BESS Voltage L2-L3 and BESS Voltage L3-L1 are used for this protection.</b></i>			

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### BESS >V Delay

Setpoint group	BESS Protections	Related FW	2.1.0
Range [units]	0.01 .. 600 [s]		
Default value	5.00 s	Force value	YES
Step	0.01 s		
Comm object	8292	Related applications	MINT
Config level	Standard		
Setpoint visibility	Always		
Description			
This setpoint specifies the delay for <b>BESS &gt;V Protection</b> .			

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## BESS >>V

Setpoint group	BESS Protections	Related FW	2.1.0
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
Config level	Standard		
Setpoint visibility	Always		
Description			
This setpoint specifies the relative voltage threshold level for <b>BESS &gt;&gt;V Protection</b> .			
<i><b>Note: BESS Voltage L1-N, BESS Voltage L2-N, BESS Voltage L3-N, BESS Voltage L1-L2, BESS Voltage L2-L3 and BESS Voltage L3-L1 are used for this protection.</b></i>			

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## BESS >>V Delay

Setpoint group	BESS Protections	Related FW	2.1.0
Range [units]	0.01 .. 600 [s]		
Default value	0.10 s	Force value	YES
Step	0.01 s		
Comm object	16416	Related applications	MINT
Config level	Standard		
Setpoint visibility	Always		
Description			
This setpoint specifies the delay for <b>BESS &gt;&gt;V Protection</b> .			

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## BESS <V

Setpoint group	BESS Protections	Related FW	2.1.0
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
Config level	Standard		
Setpoint visibility	Always		
Description			
This setpoint specifies the relative voltage threshold level for <b>BESS &lt;&lt;V Protection</b> .			
<i><b>Note: BESS Voltage L1-N, BESS Voltage L2-N, BESS Voltage L3-N, BESS Voltage L1-L2, BESS Voltage L2-L3 and BESS Voltage L3-L1 are used for this protection.</b></i>			

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## BESS <V Delay

Setpoint group	BESS Protections	Related FW	2.1.0
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
Config level	Standard		
Setpoint visibility	Always		
Description			
This setpoint specifies the delay for <b>BESS &lt;&lt;V Protection</b> .			

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## BESS V Unbalance

Setpoint group	BESS Protections	Related FW	2.1.0
Range [units]	1 .. 200 [%]		
Default value	10 %	Force value	YES
Step	1 %		
Comm object	8288	Related applications	MINT
Config level	Advanced		
Setpoint visibility	Only if <b>Connection type</b> != MonoPhase		
Description			
This setpoint specifies the relative voltage threshold level for <b>BESS &lt;&lt;V Protection</b> <b>BESS V Unbalance Protection</b> .			

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## BESS V Unbalance Delay

Setpoint group	BESS Protections	Related FW	2.1.0
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
Config level	Standard		
Setpoint visibility	Only if <b>Connection type</b> != MonoPhase		
Description			
This setpoint specifies the delay for <b>BESS V Unbalance Protection</b> .			

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## Subgroup: I>V Protection

### I>V Restraint

Setpoint group	Engine protection	Related FW	2.1.0
Range [units]	Enabled/Disabled		
Default value	Disabled	Force value	YES
Step			
Comm object	12286	Related applications	MINT
Config level	Standard		
Setpoint visibility	Always		
Description			
Depending on the setting of this setpoint will the protection <b>Sd I&gt;V Time Overcurrent</b> be evaluated by different conditions. Having the setpoint Disabled will the function logic of <b>Voltage Controlled Time Overcurrent Protection</b> take place. For Enabled will the evaluation be based on <b>Voltage Restrained Time Overcurrent Protection</b> .			
Disabled		The protection <b>Sd I&gt;V Time Overcurrent</b> activates when relative voltage to nominal is lower than setting of setpoint <b>I&gt;V Control</b> and current is higher than setting of setpoint <b>I&gt;V Control Current Level</b> .	
Enabled		The protection <b>Sd I&gt;V Time Overcurrent</b> activates based on the restraint curve. Setpoint <b>I&gt;V Control</b> provides starting point in the curve from which if the relative voltage to nominal is larger, tripping of the protection is applied based on the measured current.	

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## I>V Control

Setpoint group	Engine protection	Related FW	2.1.0
Range [units]	1.0 - 200.0 [%] of BESS Nominal Voltage Ph-N		
Default value	200.0 %	Force value	YES
Step	0.1 %		
Comm object	12285	Related applications	MINT
Config level	Standard		
Setpoint visibility	Always		
Description			
Sets the threshold from which the protection <b>Sd I&gt;V Time Overcurrent</b> starts to be evaluate based on the voltage compared to the nominal voltage.Dependng on the setting of setpoint I>V Restraint is the evaluation different. For more information see the <b>Voltage Controlled Time Overcurrent Protection</b> or <b>Voltage Restrained Time Overcurrent Protection</b> .			

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## I>V Control Current Level

Setpoint group	Engine protection	Related FW	2.1.0
Range [units]	1 - 250 [%] of BESS Nominal Current		
Default value	50 %	Force value	YES
Step	1 %		
Comm object	16271	Related applications	MINT
Config level	Standard		
Setpoint visibility	Always		
Description			
Sets the threshold from which the protection <b>Sd I&gt;V Time Overcurrent</b> starts to be evaluate based on the current compared to the nominal current.Dependent on the setting of setpoint I>V Restraint is the evaluation different. For more information see the <b>Voltage Controlled Time Overcurrent Protection</b> or <b>Voltage Restrained Time Overcurrent Protection</b> .			

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## I>V Delay

Setpoint group	Engine protection	Related FW	2.1.0
Range [units]	0.1 ... 600.0 [s]		
Default value	1.0 s	Force value	YES
Step	0.1 s		
Comm object	12276	Related applications	MINT
Config level	Standard		
Setpoint visibility	Always		
Description			
This setpoint adjusts the reaction time and reset time delay for <b>Sd I&gt;V Time Overcurrent</b> protection to activate after conditions for the protection are present. The total reaction time and reset time is taken from this delay setting and from the setting of setpoint <b>IDMT Curve</b> . For more information see the <b>Voltage Controlled Time Overcurrent Protection</b> or <b>Voltage Restrained Time Overcurrent Protection</b> .			

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## Subgroup: Frequency Protection

### BESS >f

Setpoint group	BESS Protections	Related FW	2.1.0
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
Config level	Standard		
Setpoint visibility	Always		
Description			
This setpoint adjusts maximal accepted frequency for <b>BESS &gt;f Protection</b> .			
<b>IMPORTANT: When Active Application = MINT this setpoint also specifies the maximal accepted frequency for Bus &gt;f Protection.</b>			
<b>Note:</b> $f_{max} = \text{Nominal Frequency} + \text{BESS } >f$			

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## BESS >f Delay

Setpoint group	BESS Protections	Related FW	2.1.0
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
Config level	Standard		
Setpoint visibility	Always		
Description			
This setpoint specifies the delay for <b>BESS &gt;f Protection</b> .			
<b>IMPORTANT: When Active Application = MINT this setpoint also specifies the maximal accepted frequency for Bus &gt;f Protection.</b>			

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## BESS <f

Setpoint group	BESS Protections	Related FW	2.1.0
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
Config level	Standard		
Setpoint visibility	Always		
Description			
This setpoint adjusts maximal accepted frequency for <b>BESS &lt;f Protection</b> .			
<b>IMPORTANT: When Active Application = MINT this setpoint also specifies the maximal accepted frequency for Bus &lt;f Protection.</b>			
<b>Note:</b> $f_{min}$ = Nominal Frequency - BESS <f			

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## BESS <f Delay

Setpoint group	BESS Protections	Related FW	2.1.0
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
Config level	Standard		
Setpoint visibility	Always		
Description			
This setpoint specifies the delay for <b>BESS &lt;f Protection</b> .			
<b>IMPORTANT: When Active Application = MINT this setpoint also specifies the maximal accepted frequency for Bus &lt;f Protection.</b>			

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## Subgroup: Earth Fault Current Protection

### IDMT Earth Fault Current Sd

Setpoint group	BESS Protections	Related FW	2.1.0
Range [units]	0..10000 [A]		
Default value	10 A	Force value	NO
Step	1 A		
Comm object	20791	Related applications	MINT
Config level	Standard		
Setpoint visibility	Always		
Description			
This setpoint is used as "nominal" reference for the IDMT protection upon the Earth Fault Current..			

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### IDMT Earth Fault Current Delay

Setpoint group	BESS Protections	Related FW	2.1.0
Range [units]	0..600,0 [s]		
Default value	5,0 s	Force value	NO
Step	0,1 s		
Comm object	20792	Related applications	MINT
Config level	Standard		
Setpoint visibility	Always		
Description			
This setpoint is used for delay calculating for IDMT Earth Fault Current Protection.			

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## Group: ES Protections

### Subgroup: Voltage Protection

#### ES >V

Setpoint group	ES Protections	Related FW	2.1.0
Range [units]	100 % .. ES >>V		
Default value	105 %	Force value	YES
Step	1 [%]		
Comm object	19587	Related applications	MINT
Config level	Advanced		
Setpoint visibility	Always		
Description			
This setpoint specifies the relative voltage threshold level for <b>ES &gt;V Protection</b> .			
<i><b>Note: ES Voltage Meas</b> is used for this protection.</i>			

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#### ES >V Delay

Setpoint group	ES Protections	Related FW	2.1.0
Range [units]	0,01 .. 600,00 [s]		
Default value	2,00 s	Force value	YES
Step	0,01 [s]		
Comm object	19586	Related applications	MINT
Config level	Advanced		
Setpoint visibility	Always		
Description			
This setpoint specifies the delay for <b>ES &gt;V Protection</b> .			

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#### ES >>V

Setpoint group	ES Protections	Related FW	2.1.0
Range [units]	ES >V .. 150 [%]		
Default value	110 %	Force value	YES
Step	1 [%]		
Comm object	19585	Related applications	MINT
Config level	Advanced		
Setpoint visibility	Always		
Description			
This setpoint specifies the relative voltage threshold level for <b>ES &gt;&gt;V Protection</b> .			
<i><b>Note: ES Voltage Meas</b> is used for this protection.</i>			



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## ES >>V Delay

Setpoint group	ES Protections	Related FW	2.1.0
Range [units]	0,01 .. 600,00 [s]		
Default value	0,02 s	Force value	YES
Step	0,01 [s]		
Comm object	19584	Related applications	MINT
Config level	Advanced		
Setpoint visibility	Always		
Description			
This setpoint specifies the delay for <b>ES &gt;&gt;V Protection</b> .			

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## ES <V

Setpoint group	ES Protections	Related FW	2.1.0
Range [units]	ES <<V .. 99 [%]		
Default value	95 %	Force value	YES
Step	1 [%]		
Comm object	19583	Related applications	MINT
Config level	Advanced		
Setpoint visibility	Always		
Description			
This setpoint specifies the relative voltage threshold level for <b>ES &lt;V Protection</b> .			
<i><b>Note:</b> ES Voltage Meas is used for this protection.</i>			

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## ES < VDelay

Setpoint group	ES Protections	Related FW	2.1.0
Range [units]	0,01 .. 600,00 [s]		
Default value	2,00 s	Force value	YES
Step	0,01 [s]		
Comm object	19582	Related applications	MINT
Config level	Advanced		
Setpoint visibility	Always		
Description			
This setpoint specifies the delay for <b>ES &lt;V Protection</b> .			

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## ES <<V

Setpoint group	ES Protections	Related FW	2.1.0
Range [units]	20 .. ES <V [%]		
Default value	90 %	Force value	YES
Step	1 [%]		
Comm object	19581	Related applications	MINT
Config level	Advanced		
Setpoint visibility	Always		
Description			
This setpoint specifies the relative voltage threshold level for ES <<V Protection.			
Note: ES Voltage Meas is used for this protection.			

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## ES <<V Delay

Setpoint group	ES Protections	Related FW	2.1.0
Range [units]	0,01 .. 600,00 [s]		
Default value	0,02 s	Force value	YES
Step	0,01 [s]		
Comm object	19580	Related applications	MINT
Config level	Advanced		
Setpoint visibility	Always		
Description			
This setpoint specifies the delay for <b>ES &lt;&lt;V Protection</b> .			

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## Subgroup: SOC Protection

### ES <SOC

Setpoint group	BESS Protections	Related FW	2.1.0
Range [units]	ES <<SOC .. 50 [%] of ES Nominal Capacity		
Default value	10 % of ES Nominal Capacity	Force value	YES
Step	1 % of ES Nominal Capacity		
Comm object	20263	Related applications	MINT
Config level	Advanced		
Setpoint visibility	Always		
Description			
This setpoint specifies the relative state of charge threshold level for ES <SOC Protection. Having the SOC below the threshold of the setting of the setpoint more than 5 seconds will activate alarm Wrn SOC Low Alarm.			

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### ES >SOC

Setpoint group	BESS Protections	Related FW	2.1.0
Range [units]	50 .. ES >>SOC [%] of ES Nominal Capacity		
Default value	90 % of ES Nominal Capacity	Force value	YES
Step	1 % of ES Nominal Capacity		
Comm object	20264	Related applications	MINT
Config level	Advanced		
Setpoint visibility	Always		
Description			
This setpoint specifies the relative state of charge threshold level for ES >SOC Protection.Having the SOC above the threshold of the setting of the setpoint more than 5 seconds will activate alarm Wrn SOC High Alarm..			

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## ES <<SOC

Setpoint group	BESS Protections	Related FW	2.1.0
Range [units]	0 .. ES <SOC [%] of ES Nominal Capacity		
Default value	5 % of ES Nominal Capacity	Force value	YES
Step	1 % of ES Nominal Capacity		
Comm object	20261	Related applications	MINT
Config level	Advanced		
Setpoint visibility	Always		
Description			
This setpoint specifies the relative state of charge threshold level for ES <<SOC Protection. Having the SOC below the threshold of the setting of the setpoint more than 5 seconds will activate alarm <b>Sd SOC Critical Low</b> .			

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## ES >>SOC

Setpoint group	BESS Protections	Related FW	2.1.0
Range [units]	ES >SOC .. 120 [%] of ES Nominal Capacity		
Default value	100 % of ES Nominal Capacity	Force value	YES
Step	1 % of ES Nominal Capacity		
Comm object	20262	Related applications	MINT
Config level	Advanced		
Setpoint visibility	Always		
Description			
This setpoint specifies the relative state of charge threshold level for ES >>SOC Protection.Having the SOC above the threshold of the setting of the setpoint more than 5 seconds will activate alarm <b>Sd SOC Critical High</b> .			

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## Subgroup: ES Temperature Protection

### ES > Temperature

Setpoint group	ES Protections	Related FW	2.1.0
Range [units]	ES >SOC		
Default value	45	Force value	YES
Step	1		
Comm object	62730	Related applications	MINT
Config level	Standard		
Setpoint visibility	Always		
Description			
When value <b>ES Temperature</b> is above the setting of this setpoint alarm <b>Wrn ES &gt; Temperature</b> appears after setpoint <b>ES &lt;&gt; Temperature Delay</b> elapsing.			

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### ES >> Temperature

Setpoint group	ES Protections	Related FW	2.1.0
Range [units]	ES >SOC		
Default value	55	Force value	YES
Step	1		
Comm object	62731	Related applications	MINT
Config level	Standard		
Setpoint visibility	Always		
Description			
When value <b>ES Temperature</b> is above the setting of this setpoint alarm <b>Sd ES &gt;&gt; Temperature</b> appears after setpoint <b>ES &lt;&gt; Temperature Delay</b> elapsing.			

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## ES << Temperature

Setpoint group	ES Protections	Related FW	2.1.0
Range [units]	ES >SOC		
Default value	-15	Force value	YES
Step	1		
Comm object	62732	Related applications	MINT
Config level	Standard		
Setpoint visibility	Always		
Description			
When value <b>ES Temperature</b> is below the setting of this setpoint alarm <b>Sd ES &lt;&lt; Temperature</b> appears after setpoint <b>ES &lt;&gt; Temperature Delay</b> elapsing.			

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## ES <> Temperature Delay

Setpoint group	ES Protections	Related FW	2.1.0
Range [units]	ES >SOC		
Default value	1 s	Force value	YES
Step	1 s		
Comm object	62733	Related applications	MINT
Config level	Standard		
Setpoint visibility	Always		
Description			
Protection evaluation delay for value <b>ES Temperature</b> .			

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## Subgroup: Cell Protection

### Cell >V

Setpoint group	ES Protections	Related FW	2.1.0
Range [units]	ES >SOC		
Default value	3,60	Force value	YES
Step	0,01		
Comm object	62707	Related applications	MINT
Config level	Standard		
Setpoint visibility	Always		
Description			
When value <b>Cell Max Voltage</b> is above the setting of this setpoint alarm <b>Wrn Cell &gt; Voltage</b> appears after setpoint Cell <b>Cell &lt;&gt;V Delay</b> .			

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### Cell >>V

Setpoint group	ES Protections	Related FW	2.1.0
Range [units]	ES >SOC		
Default value	4,00	Force value	YES
Step	0,01		
Comm object	62706	Related applications	MINT
Config level	Standard		
Setpoint visibility	Always		
Description			
When value <b>Cell Max Voltage</b> is above the setting of this setpoint alarm <b>Sd Cell &gt;&gt; Voltage</b> appears after setpoint <b>Cell &lt;&gt;V Delay</b> .			

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## Cell <V

Setpoint group	ES Protections	Related FW	2.1.0
Range [units]	ES >SOC		
Default value	2,90	Force value	YES
Step	0,01		
Comm object	62705	Related applications	MINT
Config level	Standard		
Setpoint visibility	Always		
Description			
When value <b>Cell Min Voltage</b> is below the setting of this setpoint alarm <b>Wrn Cell &lt; Voltage</b> appears after setpoint <b>Cell &lt;&gt;V Delay</b> .			

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## Cell <<V

Setpoint group	ES Protections	Related FW	2.1.0
Range [units]	ES >SOC		
Default value	2,70	Force value	YES
Step	0,01		
Comm object	62704	Related applications	MINT
Config level	Standard		
Setpoint visibility	Always		
Description			
When value <b>Cell Min Voltage</b> is below the setting of this setpoint, alarm <b>Sd Cell &lt;&lt; Voltage</b> appears after setpoint <b>Cell &lt;&gt;V Delay</b> .			

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## Cell <>V Delay

Setpoint group	ES Protections	Related FW	2.1.0
Range [units]	ES >SOC		
Default value	1,0	Force value	YES
Step	0,1		
Comm object	62698	Related applications	MINT
Config level	Standard		
Setpoint visibility	Always		
Description			
Protection evaluation delay for values <b>Cell Max Voltage</b> and <b>Cell Min Voltage</b> .			

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## Cell >Temperature

Setpoint group	ES Protections	Related FW	2.1.0
Range [units]	ES >SOC		
Default value	40	Force value	YES
Step	1		
Comm object	62703	Related applications	MINT
Config level	Standard		
Setpoint visibility	Always		
Description			
When value <b>Cell Max Temperature</b> is above the setting of this setpoint alarm <b>Wrn Cell &gt; Temperature</b> appears after setpoint <b>Cell &lt;&gt;Temperature Delay</b> .			

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## Cell >>Temperature

Setpoint group	ES Protections	Related FW	2.1.0
Range [units]	0 .. 32767 [°C / °F] (based on Units selected in configuration)		
Default value	45	Force value	YES
Step	1		
Comm object	62702	Related applications	MINT
Config level	Standard		
Setpoint visibility	Always		
Description			
When value <b>Cell Max Temperature</b> is above the setting of this setpoint alarm <b>Sd Cell &gt;&gt; Temperature</b> appears after setpoint <b>Cell &lt;&gt;Temperature Delay</b> .			

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## Cell <Temperature

Setpoint group	ES Protections	Related FW	2.1.0
Range [units]	ES >SOC		
Default value	-10	Force value	YES
Step	1		
Comm object	62701	Related applications	MINT
Config level	Standard		
Setpoint visibility	Always		
<b>Description</b>			
When value <b>Cell Min Temperature</b> is below the setting of this setpoint alarm <b>Wrn Cell &lt; Temperature</b> appears after setpoint <b>Cell &lt;&gt;Temperature Delay</b> .			

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## Cell <<Temperature

Setpoint group	ES Protections	Related FW	2.1.0
Range [units]	ES >SOC		
Default value	-20	Force value	YES
Step	1		
Comm object	62700	Related applications	MINT
Config level	Standard		
Setpoint visibility	Always		
<b>Description</b>			
When value <b>Cell Min Temperature</b> is below the setting of this setpoint, alarm <b>Sd Cell &lt;&lt; Temperature</b> appears after setpoint <b>Cell &lt;&gt;Temperature Delay</b> .			

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## Cell <>Temperature Delay

Setpoint group	ES Protections	Related FW	2.1.0
Range [units]	ES >SOC		
Default value	1	Force value	YES
Step	1		
Comm object	62699	Related applications	MINT
Config level	Standard		
Setpoint visibility	Always		
<b>Description</b>			
Protection evaluation delay for values <b>Cell Max Temperature</b> and <b>Cell Min Temperature</b> .			

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## Group: Multi BMS

### Multi BMS

Setpoint group	Multi BMS	Related FW	2.1.0
Range [units]	Enabled/Disabled		
Default value	Disabled	Force value	NO
Step			
Comm object	17662	Related applications	MINT
Config level	Advanced		
Setpoint visibility	All the time		
Description			
<p>This setpoint Enables the Multi BMS function. Having the setpoint set as Enabled ar SW key Multi BMS needs to be present.</p> <p>➤ SW key Multi BMS Control 8 BMS = 1 (allows operation of up to 8 BMS)</p> <p>By chance that the setpoint is enabled and the SW key is not present, an alarm Wrn SW Key Multi BMS Control Error appears and does not allow the use of multibms functions.</p>			

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### SBMB Breaker Feedback TO

Setpoint group	Multi BMS	Related FW	2.1.0
Range [units]	0 .. 600		
Default value	60 s	Force value	NO
Step	0.1 [s]		
Comm object	17644	Related applications	MINT
Config level	Advanced		
Setpoint visibility	setpoint Multi BMS = Enabled		
Description			
This setpoint adjusts the length of breaker closing attempt. Example: When set to 5.0s, the LBO <b>SBMB CLOSE/OPEN 1... SBMB CLOSE/OPEN 8</b> is active for 5.0 s.			

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### String V>

Setpoint group	Multi BMS	Related FW	2.1.0
Range [units]	20...99		
Default value	95	Force value	NO
Step	1 [%]		
Comm object	17642	Related applications	MINT
Config level	Advanced		
Setpoint visibility	setpoint Multi BMS = Enabled		
Description			
This setpoint specifies the relative voltage threshold level for <b>String Voltage 1... String Voltage 8</b> .			



**Note:** Evaluation is taken from setpoint ES Nominal Voltage and if the value String Voltage 1...8 is above the setting of the setpoint String V< a protection Wrn String 1... 8 Diff Voltage appears after the countdown of setpoint String <> V Delay. The battery string with voltage out of threshold level will not participate in MultiBMS function.

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### String V<

Setpoint group	Multi BMS	Related FW	2.1.0
Range [units]	100...150		
Default value	95	Force value	NO
Step	1 [%]		
Comm object	17641	Related applications	MINT
Config level	Advanced		
Setpoint visibility	setpoint Multi BMS = Enabled		
Description			
This setpoint specifies the relative voltage threshold level for <b>String Voltage 1... String Voltage 8</b> .			
<i><b>Note:</b> Evaluation is taken from setpoint ES Nominal Voltage and if the value String Voltage 1...8 is above the setting of the setpoint String V&lt; a protection Wrn String 1... 8 Diff Voltage appears after the countdown of setpoint String &lt;&gt; V Delay. The battery string with voltage out of threshold level will not participate in MultiBMS function.</i>			

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### String <> V Delay

Setpoint group	Multi BMS	Related FW	2.1.0
Range [units]	0 .. 600 [s]		
Default value	1 s	Force value	YES
Step	1 [s]		
Comm object	17643	Related applications	MINT
Config level	Advanced		
Setpoint visibility	setpoint Multi BMS = Enabled		
Description			
Delay for Battery String protections. Having the LA <b>STRING VOLTAGE 1</b> is above the setpoint <b>String V&gt;</b> or below the setpoint <b>String V&lt;</b> a protection Wrn String 1..8 Diff Voltage appears after countdown of setpoint String <> V Delay.			

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## Group: Group: PCS Protections

### Subgroup: Current Protection

#### PCS Short Circuit Level

Setpoint group	PCS Protections	Related FW	2.1.0
Range [units]	100 .. 500 [%]		
Default value	150 %	Force value	YES
Step	1 [%]		
Comm object	19614	Related applications	MINT
Config level	Advanced		
Setpoint visibility	Always		
Description			
This setpoint specifies the relative current threshold level for <b>PCS Short Cicuit Protection</b> .			
<i><b>Note:</b> PCS Current Meas is used for this protection.</i>			

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#### PCS Short Circuit Delay

Setpoint group	PCS Protections	Related FW	2.1.0
Range [units]	0,00 .. 10,00 [s]		
Default value	0,00 s	Force value	YES
Step	0,01 [s]		
Comm object	19613	Related applications	MINT
Config level	Advanced		
Setpoint visibility	Always		
Description			
This setpoint specifies the delay for <b>PCS Short Cicuit Protection</b> .			

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#### PCS IDMT >A Delay

Setpoint group	PCS Protections	Related FW	2.1.0
Range [units]	1,0 .. 600,0 [s]		
Default value	4,0 s	Force value	YES
Step	0,1 [s]		
Comm object	19611	Related applications	MINT
Config level	Advanced		
Setpoint visibility	Always		
Description			
This setpoint adjusts the delay for <b>PCS IDMT &gt;A Protection</b> .			
IDMT PCS Overcurrent Delay is a reaction time of IDMT protection for 200% overcurrent $I_{BESS} = 2 \cdot I_{BESS}$			



## 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:

$$\text{Reaction time} = \frac{\text{IDMT PCS >A Delay} \times \text{ES Nominal Current}}{I_{ES} - \text{ES Nominal Current}}$$

**Note:** Reaction time is limited to 3600 s = 60 minutes. IDMT protection is not active for Reaction time values longer than 60 minutes.

IBESS is maximal value of all measured phases of BESS current.

	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

Table 7.2 EXAMPLE of Reaction time for different PCS Overcurrent levels

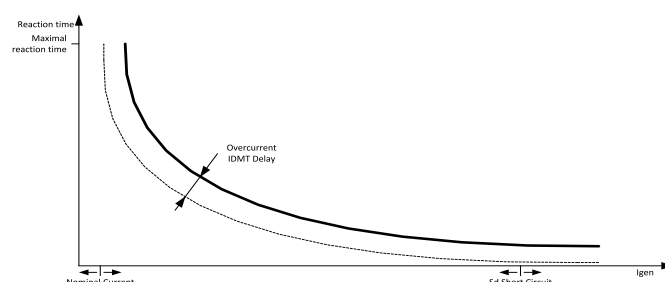


Image 7.5 IDMT PCS Overcurrent Delay

**Note:** PCS Current Meas is used for this protection.

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## Subgroup: Voltage Protection

### PCS >V

Setpoint group	PCS Protections	Related FW	2.1.0
Range [units]	100 % .. <b>PCS &gt;&gt;V</b>		
Default value	105 %	Force value	YES
Step	1 [%]		
Comm object	19630	Related applications	MINT
Config level	Advanced		
Setpoint visibility	Always		
Description			
This setpoint specifies the relative voltage threshold level for <b>PCS &gt;V Protection</b> .			
<i><b>Note: PCS Voltage Meas</b> is used for this protection.</i>			

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## PCS >V Delay

Setpoint group	PCS Protections	Related FW	2.1.0
Range [units]	0,01 .. 600,00 [s]		
Default value	2,00 s	Force value	YES
Step	0,01 [s]		
Comm object	19629	Related applications	MINT
Config level	Advanced		
Setpoint visibility	Always		
Description			
This setpoint specifies the delay for <b>ES &gt;V Protection</b> .			

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## PCS >>V

Setpoint group	PCS Protections	Related FW	2.1.0
Range [units]	PCS >V .. 150 [%]		
Default value	110 %	Force value	YES
Step	1 [%]		
Comm object	19628	Related applications	MINT
Config level	Advanced		
Setpoint visibility	Always		
Description			
This setpoint specifies the relative voltage threshold level for PCS >>V Protection.			
Note: PCS Voltage Meas is used for this protection.			

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## PCS >>V Delay

Setpoint group	PCS Protections	Related FW	2.1.0
Range [units]	0,01 .. 600,00 [s]		
Default value	0,02 s	Force value	YES
Step	0,01 [s]		
Comm object	19627	Related applications	MINT
Config level	Advanced		
Setpoint visibility	Always		
Description			
This setpoint specifies the delay for <b>ES &gt;&gt;V Protection</b> .			

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## PCS <V

Setpoint group	PCS Protections	Related FW	2.1.0
Range [units]	PCS <<V .. 99 [%]		
Default value	95 %	Force value	YES
Step	1 [%]		
Comm object	19626	Related applications	MINT
Config level	Advanced		
Setpoint visibility	Always		
Description			
This setpoint specifies the relative voltage threshold level for <b>PCS &lt;V Protection</b> .			
<i><b>Note:</b> PCS Voltage Meas is used for this protection.</i>			

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## PCS <V Delay

Setpoint group	PCS Protections	Related FW	2.1.0
Range [units]	0,01 .. 600,00 [s]		
Default value	2,00 s	Force value	YES
Step	0,01 [s]		
Comm object	19625	Related applications	MINT
Config level	Advanced		
Setpoint visibility	Always		
Description			
This setpoint specifies the delay for <b>ES &lt;V Protection</b> .			

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## PCS <<V

Setpoint group	PCS Protections	Related FW	2.1.0
Range [units]	20 .. <b>PCS &lt;V</b> [%]		
Default value	90 %	Force value	YES
Step	1 [%]		
Comm object	19624	Related applications	MINT
Config level	Advanced		
Setpoint visibility	Always		
Description			
This setpoint specifies the relative voltage threshold level for <b>PCS &lt;&lt;V Protection</b> .			
<i><b>Note: PCS Voltage Meas</b> is used for this protection.</i>			

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## PCS <<V Delay

Setpoint group	PCS Protections	Related FW	2.1.0
Range [units]	0,01 .. 600,00 [s]		
Default value	0,02 s	Force value	YES
Step	0,01 [s]		
Comm object	19623	Related applications	MINT
Config level	Advanced		
Setpoint visibility	Always		
Description			
This setpoint specifies the delay for <b>ES &lt;&lt;V Protection</b> .			

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### Group: Protections

#### Subgroup: Overload Protection

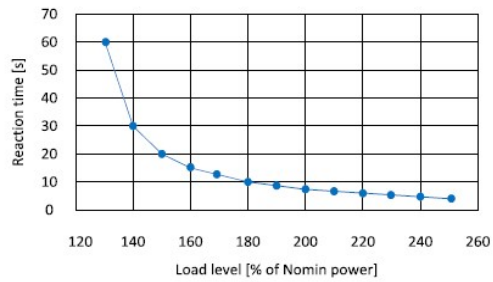
#### BESS IDMT Overload Protection

Setpoint group	Protections	Related FW	2.1.0
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
Config level	Advanced		
Setpoint visibility	Always		
Description			
This setpoint enables or disables BESS IDMT Overload Protection.			
Behavior of protection is adjusted via setpoints <b>BESS 2POverload Evaluation Level</b> and <b>BESS 2POverload Evaluation Delay</b> . This protection activates alarm <b>Sd IDMT Overload</b> .			
The reaction time is calculated by this formula:			
$\text{Reaction time} = \frac{2\text{POverload Start Evaluation Level} \times 2\text{Poverload Start Evaluation Delay}}{\frac{\text{BESS } P}{\text{Nominal Power}} \times 100 \times 2\text{Poverload Start Evaluation Level}}$			
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

2POverload Start Evaluation Level = 120 %  
2POverload Start Evaluation Delay = 5 s



#### 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	Protections	Related FW	2.1.0
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
Config level	Advanced		
Setpoint visibility	Always		
Description			
This setpoint enables or disables Short Circuit Protection.			
Behavior of protection is adjusted via setpoints <b>BESS Short Circuit</b> and <b>BESS Short Circuit Delay</b> . When value of <b>BESS Current L1</b> , <b>BESS Current L2</b> and <b>BESS Current L3</b> related to <b>BESS Nominal Current</b> cross over <b>BESS Short Circuit</b> for time longer than <b>BESS Short Circuit Delay</b> alarm <b>Sd Short Circuit</b> 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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### BESS IDMT >A Protection

Setpoint group	Protections	Related FW	2.1.0
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
Config level	Advanced		
Setpoint visibility	Always		
Description			
This setpoint enables or disables BESS IDMT >A Protection. For more information see <b>Overcurrent Protection</b> .			
Behavior of protection is adjusted via setpoints <b>IDMT BESS &gt;A Delay</b> . This protection activates alarm <b>Sd IDMT BESS &gt;A</b> .			
The reaction time is calculated by this formula:			

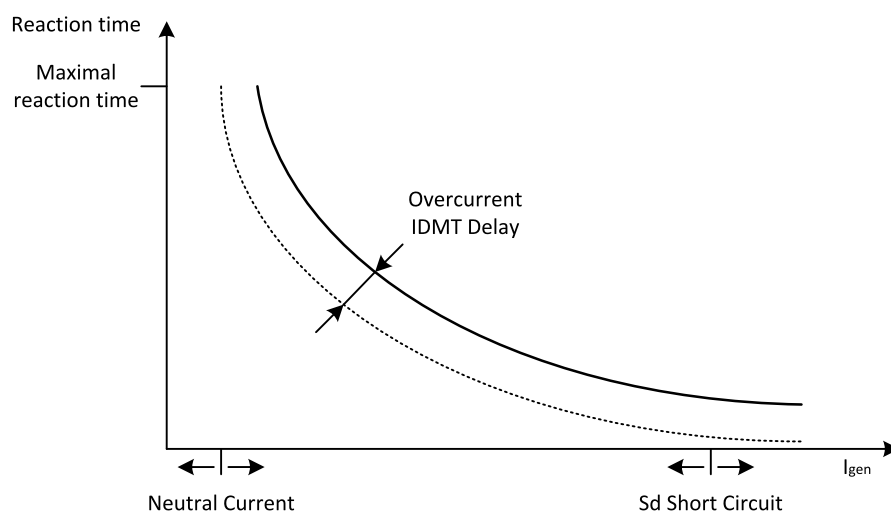


$$\text{Reaction time} = \frac{IDMT \text{ BESS} > A \text{ Delay} \times \text{Nominal Current}}{I_{\text{gen}} - \text{Nominal Current}}$$

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	Protections	Related FW	2.1.0									
Range [units]	Enabled / Blocked / Protection Force Blocked 1 / Protection Force Blocked 2 / Protection Force Blocked 3 [-]											
Default value	Blocked	Force value	YES									
Step	[-]											
Comm object	15667	Related applications	MINT									
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 <b>BESS Current Unbalance</b> and <b>BESS Current Unbalance Delay</b> . When relative difference between BESS currents is over setpoint <b>BESS Current Unbalance</b> for time longer than <b>BESS Current Unbalance Delay</b> alarm <b>Sd BESS Current Unbalance</b> is activated.												
IMPORTANT: Behavior of this protection is influenced by setpoint Connection type												
<table><tr><th>Connection type</th><th>Compared values (maximum difference)</th></tr><tr><td>3Ph4Wire</td><td rowspan="4">(BESS Current L1,BESS Current L1</td></tr><tr><td>High Leg D</td></tr><tr><td>3Ph3Wire</td></tr><tr><td>SplitPhase</td></tr><tr><td>MonoPhase</td><td>No protection is evaluated.</td></tr></table>				Connection type	Compared values (maximum difference)	3Ph4Wire	(BESS Current L1,BESS Current L1	High Leg D	3Ph3Wire	SplitPhase	MonoPhase	No protection is evaluated.
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:												
<div>&gt; Enabled / Blocked : Protection is enabled / blocked .</div> <div>&gt; Protection Force Block 1 / 2 / 3: Protection is enabled or disabled by the state of LBI <b>PROTECTION FORCE DISABLE BLOCK 1 / PROTECTION FORCE DISABLE BLOCK 2 / PROTECTION FORCE DISABLE BLOCK 3</b>.</div>												
IMPORTANT: If this protection is blocked, the BCB cannot be closed.												

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## I>V Protection

Setpoint group	Protections	Related FW	2.1.0
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	62712	Related applications	MINT
Config level	Advanced		
Setpoint visibility	Always		

### Description

This setpoint enables or blocks the I>V Control protection. For more information see the **Voltage Controlled Time Overcurrent Protection** or **Voltage Restrained Time Overcurrent Protection**. When protection is enabled, the behavior of protection is adjusted via setpoints I>V Control and I>V Restraint (in some cases I>V Control Current Level).

**IMPORTANT: Behavior of this protection is influenced by setpoint Connection type**

Connection type	Nominal voltage utilized for the evaluation of the protection	Evaluated values
3Ph4Wire	<b>BESS Nominal Voltage Ph-N</b>	<b>BESS Voltage L1-N, BESS Voltage L2-N, BESS Voltage L3-N</b>
High Leg D	<b>BESS Nominal Voltage Ph-N</b>	<b>BESS Voltage L1-N, BESS Voltage L2-N, BESS Voltage L3-N</b>
3Ph3Wire	<b>BESS Nominal Voltage Ph-Ph</b>	<b>BESS Voltage L1-L2, BESS Voltage L2-L3, BESS Voltage L3-L1</b>
SplitPhase	<b>BESS Nominal Voltage Ph-N</b>	<b>BESS Voltage L1-N, BESS Voltage L2-N</b>
MonoPhase	<b>BESS Nominal Voltage Ph-N</b>	<b>BESS Voltage L1-N</b>

### 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: Even if this protection is blocked, the BCB can still be closed. The closing of the breaker is no longer allowed until the protection **Sd I>V Time Overcurrent** is activated.**

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## PCS Short Circuit Protection

Setpoint group	Protections	Related FW	2.1.0
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	19612	Related applications	MINT
Config level	Advanced		
Setpoint visibility	Always		
Description			
This setpoint enables or disables PCS Short Circuit Protection.			
Behavior of protection is adjusted via setpoints <b>PCS Short Circuit Level</b> and <b>PCS Short Circuit Delay</b> . When value <b>PCS Current Meas</b> exceeds limit set by <b>PCS Short Circuit Level</b> for time longer than <b>PCS Short Circuit Delay</b> appropriate 2nd level alarm is activated <b>Sd PCS Short Circuit</b> .			
Setpoint options:			
➤ Enabled / Blocked : Protection is enabled / blocked .			
➤ Protection Force Block 1 / 2 / 3: Protection is enabled or disabled by the state of LBI <b>PROTECTION FORCE DISABLE BLOCK 1 / PROTECTION FORCE DISABLE BLOCK 2 / PROTECTION FORCE DISABLE BLOCK 3</b>			

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## PCS IDMT >A Protection

Setpoint group	Protections	Related FW	2.1.0
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	19610	Related applications	MINT
Config level	Advanced		
Setpoint visibility	Always		
Description			
This setpoint enables or disables PCS IDMT >A Protection.			
Behavior of protection is adjusted via setpoints <b>PCS IDMT &gt;A Delay</b> . If tripped this protection activates appropriate 2nd level alarm.			
The reaction time is calculated by this formula:			
$\text{Reaction time} = \frac{IDMT \text{ PCS } >A \text{ Delay} \times ES \text{ Nominal Current}}{I_{ES} - ES \text{ Nominal Current}}$			
<b>Note:</b> 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		
		$\leq 100\%$	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

Table 7.3 EXAMPLE of Reaction time for different PCS Overcurrent levels

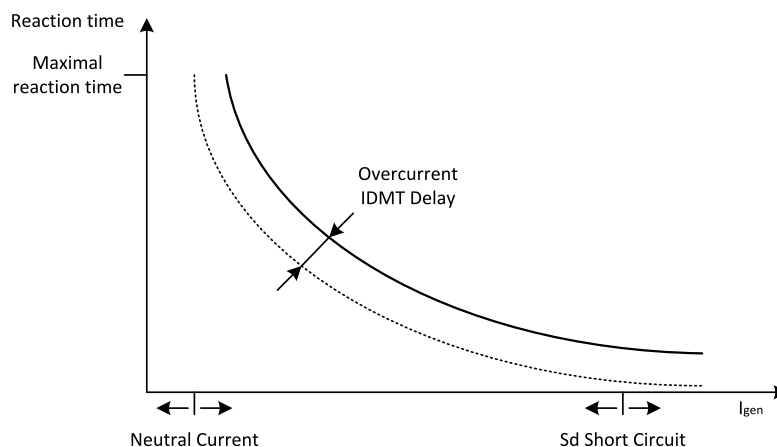


Image 7.6 IDMT PCS Overcurrent Delay

**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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## I>V Protection

Setpoint group	Protections	Related FW	2.1.0
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	62712	Related applications	MINT
Config level	Advanced		
Setpoint visibility	Always		

### Description

This setpoint enables or blocks the I>V Control protection. For more information see the **Voltage Controlled Time Overcurrent Protection** or **Voltage Restrained Time Overcurrent Protection**. When protection is enabled, the behavior of protection is adjusted via setpoints I>V Control and I>V Restraint (in some cases I>V Control Current Level).

**IMPORTANT: Behavior of this protection is influenced by setpoint Connection type**

Connection type	Nominal voltage utilized for the evaluation of the protection	Evaluated values
3Ph4Wire	<b>BESS Nominal Voltage Ph-N</b>	<b>BESS Voltage L1-N, BESS Voltage L2-N, BESS Voltage L3-N</b>
High Leg D	<b>BESS Nominal Voltage Ph-N</b>	<b>BESS Voltage L1-N, BESS Voltage L2-N, BESS Voltage L3-N</b>
3Ph3Wire	<b>BESS Nominal Voltage Ph-Ph</b>	<b>BESS Voltage L1-L2, BESS Voltage L2-L3, BESS Voltage L3-L1</b>
SplitPhase	<b>BESS Nominal Voltage Ph-N</b>	<b>BESS Voltage L1-N, BESS Voltage L2-N</b>
MonoPhase	<b>BESS Nominal Voltage Ph-N</b>	<b>BESS Voltage L1-N</b>

### 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: Even if this protection is blocked, the BCB can still be closed. The closing of the breaker is no longer allowed until the protection **Sd I>V Time Overcurrent** is activated.**

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## Subgroup: Voltage Protection

### BESS >V Protection

Setpoint group	Protections	Related FW	2.1.0														
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														
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 <b>BESS &gt;V</b> and <b>BESS &gt;V Delay</b> . When BESS voltage exceeds limit set by <b>BESS &gt;V</b> for time longer than <b>BESS &gt;V Delay</b> appropriate alarm is activated.																	
<table><tr><th>Value</th><th>Alarm</th></tr><tr><td>BESS Voltage L1-N</td><td>Sd BESS &gt;V L1-N</td></tr><tr><td>BESS Voltage L2-N</td><td>Sd BESS &gt;V L2-N</td></tr><tr><td>BESS Voltage L3-N</td><td>Sd BESS &gt;V L3-N</td></tr><tr><td>BESS Voltage L1-L2</td><td>SdBESS &gt;V L1-L2</td></tr><tr><td>BESS Voltage L2-L3</td><td>Sd BESS &gt;V L2-L3</td></tr><tr><td>BESS Voltage L3-L1</td><td>Sd BESS &gt;V L3-L1</td></tr></table>				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
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:																	
<div>&gt; Enabled / Blocked : Protection is enabled / blocked .</div> <div>&gt; Protection Force Block 1 / 2 / 3: Protection is enabled or disabled by the state of LBI <b>PROTECTION FORCE DISABLE BLOCK 1 / PROTECTION FORCE DISABLE BLOCK 2 / PROTECTION FORCE DISABLE BLOCK 3</b>.</div>																	
IMPORTANT: If this protection is disabled, the BCB cannot be closed.																	

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## BESS >>V Protection

Setpoint group	Protections	Related FW	2.1.0														
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														
Config level	Advanced																
Setpoint visibility	Always																
Description																	
This setpoint enables or disables BESS >>V Protection..																	
Behavior of protection is adjusted via setpoints <b>BESS &gt;&gt;V</b> and <b>BESS &gt;&gt;V Delay</b> . When BESS voltage exceeds limit set by <b>BESS &gt;&gt;V</b> for time longer than <b>BESS &gt;&gt;V Delay</b> appropriate alarm is activated.																	
<table><tr><td>Value</td><td>Alarm</td></tr><tr><td>BESS Voltage L1-N</td><td>Sd BESS &gt;&gt;V L1-N</td></tr><tr><td>BESS Voltage L2-N</td><td>Sd BESS &gt;&gt;V L2-N</td></tr><tr><td>BESS Voltage L3-N</td><td>Sd BESS &gt;&gt;V L3-N</td></tr><tr><td>BESS Voltage L1-L2</td><td>Sd BESS &gt;&gt;V L1-L2</td></tr><tr><td>BESS Voltage L2-L3</td><td>Sd BESS &gt;&gt;V L2-L3</td></tr><tr><td>BESS Voltage L3-L1</td><td>Sd BESS &gt;&gt;V L3-L1</td></tr></table>				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
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:																	
<div>&gt; Enabled / Blocked : Protection is enabled / blocked .</div> <div>&gt; Protection Force Block 1 / 2 / 3: Protection is enabled or disabled by the state of LBI <b>PROTECTION FORCE DISABLE BLOCK 1 / PROTECTION FORCE DISABLE BLOCK 2 / PROTECTION FORCE DISABLE BLOCK 3</b>.</div>																	
IMPORTANT: If this protection is disabled, the BCB cannot be closed.																	

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## BESS <V Protection

Setpoint group	Protections	Related FW	2.1.0														
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														
Config level	Advanced																
Setpoint visibility	Always																
Description																	
This setpoint enables or disables BESS <V Protection.																	
Behavior of protection is adjusted via setpoints <b>BESS &lt;V</b> and <b>BESS &lt;V Delay</b> When BESS voltage drops below limit set by <b>BESS &lt;V</b> for time longer than <b>BESS &lt;V Delay</b> appropriate alarm is activated.																	
<table><tr><td>Value</td><td>Alarm</td></tr><tr><td>BESS Voltage L1-N</td><td>Sd BESS &lt;V L1-N</td></tr><tr><td>BESS Voltage L2-N</td><td>Sd BESS &lt;V L2-N</td></tr><tr><td>BESS Voltage L3-N</td><td>Sd BESS &lt;V L3-N</td></tr><tr><td>BESS Voltage L1-L2</td><td>Sd BESSMains &lt;V L1-L2</td></tr><tr><td>BESS Voltage L2-L3</td><td>Sd BESSMains &lt;V L2-L3</td></tr><tr><td>BESS Voltage L3-L1</td><td>Sd BESS &gt;V L3-L1</td></tr></table>				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
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:																	
<div>&gt; Enabled / Blocked : Protection is enabled / blocked .</div> <div>&gt; Protection Force Block 1 / 2 / 3: Protection is enabled or disabled by the state of LBI <b>PROTECTION FORCE DISABLE BLOCK 1 / PROTECTION FORCE DISABLE BLOCK 2 / PROTECTION FORCE DISABLE BLOCK 3</b>.</div>																	
IMPORTANT: If this protection is disabled, the BCB cannot be closed.																	

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## BESS V Unbalance Protection

Setpoint group	Protections	Related FW	2.1.0
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
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 Voltage 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	<b>BESS Voltage L1-N, BESS Voltage L2-N and BESS Voltage L3-N</b> OR <b>BESS Voltage L1-L2, BESS Voltage L2-L3 and BESS Voltage L3-L1</b>
High Leg D	<b>BESS Voltage L1-L2, BESS Voltage L2-L3 and BESS Voltage L3-L1</b>
3Ph3Wire	<b>BESS Voltage L1-L2, BESS Voltage L2-L3 and BESS Voltage L3-L1</b>
SplitPhase	<b>BESS Voltage L1-N, BESS Voltage L2-N and BESS Voltage L3-N</b>
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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## ES >V Protection

Setpoint group	Protections	Related FW	2.1.0
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	19579	Related applications	MINT
Config level	Advanced		
Setpoint visibility	Always		
Description			
This setpoint enables or disables ES >V Protection.			
Behavior of protection is adjusted via setpoints <b>ES &gt;V</b> and <b>ES &gt;V Delay</b> . When ES voltage exceeds limit set by <b>ES &gt;V</b> for time longer than <b>ES &gt;V Delay</b> appropriate 1st level alarm is activated.			
Setpoint options:			
➤ Enabled / Blocked : Protection is enabled / blocked .			
➤ Protection Force Block 1 / 2 / 3: Protection is enabled or disabled by the state of LBI <b>PROTECTION FORCE DISABLE BLOCK 1 / PROTECTION FORCE DISABLE BLOCK 2 / PROTECTION FORCE DISABLE BLOCK 3</b> .			



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## ES >>V Protection

Setpoint group	Protections	Related FW	2.1.0
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	19578	Related applications	MINT
Config level	Advanced		
Setpoint visibility	Always		
Description			
This setpoint enables or disables ES >>V Protection.			
Behavior of protection is adjusted via setpoints <b>ES &gt;&gt;V</b> and <b>ES &gt;&gt;V Delay</b> . When ES voltage exceeds limit set by <b>ES &gt;&gt;V</b> for time longer than <b>ES &gt;&gt;V Delay</b> appropriate 2nd level alarm is activated.			
Setpoint options:			
➤ Enabled / Blocked : Protection is enabled / blocked .			
➤ Protection Force Block 1 / 2 / 3: Protection is enabled or disabled by the state of LBI <b>PROTECTION FORCE DISABLE BLOCK 1 / PROTECTION FORCE DISABLE BLOCK 2 / PROTECTION FORCE DISABLE BLOCK 3</b> .			

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## ES <V Protection

Setpoint group	Protections	Related FW	2.1.0
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	19577	Related applications	MINT
Config level	Advanced		
Setpoint visibility	Always		
Description			
This setpoint enables or disables ES <V Protection.			
Behavior of protection is adjusted via setpoints <b>ES &lt;V</b> and <b>ES &lt; VDelay</b> . When ES voltage exceeds limit set by <b>ES &lt;V</b> for time longer than <b>ES &lt; VDelay</b> appropriate 1st level alarm is activated.			
Setpoint options:			
➤ Enabled / Blocked : Protection is enabled / blocked .			
➤ Protection Force Block 1 / 2 / 3: Protection is enabled or disabled by the state of LBI <b>PROTECTION FORCE DISABLE BLOCK 1 / PROTECTION FORCE DISABLE BLOCK 2 / PROTECTION FORCE DISABLE BLOCK 3</b> .			

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## ES <<V Protection

Setpoint group	Protections	Related FW	2.1.0
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	19576	Related applications	MINT
Config level	Advanced		
Setpoint visibility	Always		
Description			
<p>This setpoint enables or disables ES &lt;&lt;V Protection.</p> <p>Behavior of protection is adjusted via setpoints <b>ES &lt;&lt;V</b> and <b>ES &lt;&lt;V</b>. When ES voltage exceeds limit set by <b>ES &lt;&lt;V</b> for time longer than <b>ES &lt; VDelay</b> appropriate 2nd level alarm is activated.</p> <p><b>Setpoint options:</b></p> <ul style="list-style-type: none"><li>➤ Enabled / Blocked : Protection is enabled / blocked .</li><li>➤ Protection Force Block 1 / 2 / 3: Protection is enabled or disabled by the state of LBI <b>PROTECTION FORCE DISABLE BLOCK 1 / PROTECTION FORCE DISABLE BLOCK 2 / PROTECTION FORCE DISABLE BLOCK 3</b>.</li></ul>			

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## PCS >V Protection

<b>Setpoint group</b>	Protections	<b>Related FW</b>	2.1.0
<b>Range [units]</b>	Enabled / Blocked / Protection Force Blocked 1 / Protection Force Blocked 2 / Protection Force Blocked 3 [-]		
<b>Default value</b>	Enabled	<b>Force value</b>	YES
<b>Step</b>	[-]		
<b>Comm object</b>	19622	<b>Related applications</b>	MINT
<b>Config level</b>	Advanced		
<b>Setpoint visibility</b>	Always		
<b>Description</b>			
This setpoint enables or disables PCS >V Protection.			
Behavior of protection is adjusted via setpoints <b>PCS &gt;V</b> and <b>PCS &gt;V Delay</b> . When PCS voltage exceeds limit set by <b>PCS &gt;V</b> for time longer than <b>PCS &gt;V Delay</b> appropriate 1st level alarm is activated.			
<b>Setpoint options:</b>			
➤ Enabled / Blocked : Protection is enabled / blocked .			
➤ Protection Force Block 1 / 2 / 3: Protection is enabled or disabled by the state of LBI <b>PROTECTION FORCE DISABLE BLOCK 1 / PROTECTION FORCE DISABLE BLOCK 2 / PROTECTION FORCE DISABLE BLOCK 3</b> .			

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## PCS >>V Protection

<b>Setpoint group</b>	Protections	<b>Related FW</b>	2.1.0
<b>Range [units]</b>	Enabled / Blocked / Protection Force Blocked 1 / Protection Force Blocked 2 / Protection Force Blocked 3 [-]		
<b>Default value</b>	Enabled	<b>Force value</b>	YES
<b>Step</b>	[-]		
<b>Comm object</b>	19621	<b>Related applications</b>	MINT
<b>Config level</b>	Advanced		
<b>Setpoint visibility</b>	Always		
<b>Description</b>			
This setpoint enables or disables PCS >>V Protection.			
Behavior of protection is adjusted via setpoints <b>PCS &gt;&gt;V</b> and <b>PCS &gt;&gt;V Delay</b> . When PCS voltage exceeds limit set by <b>PCS &gt;&gt;V</b> for time longer than <b>PCS &gt;&gt;V Delay</b> appropriate 2nd level alarm is activated.			
<b>Setpoint options:</b>			
➤ Enabled / Blocked : Protection is enabled / blocked .			
➤ Protection Force Block 1 / 2 / 3: Protection is enabled or disabled by the state of LBI <b>PROTECTION FORCE DISABLE BLOCK 1 / PROTECTION FORCE DISABLE BLOCK 2 / PROTECTION FORCE DISABLE BLOCK 3</b> .			

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## PCS <V Protection

Setpoint group	Protections	Related FW	2.1.0
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	19620	Related applications	MINT
Config level	Advanced		
Setpoint visibility	Always		
Description			
<p>This setpoint enables or disables PCS &lt;V Protection.</p> <p>Behavior of protection is adjusted via setpoints <b>PCS &lt;V</b> and <b>PCS &lt;V Delay</b>. When PCS voltage exceeds limit set by <b>PCS &lt;V</b> for time longer than <b>PCS &lt;V Delay</b> appropriate 1st level alarm is activated.</p> <p><b>Setpoint options:</b></p> <ul style="list-style-type: none"><li>➤ Enabled / Blocked : Protection is enabled / blocked .</li><li>➤ Protection Force Block 1 / 2 / 3: Protection is enabled or disabled by the state of LBI <b>PROTECTION FORCE DISABLE BLOCK 1 / PROTECTION FORCE DISABLE BLOCK 2 / PROTECTION FORCE DISABLE BLOCK 3</b>.</li></ul>			

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## PCS <<V Protection

Setpoint group	Protections	Related FW	2.1.0
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	19619	Related applications	MINT
Config level	Advanced		
Setpoint visibility	Always		
Description			
<p>This setpoint enables or disables PCS &lt;&lt;V Protection.</p> <p>Behavior of protection is adjusted via setpoints <b>PCS &lt;&lt;V</b> and <b>PCS &lt;&lt;V Delay</b>. When PCS voltage exceeds limit set by <b>PCS &lt;&lt;V</b> for time longer than <b>PCS &lt;&lt;V Delay</b> appropriate 2nd level alarm is activated.</p> <p><b>Setpoint options:</b></p> <ul style="list-style-type: none"><li>➤ Enabled / Blocked : Protection is enabled / blocked .</li><li>➤ Protection Force Block 1 / 2 / 3: Protection is enabled or disabled by the state of LBI <b>PROTECTION FORCE DISABLE BLOCK 1 / PROTECTION FORCE DISABLE BLOCK 2 / PROTECTION FORCE DISABLE BLOCK 3</b>.</li></ul>			

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## Subgroup: Frequency Protection

### BESS >f Protection

Setpoint group	Protections	Related FW	2.1.0
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
Config level	Advanced		
Setpoint visibility	Always		
Description			
This setpoint enables or disables BESS >f Protection.			
Behavior of protection is adjusted via setpoints <b>BESS &gt;f</b> and <b>BESS &gt;f Delay</b> . When <b>BESS Frequency</b> exceeds maximal accepted frequency for period longer than <b>BESS &gt;f Delay</b> alarm <b>Sd BESS &gt;f</b> is activated.			
<b>Note:</b> $f_{max} = \text{Nominal Frequency} + \text{BESS >f}$			
Setpoint options:			
<div>&gt; Enabled / Blocked : Protection is enabled / blocked .</div> <div>&gt; Protection Force Block 1 / 2 / 3: Protection is enabled or disabled by the state of LBI <b>PROTECTION FORCE DISABLE BLOCK 1 / PROTECTION FORCE DISABLE BLOCK 2 / PROTECTION FORCE DISABLE BLOCK 3</b>.</div>			
<b>IMPORTANT:</b> If this protection is disabled, the BCB cannot be closed.			

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## BESS <f Protection

Setpoint group	Protections	Related FW	2.1.0
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
Config level	Advanced		
Setpoint visibility	Always		
Description			
This setpoint enables or disables BESS <f Protection.			
Behavior of protection is adjusted via setpoints <b>BESS &lt;f</b> and <b>BESS &lt;f Delay</b> . When <b>BESS Frequency</b> drops below minimal accepted frequency for period longer than <b>BESS &lt;f Delay</b> alarm <b>Sd BESS &lt;f</b> is activated.			
<b>Note:</b> $f_{min} = \text{Nominal Frequency} + \text{BESS <f}$			
Setpoint options:			
<div>&gt; Enabled / Blocked : Protection is enabled / blocked .</div> <div>&gt; Protection Force Block 1 / 2 / 3: Protection is enabled or disabled by the state of LBI <b>PROTECTION FORCE DISABLE BLOCK 1 / PROTECTION FORCE DISABLE BLOCK 2 / PROTECTION FORCE DISABLE BLOCK 3</b>.</div>			
<b>IMPORTANT:</b> If this protection is disabled, the BCB cannot be closed.			

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## Subgroup: Bus Meas Error

### Bus Meas Error

Setpoint group	Protections	Related FW	2.1.0
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 <b>Active Application</b> = MINT		
<b>Description</b>			
This setpoint enables or disables Bus Measurement Error protection.			
Alarm <b>Bus Meas Error</b> is activated if controller detects a mismatch between the expected and currently measured voltage on the bus for period longer set by setpoint <b>Bus Meas Error Delay</b> .			
<b>Setpoint options:</b>			
➤ Enabled / Blocked			
➤ Protection Force Blocked 1 / 2 / 3: Protection is enabled or disabled by the state of LBI <b>PROTECTION FORCE DISABLE BLOCK 1 / PROTECTION FORCE DISABLE BLOCK 2 / PROTECTION FORCE DISABLE BLOCK 3</b> .			

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## Subgroup: Phase Rotation Protection

### Phase Rotation Protection

Setpoint group	Basic settings	Related FW	2.1.0
Range [units]	Clockwise / Counterclockwise [-]		
Default value	Clockwise	Force value	YES
Step	[-]		
Comm object	19709	Related applications	MINT
Config level	Advanced		
Setpoint visibility	Always		
Description			
This setpoint enables or disables Bus Measurement Error protection. The alarm <b>ALI AC BusMains Ph Rotation Opposite</b> is activated when controller detects wrong phase rotation, e.g. <b>Phase Rotation</b> .			
Setpoint options:			
<div><div>&gt;</div>Enabled / Blocked : Protection is enabled / blocked .</div>			
<div><div>&gt;</div>Protection Force Block 1 / 2 / 3: Protection is enabled or disabled by the state of LBI <b>PROTECTION FORCE DISABLE BLOCK 1 / PROTECTION FORCE DISABLE BLOCK 2 / PROTECTION FORCE DISABLE BLOCK 3</b>.</div>			

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**Subgroup: Earth Fault Current Protection**



## Earth Fault Current Protection

Setpoint group	Protections	Related FW	2.1.0
Range [units]	Enabled / Blocked / Protection Force Blocked 1 / Protection Force Blocked 2 / Protection Force Blocked 3 [-]		
Default value	Disabled	Force value	NO
Step	[-]		
Comm object	11631	Related applications	MINT
Config level	Standard		
Setpoint visibility	Always		

### Description

This setpoint enables or disables Earth Fault Current Protection.

Behavior is adjusted via setpoints **Earth Fault Sd** and **Earth Fault Delay**. When the protection is triggered the alarm **Sd IDMT Earth Fault Current** is activated.

The reaction time is calculated by this formula:

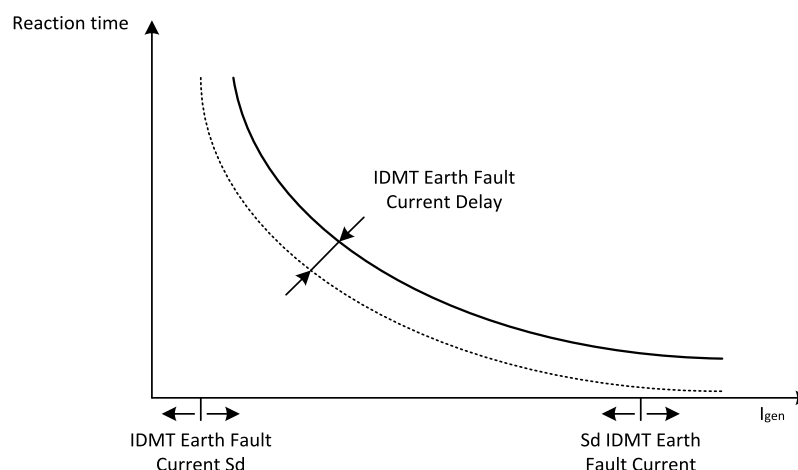
$$\text{Reaction time} = \frac{\text{IDMT Earth Fault Current Delay} \times \text{IDMT Earth Fault Current Sd}}{I_{\text{gen}} - \text{IDMT Earth Fault Current Sd}}$$

$I_{\text{gen}}$  = Maximum (BESS Current L1, BESS Current L2, BESS Current L3)

#### Example:

Earth Fault Sd = 10 A

	Delay [s]	$I_{\text{gen}}$ [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



#### 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: Loss of Mains Protections

### Vector Shift Protection

Setpoint group	Protections	Related FW	2.1.0						
Range [units]	Enabled / Parallel Only / Disabled [-]								
Default value	Disabled	Force value	YES						
Step	[-]								
Comm object	10551	Related applications	MINT						
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 setpoint <b>Vector Shift Limit</b> . When measured vector shift on <b>Mains/Bus Voltage L1-N</b> is over the <b>Vector Shift Limit</b> , breaker is opened and history record Vector Shift is written to the history.									
<table><tr><td>Enabled</td><td>Protection is always active while MCB is closed.</td></tr><tr><td>Parallel Only</td><td>Protection is active only if <b>Breaker state</b> = ParalOper.</td></tr><tr><td>Disabled</td><td>Protection is disabled.</td></tr></table>				Enabled	Protection is always active while MCB is closed.	Parallel Only	Protection is active only if <b>Breaker state</b> = ParalOper.	Disabled	Protection is disabled.
Enabled	Protection is always active while MCB is closed.								
Parallel Only	Protection is active only if <b>Breaker state</b> = ParalOper.								
Disabled	Protection is disabled.								

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## ROCOF1 Protection

Setpoint group	Protections	Related FW	2.1.0						
Range [units]	Enabled / Parallel Only / Disabled [-]								
Default value	Disabled	Force value	YES						
Step	[-]								
Comm object	9840	Related applications	MINT						
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 <b>ROCOF1 Windows Length</b> , <b>ROCOF1 df/dt</b> .									
When measured <b>ROCOF1</b> on <b>Mains/Bus Frequency</b> is over <b>ROCOF1 df/dt</b> in respective period given by <b>ROCOF1 Windows Length</b> , breaker is opened and history record ROCOF is written to the history.									
Maximal ROCOF is stored in <b>Max ROCOF1</b> which is reset every time when the breaker is closed again.									
<table><tr><td>Enabled</td><td>Protection is always active while MCB is closed.</td></tr><tr><td>Parallel Only</td><td>Protection is active only if <b>Breaker state</b> = ParalOper.</td></tr><tr><td>Disabled</td><td>Protection is disabled.</td></tr></table>				Enabled	Protection is always active while MCB is closed.	Parallel Only	Protection is active only if <b>Breaker state</b> = ParalOper.	Disabled	Protection is disabled.
Enabled	Protection is always active while MCB is closed.								
Parallel Only	Protection is active only if <b>Breaker state</b> = ParalOper.								
Disabled	Protection is disabled.								

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## ROCOF2 Protection

Setpoint group	Protections	Related FW	2.1.0
Range [units]	Enabled / Parallel Only / Disabled [-]		
Default value	Disabled	Force value	YES
Step	[-]		
Comm object	16145	Related applications	MINT
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 <b>ROCOF2 Windows Length</b> <b>ROCOF2 df/dt</b> .			
When measured <b>ROCOF2</b> on <b>Mains/Bus Frequency</b> is over <b>ROCOF2 df/dt</b> in respective time given by <b>ROCOF2 Windows Length</b> , breaker is opened and history record ROCOF is written to the history.			
Maximal ROCOF is stored in <b>Max ROCOF2</b> which is reset every time when the breaker is closed again.			
Enabled	Protection is always active while MCB is closed.		
Parallel Only	Protection is active only if <b>Breaker state</b> = ParalOper.		
Disabled	Protection is disabled.		

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## ROCOF3 Protection

Setpoint group	Protections	Related FW	2.1.0
Range [units]	Enabled / Parallel Only / Disabled [-]		
Default value	Disabled	Force value	YES
Step	[-]		
Comm object	16146	Related applications	MINT
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 <b>ROCOF3 Windows Length ROCOF3 df/dt</b> .			
When measured <b>ROCOF3</b> on <b>Mains/Bus Frequency</b> is over <b>ROCOF3 df/dt</b> in respective time given by <b>ROCOF3 Windows Length</b> , breaker is opened and history record ROCOF is written to the history.			
Maximal ROCOF is stored in <b>Max ROCOF3</b> which is reset every time when the breaker is closed again.			
Enabled	Protection is always active while MCB is closed.		
Parallel Only	Protection is active only if <b>Breaker state</b> = ParalOper.		
Disabled	Protection is disabled.		

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## ROCOF4 Protection

Setpoint group	Protections	Related FW	2.1.0
Range [units]	Enabled / Parallel Only / Disabled [-]		
Default value	Disabled	Force value	YES
Step	[-]		
Comm object	16147	Related applications	MINT
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 <b>ROCOF4 Windows Length ROCOF4 df/dt</b> .			
When measured <b>ROCOF4</b> on <b>Mains/Bus Frequency</b> is over <b>ROCOF4 df/dt</b> in respective time given by <b>ROCOF4 Windows Length</b> , breaker is opened and history record ROCOF is written to the history.			
Maximal ROCOF is stored in <b>Max ROCOF4</b> which is reset every time when the breaker is closed again.			
Enabled	Protection is always active while MCB is closed.		
Parallel Only	Protection is active only if <b>Breaker state</b> = ParalOper.		
Disabled	Protection is disabled.		

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## Subgroup: SOC Protection

### ES <SOC Protection

Setpoint group	Protections	Related FW	2.1.0
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
Config level	Advanced		
Setpoint visibility	Always		
Description			
This setpoint enables or disables BESS <SOC Protection. When <b>ES SOC</b> exceeds limit set by the setpoint <b>ES &lt;SOC</b> the alarm <b>Wrn SOC Low Alarm</b> .			
Setpoint options:			
➤ Enabled / Blocked : Protection is enabled / blocked .			
➤ Protection Force Block 1 / 2 / 3: Protection is enabled or disabled by the state of LBI <b>PROTECTION FORCE DISABLE BLOCK 1 / PROTECTION FORCE DISABLE BLOCK 2 / PROTECTION FORCE DISABLE BLOCK 3</b>			

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### ES >SOC Protection

Setpoint group	Protections	Related FW	2.1.0
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
Config level	Advanced		
Setpoint visibility	Always		
Description			
This setpoint enables or disables BESS >SOC Protection. When <b>ES SOC</b> exceeds limit set by the setpoint <b>ES &gt;SOC</b> the alarm <b>Wrn SOC High Alarm</b> .			
Setpoint options:			
➤ Enabled / Blocked : Protection is enabled / blocked .			
➤ Protection Force Block 1 / 2 / 3: Protection is enabled or disabled by the state of LBI <b>PROTECTION FORCE DISABLE BLOCK 1 / PROTECTION FORCE DISABLE BLOCK 2 / PROTECTION FORCE DISABLE BLOCK 3</b>			

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## ES <<SOC Protection

Setpoint group	Protections	Related FW	2.1.0
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
Config level	Advanced		
Setpoint visibility	Always		
Description			
This setpoint enables or disables BESS <<SOC Protection. When <b>ES SOC</b> exceeds limit set by the setpoint <b>ES &lt;&lt;SOC</b> the alarm <b>Sd SOC Critical Low</b> .			
Setpoint options:			
➤ Enabled / Blocked : Protection is enabled / blocked .			
➤ Protection Force Block 1 / 2 / 3: Protection is enabled or disabled by the state of LBI <b>PROTECTION FORCE DISABLE BLOCK 1 / PROTECTION FORCE DISABLE BLOCK 2 / PROTECTION FORCE DISABLE BLOCK 3</b>			

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## ES >>SOC Protection

Setpoint group	Protections	Related FW	2.1.0
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
Config level	Advanced		
Setpoint visibility	Always		
Description			
This setpoint enables or disables BESS >>SOC Protection. When <b>ES SOC</b> exceeds limit set by the setpoint <b>ES &gt;&gt;SOC</b> the alarm <b>Sd SOC Critical High</b> .			
Setpoint options:			
➤ Enabled / Blocked : Protection is enabled / blocked .			
➤ Protection Force Block 1 / 2 / 3: Protection is enabled or disabled by the state of LBI <b>PROTECTION FORCE DISABLE BLOCK 1 / PROTECTION FORCE DISABLE BLOCK 2 / PROTECTION FORCE DISABLE BLOCK 3</b>			

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## Subgroup: ES Protection

### ES Temperature Protection

Setpoint group	Protections	Related FW	2.1.0
Range [units]	Enabled/Blocked/Protection Force Block 1/Protection Force Block 2/Protection Force Block 3		
Default value	N/A	Force value	YES
Step	N/A		
Comm object	62734	Related applications	MINT
Config level	Standard		
Setpoint visibility	Always		
Description			
This setpoint enables or blocks <b>ES Temperature Protection</b> . Protections that are influenced by this setpoint <b>Wrn ES &gt; Temperature</b> , <b>Sd ES &gt;&gt; Temperature</b> and <b>Sd ES &lt;&lt; Temperature</b> .			
Setpoint options:			
<div>&gt; Enabled / Blocked : Protection is enabled / blocked .</div>			
<div>&gt; Protection Force Block 1 / 2 / 3: Protection is enabled or blocked by the state of LBI <b>PROTECTION FORCE DISABLE BLOCK 1 / PROTECTION FORCE DISABLE BLOCK 2 / PROTECTION FORCE DISABLE BLOCK 3</b></div>			

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## Subgroup: Cell Protection

### Cell Max Voltage Protection

Setpoint group	Protections	Related FW	2.1.0
Range [units]	ES >SOC		
Default value	N/A	Force value	YES
Step	N/A		
Comm object	62697	Related applications	MINT
Config level	Standard		
Setpoint visibility	Always		
Description			
This setpoint enables or blocks <b>Cell Max Voltage Protection</b> . When the value <b>Cell Max Voltage</b> exceeds the setting of setpoint <b>Cell &gt;&gt;V</b> the alarm <b>Sd Cell &gt;&gt; Voltage</b> activates.			
Setpoint options:			
➤ Enabled / Blocked : Protection is enabled / blocked .			
➤ Protection Force Block 1 / 2 / 3: Protection is enabled or blocked by the state of LBI <b>PROTECTION FORCE DISABLE BLOCK 1 / PROTECTION FORCE DISABLE BLOCK 2 / PROTECTION FORCE DISABLE BLOCK 3</b>			

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## Cell Min Voltage Protection

Setpoint group	Protections	Related FW	2.1.0
Range [units]	ES >SOC		
Default value	N/A	Force value	YES
Step	N/A		
Comm object	62696	Related applications	MINT
Config level	Standard		
Setpoint visibility	Always		
Description			
This setpoint enables or blocks <b>Cell Min Voltage Protection</b> . When the value <b>Cell Min Voltage</b> is below the setting of setpoint <b>Cell &lt;&lt;V</b> the alarm <b>Sd Cell &lt;&lt; Voltage</b> activates.			
Setpoint options:			
<div>➤ Enabled / Blocked : Protection is enabled / blocked .</div>			
<div>➤ Protection Force Block 1 / 2 / 3: Protection is enabled or blocked by the state of LBI <b>PROTECTION FORCE DISABLE BLOCK 1 / PROTECTION FORCE DISABLE BLOCK 2 / PROTECTION FORCE DISABLE BLOCK 3</b></div>			

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## Cell Max Temperature Protection


Setpoint group	Protections	Related FW	2.1.0
Range [units]	Enabled/Blocked/Protection Force Block 1/Protection Force Block 2/Protection Force Block 3		
Default value	N/A	Force value	YES
Step	N/A		
Comm object	62695	Related applications	MINT
Config level	Standard		
Setpoint visibility	Always		
Description			
<p>This setpoint enables or blocks <b>Cell Max Temperature Protection</b>. When the value <b>Cell Max Temperature</b> exceeds the setting of setpoint <b>Cell &gt;&gt;Temperature</b> the alarm <b>Sd Cell &gt;&gt; Temperature</b> activates.</p> <p>Setpoint options:</p> <ul style="list-style-type: none"><li>➤ Enabled / Blocked : Protection is enabled / blocked .</li><li>➤ Protection Force Block 1 / 2 / 3: Protection is enabled or blocked by the state of LBI <b>PROTECTION FORCE DISABLE BLOCK 1 / PROTECTION FORCE DISABLE BLOCK 2 / PROTECTION FORCE DISABLE BLOCK 3</b></li></ul>			

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## Cell Min Temperature Protection

Setpoint group	Protections	Related FW	2.1.0
Range [units]	Enabled/Blocked/Protection Force Block 1/Protection Force Block 2/Protection Force Block 3		
Default value	N/A	Force value	YES
Step	N/A		
Comm object	62694	Related applications	MINT
Config level	Standard		
Setpoint visibility	Always		
Description			
<p>This setpoint enables or blocks <b>Cell Min Temperature Protection</b>. When the value <b>Cell Min Temperature</b> is below the setting of setpoint <b>Cell &lt;&lt;Temperature</b> the alarm <b>Sd Cell &lt;&lt; Temperature</b> activates.</p> <p>Setpoint options:</p> <ul style="list-style-type: none"><li>➤ Enabled / Blocked : Protection is enabled / blocked .</li><li>➤ Protection Force Block 1 / 2 / 3: Protection is enabled or blocked by the state of LBI <b>PROTECTION FORCE DISABLE BLOCK 1 / PROTECTION FORCE DISABLE BLOCK 2 / PROTECTION FORCE DISABLE BLOCK 3</b></li></ul>			

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## Subgroup: IDMT

### IDMT Curve

Setpoint group	Protections	Related FW	2.1.0
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
Config level	Advanced		
Setpoint visibility	Always		
Description			
Possibility to select IDMT curve based on different standards.For more information see <b>Inverse Definite Minimum Time</b> .			
<b>ComAp</b> - curve based on ComAp formula			
➤ <b>ANSI</b> - curve based on ANSI standard			
➤ <b>IEC</b> - curve based on EIC standard			
<b>Note: SIT</b> - A standard inverse time curve that provides a moderate trip delay for moderate overcurrents.			
<b>Note: VIT</b> - A very inverse time curve that trips faster than SIT for higher overcurrents.			
<b>Note: EIT</b> - An extremely inverse time curve that trips the fastest for extremely high overcurrents.			

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## Group: Frequency/Load Control

### Subgroup: Frequency Control

#### Frequency Regulator Character

Setpoint group	Frequency/Load Control	Related FW	2.1.0
Range [units]	Positive / Negative [-]		
Default value	Positive	Force value	YES
Step	[-]		
Comm object	9054	Related applications	MINT
Config level	Standard		
Setpoint visibility	Always		
Description			
This setpoint selects the characteristic of the <b>Frequency Regulator Output</b> . 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	2.1.0
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
Config level	Standard		
Setpoint visibility	Always		
Description			
This setpoint adjusts the initial voltage level for the <b>Frequency Regulator Output</b> . 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	2.1.0
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
Config level	Standard		
Setpoint visibility	Always		
Description			
The low limit of the <b>Frequency Regulator Output</b> .			
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	2.1.0
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
Config level	Standard		
Setpoint visibility	Always		
Description			
Upper limit of the speed <b>Frequency Regulator Output</b> .			
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	2.1.0
Range [units]	500..2900 [Hz]		
Default value	500 Hz	Force value	NO
Step	1 Hz		
Comm object	10911	Related applications	MINT
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	2.1.0
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
Config level	Standard		
Setpoint visibility	Always		
Description			
This setpoint is used to adjust the transformation ratio of the <b>Frequency Regulator Output</b> to the pulses at the binary outputs <b>SPEEDFREQUENCY UP</b> and <b>SPEEDFREQUENCYFREQUENCY DOWN</b> .			
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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## PCS Frequency Droop Slope

Setpoint group	Frequency/Load Control	Related FW	2.1.0
Range [units]	0 .. 20 [%]		
Default value	2	Force value	NO
Step	0.01		
Comm object	19450	Related applications	MINT
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 ( <b>Nominal Frequency</b> ) on the range of the requested power from 0 to 100% of <b>BESS Nominal power</b> .			

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## Subgroup: Regulation Loops

## Dynamic f-U Balance Weight

Setpoint group	Frequency/Load Control	Related FW	2.1.0
Range [units]	Disable / Enable [-]		
Default value	Disable	Force value	NO
Step	-		
Comm object	17609	Related applications	MINT
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 <b>see Dynamic Isochronous Frequency and Voltage Control on page 281.</b>			

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## Frequency Regulation Loop

Setpoint group	Speed/Load Control	Related FW	2.1.0
Range [units]	Sync Only / All The Time [-]		
Default value	Sync Only	Force value	YES
Step	[-]		
Comm object	9891	Related applications	MINT
Config level	Standard		
Setpoint visibility	Always		
Description			
This setpoint selects when the frequency regulation loop is active.			
<div><div>&gt;</div><div><b>SYNC ONLY:</b> 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.</div></div>			
<div><div>&gt;</div><div><b>ALL THE TIME:</b> 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 <b>Nominal Frequency</b>.</div></div>			
<b>Note:</b> See the chapter <i>Regulation Loops</i> for more information.			

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## Frequency Gain

Setpoint group	Speed/Load Control	Related FW	2.1.0
Range [units]			
Default value		Force value	YES
Step			
Comm object	8715	Related applications	MINT
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 <b>Regulation Loops</b> for more information.			

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## Frequency Int

Setpoint group	Speed/Load Control	Related FW	2.1.0
Range [units]			
Default value		Force value	YES
Step			
Comm object	8716	Related applications	MINT
Config level	Standard		
Setpoint visibility	Always		
Description			
This setpoint adjusts the integration factor (I-factor) of the frequency control PI loop.			
<b>Note:</b> See the chapter <b>Regulation Loops</b> for more information.			

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## Angle Gain

Setpoint group	Speed/Load Control	Related FW	2.1.0
Range [units]			
Default value		Force value	YES
Step			
Comm object	8718	Related applications	MINT
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.			
<i><b>Note:</b> 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.</i>			
<i><b>Note:</b> See the chapter <b>Regulation Loops</b> for more information.</i>			

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## Load Gain

Setpoint group	Speed/Load Control	Related FW	2.1.0
Range [units]			
Default value		Force value	YES
Step			
Comm object	8659	Related applications	MINT
Config level	Standard		
Setpoint visibility	Always		
Description			
This setpoint adjusts the gain factor (P-factor) of the load control PI loop.			
<i><b>Note:</b> See the chapter <b>Regulation Loops</b> for more information.</i>			

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## Load Int

Setpoint group	Speed/Load Control	Related FW	2.1.0
Range [units]			
Default value		Force value	YES
Step			
Comm object	8713	Related applications	MINT
Config level	Standard		
Setpoint visibility	Always		
Description			
This setpoint adjusts the integration factor (I-factor) of the load control PI loop.			
<i><b>Note:</b> See the chapter <b>Regulation Loops</b> for more information.</i>			

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## Load Sharing Gain

Setpoint group	Speed/Load Control	Related FW	2.1.0
Range [units]			
Default value		Force value	YES
Step			
Comm object	8725	Related applications	MINT
Config level	Standard		
Setpoint visibility	Only if <b>Active Application</b> = MINT		
Description			
This setpoint adjusts the gain factor (P-factor) of the load sharing control PI loop.			
<i><b>Note:</b> See the chapter <b>Regulation Loops</b> for more information.</i>			

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## Load Sharing Int

Setpoint group	Speed/Load Control	Related FW	2.1.0
Range [units]			
Default value		Force value	YES
Step			
Comm object	9035	Related applications	MINT
Config level	Standard		
Setpoint visibility	Only if <b>Active Application</b> = MINT		
Description			
This setpoint adjusts the integration factor (I-factor) of the load sharing control PI loop.			
<i><b>Note:</b> See the chapter <b>Regulation Loops</b> for more information.</i>			

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## Frequency Balancing Weight

Setpoint group	Speed/Load Control	Related FW	2.1.0
Range [units]	0.000 .. 10.000 [-]		
Default value	1.000	Force value	YES
Step	0.001		
Comm object	18574	Related applications	MINT
Config level	Standard		
Setpoint visibility	Always		
Description			
<p>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.</p> <p>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 <b>Frequency Balancing Weight</b>. 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.</p>			

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## Subgroup: Load Transfer

### BESS Unload Level BCB Open

Setpoint group	Frequency/Load Control	Related FW	2.1.0
Range [units]	0 .. 100 [%] of <b>BESS Nominal power</b>		
Default value	10 % of <b>BESS Nominal power</b>	Force value	YES
Step	1 % of <b>BESS Nominal power</b>		
Comm object	8547	Related applications	
Config level	Standard		
Setpoint visibility	Always		
Description			
This setpoint adjusts the required value of the <b>BESS P</b> related to <b>BESS Nominal power</b> for opening the BCB breaker during unloading of the BESS.			
<b>Note:</b> This setpoint is usually higher than 0 to prevent the BESS going to reverse power.			

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## Soft Load Ramp

Setpoint group	Frequency/Load Control	Related FW	2.1.0
Range [units]	0 .. 1800 [s]		
Default value	60 s	Force value	YES
Step	1 s		
Comm object	17603	Related applications	MINT
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 <b>BESS Required P</b> is always ramped to the value <b>BESS Required P Target</b> .			
<b>Example:</b> BESS Nominal power = 20 kW, Soft Load Ramp = 10 seconds. The ramp is changing with speed 20 kW per 10 seconds (2 kW/s) to the <b>BESS Required P</b> value.			

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## Load Ramp PTM

Setpoint group	Frequency/Load Control	Related FW	2.1.0
Range [units]	0 .. 1800 [s]		
Default value	30 s	Force value	YES
Step	1 s		
Comm object	17602	Related applications	MINT
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 <b>BESS Required P</b> is always ramped to the value <b>BESS Required P Target</b> .			
<b>Example:</b> BESS Nominal power = 20 kW, Load Ramp PTM = 10 seconds. The ramp is changing with speed 20 kW per 10 seconds (2 kW/s) to the <b>BESS Required P</b> value.			
<b>Note:</b> The time to go from - <b>BESS Nominal power</b> to <b>BESS Nominal power</b> is double since the time from 0 to <b>BESS Nominal power</b> takes based on this setpoint.			

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## Load Ramp Island

Setpoint group	Frequency/Load Control	Related FW	2.1.0
Range [units]	0 .. 600 [s]		
Default value	200 s	Force value	YES
Step	1 s		
Comm object	8658	Related applications	MINT
Config level	Standard		
Setpoint visibility	Always		
Description			
<p>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 <b>BESS Required P</b> is always ramped to the value <b>BESS Required P Target</b>.</p> <p><b>Example:</b> <b>BESS Nominal power</b> = 20 kW, Load Ramp Island = 10 seconds. The ramp is changing with speed 20 kW per 10 seconds (2 kW/s) to the <b>BESS Required P</b> value.</p> <p><b>Note:</b> <i>The time to go from - <b>BESS Nominal power</b> to <b>BESS Nominal power</b> is double since the time from 0 to <b>BESS Nominal power</b> takes based on this setpoint.</i></p>			

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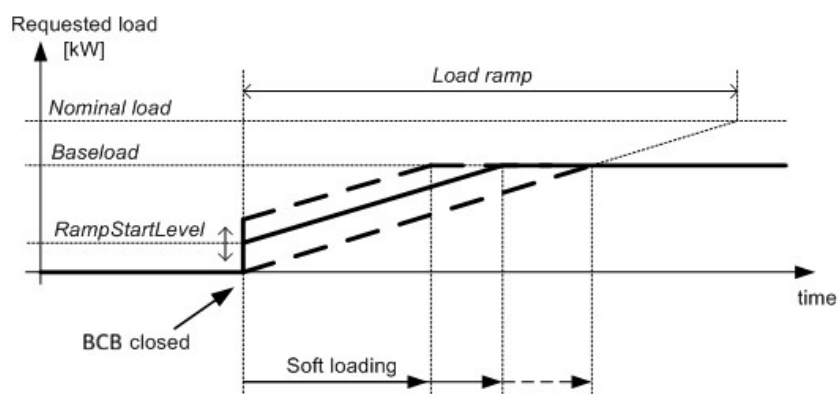
## Ramp Start Level

Setpoint group	Frequency/Load Control	Related FW	2.1.0
Range [units]	0 .. 100 [%] of BESS Nominal power		
Default value	0 % of BESS Nominal power	Force value	YES
Step	1 % of BESS Nominal power		
Comm object	10912	Related applications	MINT
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 **BESS Nominal power**.



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## Soft Unload Ramp

Setpoint group	Frequency/Load ControlGrid Codes	Related FW	2.1.0
Range [units]	0 .. 1800 [s]		
Default value	60 s	Force value	YES
Step	1 s		
Comm object	16489	Related applications	MINT
Config level	Standard		
Setpoint visibility			
Description			
<p>This setpoint adjusts the ramping time of the <b>BESS Required P</b> to the <b>BESS Required P Target</b> while soft unloading when BCB is requested to be opened.</p> <p>The Required P reach the zero value at the end of the timer. The ramping time is set for <math>\Delta P</math> which is given by the setpoint <b>BESS Nominal power</b>.</p> <p><b>Example:</b> <b>BESS Nominal power</b> = 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.</p>			

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### Group: Voltage/PF Control

#### Subgroup: Voltage Control

#### Voltage Regulator Character

Setpoint group	Voltage/PF Control	Related FW	2.1.0
Range [units]	Positive / Negative [-]		
Default value	Positive	Force value	YES
Step	[-]		
Comm object	9055	Related applications	MINT
Config level	Standard		
Setpoint visibility	Always		
Description			
This setpoint selects the characteristic of the <b>Voltage Regulator Output</b> . 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	2.1.0
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
Config level	Standard		
Setpoint visibility	Always		
Description			
This setpoint adjusts the initial level for the <b>Voltage Regulator Output</b> . 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	2.1.0
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
Config level	Standard		
Setpoint visibility	Always		
Description			
Lower limit of the <b>Voltage Regulator Output</b> . 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	2.1.0
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
Config level	Standard		
Setpoint visibility	Always		
Description			
Upper limit of the <b>Voltage Regulator Output</b> . 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	2.1.0
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
Config level	Standard		
Setpoint visibility	Always		
Description			
<p>This setpoint is used to adjust the transformation ratio of the <b>Voltage Regulator Output</b> to the pulses at the binary outputs <b>VOLTAGE UP</b> and <b>VOLTAGE DOWN</b>.</p> <p>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.</p>			

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## PCS Voltage Droop Slope

Setpoint group	Voltage/PF Control	Related FW	2.1.0
Range [units]	0 .. 20 [%]		
Default value	1	Force value	NO
Step	0.001		
Comm object	19449	Related applications	MINT
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 nominal voltage ( <b>BESS Nominal Voltage Ph-N</b> ) 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 <b>BESS Nominal power</b> whilst the PF=0,8).			

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## Subgroup: Regulation Loops

### Dynamic f-U Balance Weight

Setpoint group	Frequency/Load Control	Related FW	2.1.0
Range [units]	Disable / Enable [-]		
Default value	Disable	Force value	NO
Step	-		
Comm object	17609	Related applications	MINT
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 <b>see Dynamic Isochronous Frequency and Voltage Control on page 281.</b>			

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### Voltage Gain

Setpoint group	Voltage/PF Control	Related FW	2.1.0
Range [units]			
Default value		Force value	YES
Step			
Comm object	8501	Related applications	MINT
Config level	Standard		
Setpoint visibility	Always		
Description			
This setpoint adjusts the gain factor (P-factor) of the voltage control PI loop.			
<b>Note:</b> See the chapter <i>Regulation Loops</i> for more information.			

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## Voltage Int

Setpoint group	Voltage/PF Control	Related FW	2.1.0
Range [units]			
Default value		Force value	YES
Step			
Comm object	8720	Related applications	MINT
Config level	Standard		
Setpoint visibility	Always		
Description			
This setpoint adjusts the integration factor (I-factor) of the voltage control PI loop.			
<b>Note:</b> See the chapter <i>Regulation Loops</i> for more information.			

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## PF Gain

Setpoint group	Voltage/PF Control	Related FW	2.1.0
Range [units]			
Default value		Force value	YES
Step			
Comm object	8503	Related applications	MINT
Config level	Standard		
Setpoint visibility	Always		
Description			
This setpoint adjusts the gain factor (P-factor) of the PF control PI loop.			
<b>Note:</b> See the chapter <b>Regulation Loops</b> for more information.			

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## PF Int

Setpoint group	Voltage/PF Control	Related FW	2.1.0
Range [units]			
Default value		Force value	YES
Step			
Comm object	8721	Related applications	MINT
Config level	Standard		
Setpoint visibility	Always		
Description			
This setpoint adjusts the integration factor (I-factor) of the PF control PI loop.			
<b>Note:</b> See the chapter <i>Regulation Loops</i> for more information.			

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## VAr Sharing Gain

Setpoint group	Voltage/PF Control	Related FW	2.1.0
Range [units]			
Default value		Force value	YES
Step			
Comm object	8777	Related applications	MINT
Config level	Standard		
Setpoint visibility	Only if <b>Active Application</b> = MINT		
Description			
This setpoint adjusts the gain factor (P-factor) of the VAr sharing control PI loop.			
<b>Note:</b> See the chapter <i>Regulation Loops</i> for more information.			

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## VAr Sharing Int

Setpoint group	Voltage/PF Control	Related FW	2.1.0
Range [units]			
Default value		Force value	YES
Step			
Comm object	9036	Related applications	MINT
Config level	Standard		
Setpoint visibility	Only if <b>Active Application</b> = MINT		
Description			
This setpoint adjusts the integration factor (I-factor) of the VAr sharing control PI loop.			
<i><b>Note:</b> See the chapter <b>Regulation Loops</b> for more information.</i>			

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## Voltage Balancing Weight

Setpoint group	Voltage/PF Control	Related FW	2.1.0
Range [units]	0.000 .. 10.000 [-]		
Default value	1.000	Force value	YES
Step	0.001		
Comm object	18573	Related applications	MINT
Config level	Standard		
Setpoint visibility	Always		
Description			
<p>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.</p> <p>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 "<b>Voltage Balancing Weight</b>". 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.</p>			

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## Group: Synchronization

### Subgroup: AC Synchronization

#### Synchronization Type

Setpoint group	Synchronization	Related FW	2.1.0
Range [units]	PhaseMatch / SlipSynchr [-]		
Default value	PhaseMatch	Force value	YES
Step	[-]		
Comm object	14802	Related applications	MINT
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 / .**

**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	2.1.0
Range [units]	1 .. 1800 [s] / No Timeout		
Default value	60 s	Force value	YES
Step	1 s		
Comm object	8657	Related applications	MINT
Config level	Standard		
Setpoint visibility	Always		
Description			
This setpoint adjusts the maximum duration of <b>Synchronization</b> .			
<i><b>Note:</b> 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.</i>			

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## Voltage Window

Setpoint group	Synchronization	Related FW	2.1.0
Range [units]	0.0 .. 100.0 [%]		
Default value	10.0 %	Force value	YES
Step	0.1 %		
Comm object	8650	Related applications	MINT
Config level	Standard		
Setpoint visibility	Always		
Description			
This setpoint adjusts the maximal AC Voltage difference between respective phases of Mains/Bus and BESS for <b>Synchronization</b> . ( <b>BESS Voltage L1-N, Mains/Bus Voltage L1-N, BESS Voltage L2-N, Mains/Bus Voltage L2-N, ...</b> )			

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## BESS to Mains/Bus Phase Shift

Setpoint group	Synchronization	Related FW	2.1.0
Range [units]	-120 .. 120 [°]		
Default value	0 [°]	Force value	YES
Step	1 [°]		
Comm object	9578	Related applications	
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	2.1.0
Range [units]	0 .. 90 [°]		
Default value	10 °	Force value	YES
Step	1 °		
Comm object	8652	Related applications	MINT
Config level	Standard		
Setpoint visibility	Only if <b>Synchronization Type</b> = PhaseMatch		
Description			
This setpoint adjusts the maximal <b>Slip Angle</b> for <b>Synchronization</b> .  In order to disable breaker close command, adjust this setpoint to 0. Synchronization procedure will be active for <b>Synchronization Timeout</b> or until breaker is closed from an external device.			

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## Dwell Time

Setpoint group	Synchronization	Related FW	2.1.0
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
Config level	Standard		
Setpoint visibility	Always		
Description			
The period of time that the phase angle difference must be within <b>Phase Window</b> and voltage difference within <b>Voltage Window</b> before the breaker is closed.			

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## Slip Frequency

Setpoint group	Synchronization	Related FW	2.1.0
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
Config level	Standard		
Setpoint visibility	Only if <b>Synchronization Type</b> = SlipSynchr		
Description			
This setpoint adjusts the required <b>BESS Frequency</b> during synchronization while <b>Synchronization Type</b> = SlipSynchr.			
<i><b>Note:</b> Required <b>BESS Frequency</b> = Mains/Bus Frequency + Slip Frequency.</i>			

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## Slip Frequency Window

Setpoint group	Synchronization	Related FW	2.1.0
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
Config level	Standard		
Setpoint visibility	Only if <b>Synchronization Type</b> = SlipSynchr		
Description			
Window of slip frequency for slip synchronization ( <b>Synchronization Type</b> = SlipSynchr).			

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## BCB Latency

Setpoint group	Synchronization	Related FW	2.1.0
Range [units]	20 .. 1 000 [ms]		
Default value	80 ms	Force value	YES
Step	1 ms		
Comm object	14800	Related applications	MINT
Config level	Standard		
Setpoint visibility	Only if <b>Synchronization Type</b> = SlipSynchr		
Description			
Latency of BCB. This setpoint is enable, when <b>Synchronization Type</b> has SlipSynchro value.			

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## Subgroup: DC Synchronization

### DC Voltage Window

Setpoint group	Synchronization	Related FW	2.1.0
Range [units]	0,0 .. 100,0 [%]		
Default value	1 [%]	Force value	YES
Step	0,1 [%]		
Comm object	19631	Related applications	MINT
Config level	Standard		
Setpoint visibility	Only if <b>Precharge Sequence</b>		
<b>Description</b>			
<p>This setpoint adjusts the maximal DC Voltage difference between respective DC phases of PCS and ES for DC synchronization via ESCB. The DC voltage window is calculated from the setpoint <b>ES Nominal Voltage</b></p> <p>Connecting Battery Strings together in the Multi BMS function to the DC Bus also utilizes this setting of this setpoint. For more information see <b>DC String Coupling</b>.</p> <p><i><b>Note:</b> When setting the size of the DC Voltage Window, take into consideration that this setpoint establishes the voltage difference between two DC sources. This setpoint is used for both connecting battery strings together in Multi BMS function and also for connecting the Energy Storage to the PCS via Precharge. It is advised to use a lower voltage difference in this case.</i></p>			

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## Subgroup: Breaker Control

### ESCB Type

Setpoint group	Synchronization	Related FW	2.1.0
Range [units]	Fuse/Disc. / Breaker [-]		
Default value	Breaker	Force value	YES
Step	[-]		
Comm object	19633	Related applications	MINT
Config level	Advanced		
Setpoint visibility	Always		
Description			
This setpoint is set according to the type of ESCB breaker used.			
Breaker type	There is an electrically controllable contactor or motorized circuit breaker that the controller will operate.		
Fuse/Disc type:	The ESCB is not breaker but Fuse or Manual Disconnecter. ESCB is only monitored by the controller and is expected to be closed all the time (LBI <b>ESCB FEEDBACK</b> = 1). When LBI <b>ESCB FEEDBACK</b> = 0 then Alarm <b>Sd ESCB Fail</b> is activated.		

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## BCB Type

Setpoint group	Synchronization	Related FW	2.1.0
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 <b>BCB Feedback</b> 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	Synchronization	Related FW	2.1.0
Range [units]	Internal / Follow / External [-]		
Default value	Internal	Force value	YES
Step	[-]		
Comm object	11771	Related applications	MINT
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 <b>BCB FEEDBACK</b> causes <b>Stp BCB Fail</b> immediately. Incorrect reaction of the <b>BCB FEEDBACK</b> on internal BCB Close/Open command causes <b>Stp BCB Fail</b>		
Follow	BCB Opening ( <b>BCB FEEDBACK</b> = 0) is accepted from external devices. When such action occurs a history record "BCB Opened Externally" is written. Incorrect reaction of the <b>BCB FEEDBACK</b> to internal BCB Close/Open command causes <b>Stp BCB Fail</b>		
External	Controller does not control when the BCB is closed or opened.		



The controller always accepts the **BCB FEEDBACK** without issuing of any alarm.

When the **BCB FEEDBACK** get changed, then the event "BCB Opened" or "BCB Closed" is recorded to the history log.

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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## Attempts To Close Breaker

Setpoint group	Synchronization	Related FW	2.1.0
Range [units]	1 .. 5 [-]		
Default value	2	Force value	NO YES
Step	1 [-]		
Comm object	19885	Related applications	MINT
Config level	Advanced		
Setpoint visibility	Always		
Description			
This setpoint adjusts the amount of attempts the controller performs when a breaker is requested to be closed.			
<b>Example:</b> If the breaker feedback via LBI is not received at the end of the attempt, an alarm is not issued, unless it was the last attempt to close the breaker.			

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## Delay Between Closing Attempts

Setpoint group	Process Control	Related FW	2.1.0
Range [units]	20 .. 60 [s]		
Default value	20 [s]	Force value	NO
Step	1 [s]		
Comm object	19883	Related applications	MINT
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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## Waiting For Breaker Feedback

Setpoint group	Process Control	Related FW	2.1.0
Range [units]	1 .. Delay Between Closing Attempts [s]		
Default value	2	Force value	YES
Step	1 [-]		
Comm object	19884	Related applications	MINT
Config level	Advanced		
Setpoint visibility	Always		
Description			
This setpoint adjusts the length of breaker closing attempt.			
<div><div></div><div><b>Example:</b> When set to 10s, the LBO <b>BCB ON COIL</b> is set for 10 s.</div></div>			

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## #Neutral Contactor Control

Setpoint group	Process Control	Related FW	2.1.0
Range [units]	Each / Common [-]		
Default value	Each	Force value	NO
Step	[-]		
Comm object	9890	Related applications	MINT
Config level	Standard		
Setpoint visibility	Only if <b>Active Application</b> = MINT		
<b>Description</b>			
This setpoint changes the behavior of binary output <b>NCB CLOSE/OPEN</b> which is used for neutral contactor control.			
See more information in the chapter <b>Neutral Contactor Breaker</b> .			
<div><div>➤</div><div>The <b>EACH</b> option should be used if each Gen-set and BESS has its own neutral contactor. The <b>NCB CLOSE/OPEN</b> 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.</div></div> <div><div>➤</div><div>The <b>COMMON</b> option should be used if there is only one common neutral contactor for the whole site. The <b>NCB CLOSE/OPEN</b> 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.</div></div>			
<b>Note:</b> <i>LBI <b>NCB FEEDBACK</b> and LBO <b>NCB CLOSE/OPEN</b> has to be configured for proper functionality.</i>			
<b>Note:</b> <i>This setpoint is available only for the MINT application, in case of the SPTM application the <b>NCB</b> automatically behaves like this setpoint is set to <b>COMMON</b> option.</i>			
<b>Note:</b> <i>The # setpoints are shared with all controllers on site via intercontroller CAN line.</i>			

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## Group: Power Management

### Subgroup: Power Management Control

#### #Power Management Mode

Setpoint group	Power Management	Related FW	2.1.0
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 <b>Active Application</b> = MINT		
<b>Description</b>			
This setpoint selects the <b>Power Management</b> function mode.			
ABS [kW]	The <b>Power Management</b> is based on <b>Total Running P</b> and <b>BESS Nominal power</b> of each unit.		
ABS (kVA)	The <b>Power Management</b> is based on total running apparent power in PM and nominal apparent power.		
REL [%]	The <b>Power Management</b> is based on relative load, i.e. ratio of <b>Total Running P</b> to <b>BESS Nominal power</b> .		

**IMPORTANT:** This setpoint is shared via **CAN1** and/or **CAN2** . Change of this setpoint will be reflected in all controllers.

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## #Priority Auto Swap

Setpoint group	Power Management	Related FW	2.1.0								
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 <b>Active Application</b> = MINT										
Description											
This setpoint selects the optimization of <b>Power Management</b> function.											
<table><tr><td>Disabled</td><td>Optimization is disabled.</td></tr><tr><td>Run Hours Equal</td><td>This method changes the <b>Engine Priority (page 1)</b> to equalize running hours of the units or to keep maximal difference of running hours set by <b>#Run Hours Max Difference</b>.</td></tr><tr><td>N/A Mode</td><td>Power Management mode, which has been set via <b>CAN2 (Communication peripherals)</b>, is not supported in this controller.</td></tr><tr><td>Efficient</td><td>This method changes the <b>Engine Priority (page 1)</b> to optimize which units are running according to their <b>BESS Nominal power</b>, requested Load reserve and Run Hours. For units with the same nominal power also run hour equalization is being performed.</td></tr></table>				Disabled	Optimization is disabled.	Run Hours Equal	This method changes the <b>Engine Priority (page 1)</b> to equalize running hours of the units or to keep maximal difference of running hours set by <b>#Run Hours Max Difference</b> .	N/A Mode	Power Management mode, which has been set via <b>CAN2 (Communication peripherals)</b> , is not supported in this controller.	Efficient	This method changes the <b>Engine Priority (page 1)</b> to optimize which units are running according to their <b>BESS Nominal power</b> , requested Load reserve and Run Hours. For units with the same nominal power also run hour equalization is being performed.
Disabled	Optimization is disabled.										
Run Hours Equal	This method changes the <b>Engine Priority (page 1)</b> to equalize running hours of the units or to keep maximal difference of running hours set by <b>#Run Hours Max Difference</b> .										
N/A Mode	Power Management mode, which has been set via <b>CAN2 (Communication peripherals)</b> , is not supported in this controller.										
Efficient	This method changes the <b>Engine Priority (page 1)</b> to optimize which units are running according to their <b>BESS Nominal power</b> , requested Load reserve and Run Hours. For units with the same nominal power also run hour equalization is being performed.										
<b>IMPORTANT:</b> This setpoint is shared via <b>CAN1</b> and/or <b>CAN2</b> . Change of this setpoint will be reflected in all controllers.											

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## #System Start Delay

Setpoint group	Power Management	Related FW	2.1.0
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 <b>Active Application</b> = MINT		
<b>Description</b>			
This setpoint adjusts the delay of the system activation after the LBI <b>REMOTE START/STOP</b> has been activated.			
<i><b>Note:</b> System Start Delay countdown is changed to 1 second for parallel operation (Bus is in parallel with Mains).</i>			
<b>IMPORTANT:</b> This setpoint is shared via <b>CAN1</b> and/or <b>CAN2</b> . Change of this setpoint will be reflected in all controllers.			

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## #System Stop Delay

Setpoint group	Power Management	Related FW	2.1.0
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 <b>Active Application</b> = MINT		
<b>Description</b>			
This setpoint adjusts the delay of the system deactivation after the LBI <b>REMOTE START/STOP</b> has been deactivated.			
<i><b>Note:</b> System Stop Delay countdown is changed to 1 second for parallel operation (Bus is in parallel with Mains).</i>			
<b>IMPORTANT:</b> This setpoint is shared via <b>CAN1</b> and/or <b>CAN2</b> . Change of this setpoint will be reflected in all controllers.			

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## Dynamic Spinning Reserve

Setpoint group	Power Management	Related FW	2.1.0
Range [units]	Enabled / Disabled [-]		
Default value	Disabled	Force value	NO
Step	[-]		
Comm object	14126	Related applications	MINT
Config level	Standard		
Setpoint visibility	Only if <b>Active Application</b> = MINT		
<b>Description</b>			
This setpoint is used to enable/disable use of the <b>Dynamic Spinning Reserve</b> functionality in power management.			
<i><b>Note:</b> If enabled option is selected the InteliNeo 530 BESS 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.</i>			

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### Subgroup: Load Reserve Set 1

#### #Starting Load Reserve 1

Setpoint group	Power Management	Related FW	2.1.0
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
Config level	Standard		
Setpoint visibility	Only if #Power Management Mode = ABS [kW]		
Description			
<p>This setpoint adjusts required minimal <b>Actual Reserve</b> for <b>Power Management</b> function.</p> <p>If Load Reserve Set 1 is activated and <b>Actual Reserve</b> drops below this limit, next will be started.</p> <p>The currently active reserve set is selected by binary inputs <b>LOAD RES 2 ACTIVE</b>, <b>LOAD RES 3 ACTIVE</b> and <b>LOAD RES 4 ACTIVE</b>. If none of these inputs is active the Load Reserve Set 1 is selected.</p> <p><b>Note:</b> <i>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).</i></p> <p><b>IMPORTANT:</b> This setpoint is shared via <b>CAN1</b> and/or <b>CAN2</b> . Change of this setpoint will be reflected in all controllers.</p>			

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## #Stopping Load Reserve 1

Setpoint group	Power Management	Related FW	2.1.0
Range [units]	#Starting Load Reserve 1 .. 32000 [kW] (depends on the selected <b>Power Formats And Units</b> )		
Default value	110 kW (depends on the selected <b>Power Formats And Units</b> )	Force value	NO
Step	1 kW (depends on the selected <b>Power Formats And Units</b> )		
Comm object	8491	Related applications	MINT
Config level	Standard		
Setpoint visibility	Only if #Power Management Mode = ABS [kW]		
Description			
<p>This setpoint adjusts required maximal <b>Actual Reserve</b> for <b>Power Management</b> function.</p> <p>If Load Reserve Set 1 is activated and <b>Actual Reserve</b> rises over this limit, next will be stopped.</p> <p>The currently active reserve set is selected by binary inputs <b>LOAD RES 2 ACTIVE</b>, <b>LOAD RES 3 ACTIVE</b> and <b>LOAD RES 4 ACTIVE</b>. If none of these inputs is active the Load Reserve Set 1 is selected.</p> <p><b>Note:</b> <i>The reserve for stop must be always adjusted higher than the reserve for start.</i></p> <p><b>IMPORTANT:</b> This setpoint is shared via <b>CAN1</b> and/or <b>CAN2</b> . Change of this setpoint will be reflected in all controllers.</p>			

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## #Starting Rel Load Reserve 1

Setpoint group	Power Management	Related FW	2.1.0
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			
<p>This setpoint adjusts required minimal <b>Actual Relative Reserve</b> for <b>Power Management</b> function.</p> <p>If Load Reserve Set 1 is activated and <b>Actual Relative Reserve</b> drops below this limit, next will be started.</p> <p>The currently active reserve set is selected by binary inputs <b>LOAD RES 2 ACTIVE</b>, <b>LOAD RES 3 ACTIVE</b> and <b>LOAD RES 4 ACTIVE</b>. If none of these inputs is active the Load Reserve Set 1 is selected.</p> <p><b>IMPORTANT:</b> This setpoint is shared via <b>CAN1</b> and/or <b>CAN2</b> . Change of this setpoint will be reflected in all controllers.</p>			

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## #Stopping Rel Load Reserve 1

Setpoint group	Power Management	Related FW	2.1.0
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			
<p>This setpoint adjusts required maximal <b>Actual Relative Reserve</b> for <b>Power Management</b> function.</p> <p>If Load Reserve Set 1 is activated and <b>Actual Relative Reserve</b> rises over this limit, next will be stopped.</p> <p>The currently active reserve set is selected by binary inputs <b>LOAD RES 2 ACTIVE</b>, <b>LOAD RES 3 ACTIVE</b> and <b>LOAD RES 4 ACTIVE</b>. If none of these inputs is active the Load Reserve Set 1 is selected.</p>			
<div><b>IMPORTANT:</b> This setpoint is shared via <b>CAN1</b> and/or <b>CAN2</b> . Change of this setpoint will be reflected in all controllers.</div>			

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## Subgroup: Load Reserve Set 2

### #Starting Load Reserve 2

Setpoint group	Power Management	Related FW	2.1.0
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			
<p>This setpoint adjusts required minimal <b>Actual Reserve</b> for <b>Power Management</b> function.</p> <p>If Load Reserve Set 2 is activated and <b>Actual Reserve</b> drops below this limit, next will be started.</p> <p>The currently active reserve set is selected by binary inputs <b>LOAD RES 2 ACTIVE</b>, <b>LOAD RES 3 ACTIVE</b> and <b>LOAD RES 4 ACTIVE</b>. If none of these inputs is active the Load Reserve Set 1 is selected.</p> <p><b>Note:</b> If the absolute power management is selected, this setpoint (or the setpoints <b>#Starting Load Reserve 2</b>, <b>#Starting Load Reserve 3</b> or <b>#Starting Load Reserve 4</b> 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).</p> <p><b>IMPORTANT:</b> This setpoint is shared via <b>CAN1</b> and/or <b>CAN2</b> . Change of this setpoint will be reflected in all controllers.</p>			

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## #Stopping Load Reserve 2

Setpoint group	Power Management	Related FW	2.1.0
Range [units]	#Starting Load Reserve 2 .. 32000 [kW] (depends on the selected <b>Power Formats And Units</b> )		
Default value	460 kW (depends on the selected <b>Power Formats And Units</b> )	Force value	NO
Step	1 kW (depends on the selected <b>Power Formats And Units</b> )		
Comm object	8633	Related applications	MINT
Config level	Standard		
Setpoint visibility	Only if #Power Management Mode = ABS [kW]		
Description			
<p>This setpoint adjusts required maximal <b>Actual Reserve</b> for <b>Power Management</b> function.</p> <p>If Load Reserve Set 2 is activated and <b>Actual Reserve</b> rises over this limit, next will be stopped.</p> <p>The currently active reserve set is selected by binary inputs <b>LOAD RES 2 ACTIVE</b>, <b>LOAD RES 3 ACTIVE</b> and <b>LOAD RES 4 ACTIVE</b>. If none of these inputs is active the Load Reserve Set 1 is selected.</p> <p><b>Note:</b> <i>The reserve for stop must be always adjusted higher than the reserve for start.</i></p> <p><b>IMPORTANT:</b> This setpoint is shared via <b>CAN1</b> and/or <b>CAN2</b> . Change of this setpoint will be reflected in all controllers.</p>			

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## #Starting Rel Load Reserve 2

Setpoint group	Power Management	Related FW	2.1.0
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			
<p>This setpoint adjusts required minimal <b>Actual Relative Reserve</b> for <b>Power Management</b> function.</p> <p>If Load Reserve Set 2 is activated and <b>Actual Relative Reserve</b> drops below this limit, next will be started.</p> <p>The currently active reserve set is selected by binary inputs <b>LOAD RES 2 ACTIVE</b>, <b>LOAD RES 3 ACTIVE</b> and <b>LOAD RES 4 ACTIVE</b>. If none of these inputs is active the Load Reserve Set 1 is selected.</p>			
<b>IMPORTANT:</b> This setpoint is shared via <b>CAN1</b> and/or <b>CAN2</b> . 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	2.1.0
Range [units]	#Starting Rel Load Reserve 2 .. 110 [%]		
Default value	80 %	Force value	NO
Step	1 %		
Comm object	10653	Related applications	MINT
Config level	Standard		
Setpoint visibility	Only if #Power Management Mode = REL [%]		
Description			
<p>This setpoint adjusts required maximal <b>Actual Relative Reserve</b> for <b>Power Management</b> function.</p> <p>If Load Reserve Set 2 is activated and <b>Actual Relative Reserve</b> rises over this limit, next will be stopped.</p> <p>The currently active reserve set is selected by binary inputs <b>LOAD RES 2 ACTIVE</b>, <b>LOAD RES 3 ACTIVE</b> and <b>LOAD RES 4 ACTIVE</b>. If none of these inputs is active the Load Reserve Set 1 is selected.</p> <p><b>IMPORTANT:</b> This setpoint is shared via <b>CAN1</b> and/or <b>CAN2</b> . Change of this setpoint will be reflected in all controllers.</p>			

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## Subgroup: Load Reserve Set 3

## #Starting Load Reserve 3

Setpoint group	Power Management	Related FW	2.1.0
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			
<p>This setpoint adjusts required minimal <b>Actual Reserve</b> for <b>Power Management</b> function.</p> <p>If Load Reserve Set 3 is activated and <b>Actual Reserve</b> drops below this limit, next will be started.</p> <p>The currently active reserve set is selected by binary inputs <b>LOAD RES 2 ACTIVE</b>, <b>LOAD RES 3 ACTIVE</b> and <b>LOAD RES 4 ACTIVE</b>. If none of these inputs is active the Load Reserve Set 1 is selected.</p>			
<b>IMPORTANT:</b> This setpoint is shared via <b>CAN1</b> and/or <b>CAN2</b> . Change of this setpoint will be reflected in all controllers.			

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### #Stopping Load Reserve 3

Setpoint group	Power Management	Related FW	2.1.0
Range [units]	#Starting Load Reserve 3 .. 32000 [kW] (depends on the selected <b>Power Formats And Units</b> )		
Default value	460 kW (depends on the selected <b>Power Formats And Units</b> )	Force value	NO
Step	1 kW (depends on the selected <b>Power Formats And Units</b> )		
Comm object	8833	Related applications	MINT
Config level	Standard		
Setpoint visibility	Only if #Power Management Mode = ABS [kW]		
Description			
<p>This setpoint adjusts required maximal <b>Actual Reserve</b> for <b>Power Management</b> function.</p> <p>If Load Reserve Set 3 is activated and <b>Actual Reserve</b> rises over this limit, next will be stopped.</p> <p>The currently active reserve set is selected by binary inputs <b>LOAD RES 2 ACTIVE</b>, <b>LOAD RES 3 ACTIVE</b> and <b>LOAD RES 4 ACTIVE</b>. If none of these inputs is active the Load Reserve Set 1 is selected.</p> <p><b>Note:</b> <i>The reserve for stop must be always adjusted higher than the reserve for start.</i></p> <p><b>IMPORTANT:</b> This setpoint is shared via <b>CAN1</b> and/or <b>CAN2</b> . Change of this setpoint will be reflected in all controllers.</p>			

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### #Starting Rel Load Reserve 3

Setpoint group	Power Management	Related FW	2.1.0
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			
<p>This setpoint adjusts required minimal <b>Actual Relative Reserve</b> for <b>Power Management</b> function.</p> <p>If Load Reserve Set 3 is activated and <b>Actual Relative Reserve</b> drops below this limit, next will be started.</p> <p>The currently active reserve set is selected by binary inputs <b>LOAD RES 2 ACTIVE</b>, <b>LOAD RES 3 ACTIVE</b> and <b>LOAD RES 4 ACTIVE</b>. If none of these inputs is active the Load Reserve Set 1 is selected.</p> <p><b>IMPORTANT:</b> This setpoint is shared via <b>CAN1</b> and/or <b>CAN2</b> . Change of this setpoint will be reflected in all controllers.</p>			

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## #Stopping Rel Load Reserve 3

Setpoint group	Power Management	Related FW	2.1.0
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			
<p>This setpoint adjusts required maximal <b>Actual Relative Reserve</b> for <b>Power Management</b> function.</p> <p>If Load Reserve Set 3 is activated and <b>Actual Relative Reserve</b> rises over this limit, next will be stopped.</p> <p>The currently active reserve set is selected by binary inputs <b>LOAD RES 2 ACTIVE</b>, <b>LOAD RES 3 ACTIVE</b> and <b>LOAD RES 4 ACTIVE</b>. If none of these inputs is active the Load Reserve Set 1 is selected.</p>			
<div><b>IMPORTANT:</b> This setpoint is shared via <b>CAN1</b> and/or <b>CAN2</b> . Change of this setpoint will be reflected in all controllers.</div>			

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## Subgroup: Load Reserve Set 4

## #Starting Load Reserve 4

Setpoint group	Power Management	Related FW	2.1.0
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			
<p>This setpoint adjusts required minimal <b>Actual Reserve</b> for <b>Power Management</b> function.</p> <p>If Load Reserve Set 4 is activated and <b>Actual Reserve</b> drops below this limit, next will be started.</p> <p>The currently active reserve set is selected by binary inputs <b>LOAD RES 2 ACTIVE</b>, <b>LOAD RES 3 ACTIVE</b> and <b>LOAD RES 4 ACTIVE</b>. If none of these inputs is active the Load Reserve Set 1 is selected.</p> <p><b>IMPORTANT:</b> This setpoint is shared via <b>CAN1</b> and/or <b>CAN2</b> . Change of this setpoint will be reflected in all controllers.</p>			

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## #Stopping Load Reserve 4

Setpoint group	Power Management	Related FW	2.1.0
Range [units]	#Starting Load Reserve 4 .. 32000 [kW] (depends on the selected <b>Power Formats And Units</b> )		
Default value	460 kW (depends on the selected <b>Power Formats And Units</b> )	Force value	NO
Step	1 kW (depends on the selected <b>Power Formats And Units</b> )		
Comm object	8834	Related applications	MINT
Config level	Standard		
Setpoint visibility	Only if #Power Management Mode = ABS [kW]		
Description			
<p>This setpoint adjusts required maximal <b>Actual Reserve</b> for <b>Power Management</b> function.</p> <p>If Load Reserve Set 4 is activated and <b>Actual Reserve</b> rises over this limit, next will be stopped.</p> <p>The currently active reserve set is selected by binary inputs <b>LOAD RES 2 ACTIVE</b>, <b>LOAD RES 3 ACTIVE</b> and <b>LOAD RES 4 ACTIVE</b>. If none of these inputs is active the Load Reserve Set 1 is selected.</p> <p><b>Note:</b> <i>The reserve for stop must be always adjusted higher than the reserve for start.</i></p> <p><b>IMPORTANT:</b> This setpoint is shared via <b>CAN1</b> and/or <b>CAN2</b> . Change of this setpoint will be reflected in all controllers.</p>			

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## #Starting Rel Load Reserve 4

Setpoint group	Power Management	Related FW	2.1.0
Range [units]	0 .. #Stopping Rel Load Reserve 4 [%]		
Default value	60 %	Force value	NO
Step	1 %		
Comm object	10651	Related applications	MINT
Config level	Standard		
Setpoint visibility	Only if #Power Management Mode = REL [%]		
Description			
<p>This setpoint adjusts required minimal <b>Actual Relative Reserve</b> for <b>Power Management</b> function.</p> <p>If Load Reserve Set 4 is activated and <b>Actual Relative Reserve</b> drops below this limit, next will be started.</p> <p>The currently active reserve set is selected by binary inputs <b>LOAD RES 2 ACTIVE</b>, <b>LOAD RES 3 ACTIVE</b> and <b>LOAD RES 4 ACTIVE</b>. If none of these inputs is active the Load Reserve Set 1 is selected.</p> <p><b>IMPORTANT:</b> This setpoint is shared via <b>CAN1</b> and/or <b>CAN2</b> . Change of this setpoint will be reflected in all controllers.</p>			

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## #Stopping Rel Load Reserve 4

Setpoint group	Power Management	Related FW	2.1.0
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			
<p>This setpoint adjusts required maximal <b>Actual Relative Reserve</b> for <b>Power Management</b> function.</p> <p>If Load Reserve Set 4 is activated and <b>Actual Relative Reserve</b> rises over this limit, next will be stopped.</p> <p>The currently active reserve set is selected by binary inputs <b>LOAD RES 2 ACTIVE</b>, <b>LOAD RES 3 ACTIVE</b> and <b>LOAD RES 4 ACTIVE</b>. If none of these inputs is active the Load Reserve Set 1 is selected.</p>			
<div><b>IMPORTANT:</b> This setpoint is shared via <b>CAN1</b> and/or <b>CAN2</b> . Change of this setpoint will be reflected in all controllers.</div>			

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## Subgroup: Minimal Running Power

### #Min Run Power 1

Setpoint group	Power Management	Related FW	2.1.0
Range [units]	0 .. 65000 [kW] (depends on the selected <b>Power Formats And Units</b> )		
Default value	210 kW (depends on the selected <b>Power Formats And Units</b> )	Force value	NO
Step	1 kW (depends on the selected <b>Power Formats And Units</b> )		
Comm object	9584	Related applications	MINT
Config level	Standard		
Setpoint visibility	Only if <b>Active Application</b> = MINT		
Description			
This setpoint adjusts required <b>Minimal Running Nominal Power</b> and BESS if Minimal Running Power 1 is chosen.			
There are 3 Minimal Running Power options. This one is activated by LBI <b>MIN RUN POWER ACT 1</b> .			
<b>IMPORTANT:</b> This setpoint is shared via <b>CAN1</b> and/or <b>CAN2</b> . Change of this setpoint will be reflected in all controllers.			

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## #Min Run Power 2

Setpoint group	Power Management	Related FW	2.1.0
Range [units]	0 .. 65000 [kW] (depends on the selected <b>Power Formats And Units</b> )		
Default value	210 kW (depends on the selected <b>Power Formats And Units</b> )	Force value	NO
Step	1 kW (depends on the selected <b>Power Formats And Units</b> )		
Comm object	9585	Related applications	MINT
Config level	Standard		
Setpoint visibility	Only if <b>Active Application</b> = MINT		
<b>Description</b>			
This setpoint adjusts required <b>Minimal Running Nominal Power</b> of Controllers and BESS if Minimal Running Power 2 is chosen.			
There are 3 Minimal Running Power options. This one is activated by LBI <b>MIN RUN POWER ACT 2</b> .			
<b>IMPORTANT:</b> This setpoint is shared via <b>CAN1</b> and/or <b>CAN2</b> . Change of this setpoint will be reflected in all controllers.			

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## #Min Run Power 3

Setpoint group	Power Management	Related FW	2.1.0
Range [units]	0 .. 65000 [kW] (depends on the selected <b>Power Formats And Units</b> )		
Default value	210 kW (depends on the selected <b>Power Formats And Units</b> )	Force value	NO
Step	1 kW (depends on the selected <b>Power Formats And Units</b> )		
Comm object	9586	Related applications	MINT
Config level	Standard		
Setpoint visibility	Only if <b>Active Application</b> = MINT		
<b>Description</b>			
This setpoint adjusts required <b>Minimal Running Nominal Power</b> of Controllers and BESS if Minimal Running Power 3 is chosen.			
There are 3 Minimal Running Power options. This one is activated by LBI <b>MIN RUN POWER ACT 3</b> .			
<b>IMPORTANT:</b> This setpoint is shared via <b>CAN1</b> and/or <b>CAN2</b> . 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	2.1.0
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 <b>Active Application</b> = MINT		
Description			
This setpoint adjusts the delay before next is started after <b>Actual Reserve / Actual Relative Reserve</b> drops below Starting Load Reserve of currently active Load Reserve Set.			
<b>IMPORTANT:</b> This setpoint is shared via <b>CAN1</b> and/or <b>CAN2</b> . Change of this setpoint will be reflected in all controllers.			

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### #Next Engine Stop Delay

Setpoint group	Power Management	Related FW	2.1.0
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 <b>Active Application</b> = MINT		
Description			
This setpoint adjusts the delay before next is stopped after <b>Actual Reserve / Actual Relative Reserve</b> rises over Stopping Load Reserve of currently active Load Reserve Set.			
<b>IMPORTANT:</b> This setpoint is shared via <b>CAN1</b> and/or <b>CAN2</b> . 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	2.1.0
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 <b>Active Application</b> = MINT		
<b>Description</b>			
This setpoint adjusts for how long the next Source will suppress their own Slow Stop alarms to give chance to another Controller to start and replace the defective one.			
<i><b>Note:</b> If there is no Controller available to start, the Slow Stop alarms are not suppressed.</i>			
<b>IMPORTANT:</b> This setpoint is shared via <b>CAN1</b> and/or <b>CAN2</b> . Change of this setpoint will be reflected in all controllers.			

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## Subgroup: Over Load Next Start Protection

### #Overload Next Start Protection

Setpoint group	Power Management	Related FW	2.1.0				
Range [units]	Disabled / Enabled [-]						
Default value	Enabled	Force value	NO				
Step	[-]						
Comm object	14942	Related applications	MINT				
Config level	Standard						
Setpoint visibility	Only if <b>Active Application</b> = MINT						
<b>Description</b>							
This setpoint enables or disables Overload Next Start Protection. It makes the next (in priority order) to start when the load excises the value given by the setpoint <b>#Overload Next Start Level</b> right after the delay <b>#Overload Next Start Delay</b> . <b>#Overload Next Start Protection</b> requires Starting Load Reserve condition to be fulfilled in order to be used.							
<table><tr><td>Disabled</td><td>Protection is disabled.</td></tr><tr><td>Enabled</td><td>Protection is enabled. If <b>Total Running P</b> of PM Controllers related to <b>Running Nominal Power In PM</b> is over <b>#Overload Next Start Level</b>, another Controller is started after <b>#Overload Next Start Delay</b>.</td></tr></table>				Disabled	Protection is disabled.	Enabled	Protection is enabled. If <b>Total Running P</b> of PM Controllers related to <b>Running Nominal Power In PM</b> is over <b>#Overload Next Start Level</b> , another Controller is started after <b>#Overload Next Start Delay</b> .
Disabled	Protection is disabled.						
Enabled	Protection is enabled. If <b>Total Running P</b> of PM Controllers related to <b>Running Nominal Power In PM</b> is over <b>#Overload Next Start Level</b> , another Controller is started after <b>#Overload Next Start Delay</b> .						
<b>IMPORTANT:</b> This setpoint is shared via <b>CAN1</b> and/or <b>CAN2</b> . Change of this setpoint will be reflected in all controllers.							

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## #Overload Next Start Level

Setpoint group	Power Management	Related FW	2.1.0
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.			
<b>IMPORTANT:</b> This setpoint is shared via <b>CAN1</b> and/or <b>CAN2</b> . Change of this setpoint will be reflected in all controllers.			

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## #Overload Next Start Delay

Setpoint group	Power Management	Related FW	2.1.0
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.			
<b>IMPORTANT:</b> This setpoint is shared via <b>CAN1</b> and/or <b>CAN2</b> . Change of this setpoint will be reflected in all controllers.			

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## Subgroup: Run Hours Equalization

### #Run Hours Max Difference

Setpoint group	Power Management	Related FW	2.1.0
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 <b>Active Application</b> = MINT		
<b>Description</b>			
This setpoint adjusts the maximal difference between <b>Running Hours</b> of in <b>Power Management</b> function if <b>#Priority Auto Swap</b> .			
If the difference between <b>Running Hours</b> is over this limit, priorities are swapped.			
<b>IMPORTANT:</b> This setpoint is shared via <b>CAN1</b> and/or <b>CAN2</b> . 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	2.1.0
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 <b>Active Application</b> = MINT		
<b>Description</b>			
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 <b>#Priority Auto Swap</b> = Efficient.			
<b>IMPORTANT:</b> This setpoint is shared via <b>CAN1</b> and/or <b>CAN2</b> . 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	2.1.0
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 <b>Active Application</b> = 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 <b>#Priority Auto Swap</b> = Efficient.			
<b>IMPORTANT:</b> This setpoint is shared via <b>CAN1</b> and/or <b>CAN2</b> . 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	2.1.0
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 <b>Active Application</b> = MINT		
Description			
This setpoint adjusts control group in which the particular belongs to. If there are no logical groups on the site, adjust this setpoint to 1. See more information in chapter <b>Control Groups</b> .			
<b>Note:</b> This control group settings are applied to BESS integrated via IntelliNeo.			

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## Group Link L

<b>Setpoint group</b>	Power Management	<b>Related FW</b>	2.1.0
<b>Range [units]</b>	1 .. 32 [-]		
<b>Default value</b>	1 [-]	<b>Force value</b>	YES
<b>Step</b>	1 [-]		
<b>Comm object</b>	10590	<b>Related applications</b>	MINT
<b>Config level</b>	Standard		
<b>Setpoint visibility</b>	Only if <b>Active Application</b> = MINT		
<b>Description</b>			
If the input <b>GROUP LINK</b> of this particular controller is used to provide the "group link" information for two Control groups (to get more information refer to the chapter <b>Control Groups</b> ). 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

<b>Setpoint group</b>	Power Management	<b>Related FW</b>	2.1.0
<b>Range [units]</b>	1 .. 32 [-]		
<b>Default value</b>	1 [-]	<b>Force value</b>	YES
<b>Step</b>	1 [-]		
<b>Comm object</b>	10591	<b>Related applications</b>	MINT
<b>Config level</b>	Standard		
<b>Setpoint visibility</b>	Only if <b>Active Application</b> = MINT		
<b>Description</b>			
If the input <b>GROUP LINK</b> of this particular controller is used to provide the "group link" information for two Control groups (to get more information refer to the chapter <b>Control Groups</b> ). 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	2.1.0
Range [units]	1 .. 45 [°]		
Default value	10 °	Force value	YES
Step	1 °		
Comm object	9843	Related applications	MINT
Config level	Standard		
Setpoint visibility	Only if <b>Vector Shift Protection</b> is not Disabled		
Description			
This setpoint adjusts the threshold level for the <b>Vector Shift Protection</b> .			
<i><b>Note:</b> To adjust this setpoint properly, check the value <b>Max Vector Shift</b>. The value is available in IntelliConfig, 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 °.</i>			

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#### ROCOF1 Windows Length

Setpoint group	Loss of Mains Protection	Related FW	2.1.0
Range [units]	3 .. 30 [-]		
Default value	5	Force value	YES
Step	1 [-]		
Comm object	9990	Related applications	MINT
Config level	Standard		
Setpoint visibility	Only if <b>ROCOF1 Protection</b> is not Disabled		
Description			
This setpoint adjusts the time averaging level for the <b>ROCOF1 Protection</b> .			
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	2.1.0
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
Config level	Standard		
Setpoint visibility	Only if <b>ROCOF1 Protection</b> is not Disabled		
Description			
This setpoint adjusts the trip level for <b>ROCOF1 Protection</b> .			

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## ROCOF2 Windows Length

<b>Setpoint group</b>	Loss of Mains Protection	<b>Related FW</b>	2.1.0
<b>Range [units]</b>	0.1 .. 2.5 [s]		
<b>Default value</b>	0.5 s	<b>Force value</b>	YES
<b>Step</b>	0.1 s		
<b>Comm object</b>	16137	<b>Related applications</b>	MINT
<b>Config level</b>	Standard		
<b>Setpoint visibility</b>	Only if <b>ROCOF2 Protection</b> is not Disabled		
<b>Description</b>			
This setpoint adjusts the time averaging level for the <b>ROCOF2 Protection</b> .			
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	2.1.0
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
Config level	Standard		
Setpoint visibility	Only if <b>ROCOF2 Protection</b> is not Disabled		
Description			
This setpoint adjusts the trip level for <b>ROCOF2 Protection</b> .			

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## ROCOF3 Windows Length

<b>Setpoint group</b>	Loss of Mains Protection	<b>Related FW</b>	2.1.0
<b>Range [units]</b>	0.1 .. 2.5 [s]		
<b>Default value</b>	1.0 s	<b>Force value</b>	YES
<b>Step</b>	0.1 s		
<b>Comm object</b>	16138	<b>Related applications</b>	MINT
<b>Config level</b>	Standard		
<b>Setpoint visibility</b>	Only if <b>ROCOF3 Protection</b> is not Disabled		
<b>Description</b>			
This setpoint adjusts the time averaging level for the <b>ROCOF3 Protection</b> .			
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	2.1.0
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
Config level	Standard		
Setpoint visibility	Only if <b>ROCOF3 Protection</b> is not Disabled		
Description			
This setpoint adjusts the trip level for <b>ROCOF3 Protection</b> .			

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## ROCOF4 Windows Length

<b>Setpoint group</b>	Loss of Mains Protection	<b>Related FW</b>	2.1.0
<b>Range [units]</b>	0.1 .. 2.5 [s]		
<b>Default value</b>	2.0 s	<b>Force value</b>	YES
<b>Step</b>	0.1 s		
<b>Comm object</b>	16139	<b>Related applications</b>	MINT
<b>Config level</b>	Standard		
<b>Setpoint visibility</b>	Only if <b>ROCOF4 Protection</b> is not Disabled		
<b>Description</b>			
This setpoint adjusts the time averaging level for the <b>ROCOF4 Protection</b> .			
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	2.1.0
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
Config level	Standard		
Setpoint visibility	Only if <b>ROCOF4 Protection</b> is not Disabled		
Description			
This setpoint adjusts the trip level for <b>ROCOF4 Protection</b> .			

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Group: Grid Codes

Subgroup: Dynamic Support

## Post VRT Priority

Setpoint group	Grid Codes	Related FW	2.1.0
Range [units]	0 .. 254; OFF [-]		
Default value	2 [-]	Force value	YES
Step	1 [-]		
Comm object	14503	Related applications	MINT
Config level	Standard		
Setpoint visibility			
Description			
This setpoint adjusts priority of <b>Post VRT Ramp</b> which is used while LBO <b>EVENT POST VRT</b> is closed.			

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## Post VRT Ramp

Setpoint group	Grid Codes	Related FW	2.1.0
Range [units]	0 .. 1800 [s]		
Default value	60 s	Force value	YES
Step	1 s		
Comm object	16490	Related applications	MINT
Config level	Standard		
Setpoint visibility			
Description			
This setpoint adjusts ramping time of <b>BESS Required P</b> to <b>BESS Required P Target</b> if <b>LBO EVENT Post VRT</b> is closed.			
The ramping time is set for $\Delta P$ which is given by the setpoint <b>BESS Nominal power</b> .			
Priority of this ramp is given by <b>Post VRT Priority</b> .			

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## Subgroup: Soft Unload

### Soft Unload Priority

Setpoint group	Grid Codes	Related FW	2.1.0
Range [units]	0 .. 254; OFF [-]		
Default value	1 [-]	Force value	YES
Step	1 [-]		
Comm object	14493	Related applications	MINT
Config level	Standard		
Setpoint visibility			
Description			
This setpoint adjusts priority of <b>Soft Unload Ramp</b> which is used while LBO <b>EVENT SOFT UNLOAD</b> is closed.			
<b>Note:</b> 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	2.1.0
Range [units]	0 .. 1800 [s]		
Default value	60 s	Force value	YES
Step	1 s		
Comm object	16489	Related applications	MINT
Config level	Standard		
Setpoint visibility			
Description			
<p>This setpoint adjusts the ramping time of the <b>BESS Required P</b> to the <b>BESS Required P Target</b> while soft unloading when BCB is requested to be opened.</p> <p>The Required P reach the zero value at the end of the timer. The ramping time is set for <math>\Delta P</math> which is given by the setpoint <b>BESS Nominal power</b>.</p> <p><b>Example:</b> <b>BESS Nominal power</b> = 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.</p>			

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## Group: Load Shedding

### Subgroup: Load Shedding

#### Load Shedding Active

Setpoint group	Load Shedding	Related FW	2.1.0
Range [units]	Disabled / Island only / IsL+Trip paral / All the time [-]		
Default value	Disabled	Force value	YES
Step	[-]		
Comm object	11001	Related applications	MINT
Config level	Advanced		
Setpoint visibility	Allways		
Description			
This setpoint adjusts the activation of the <b>Load Shedding</b> function.			
<ul style="list-style-type: none"><li>&gt; <b>Disabled</b> – Function is disabled.</li><li>&gt; <b>Island only</b> – Function is active when <b>Breaker state</b> = IsOper or <b>Breaker state</b> = MultIsOp.<ul style="list-style-type: none"><li>&gt;&gt; <b>Load shedding outputs</b> are closed/opened one by one in island operations</li><li>&gt;&gt; Setpoint <b>Number Of Tripped Stages (page 1)</b> adjusts number of Load Shedding Outputs which are closed at once when the BESS source changes into the island operation if MCB and MGCB were opened -&gt; Bus is powered -&gt; MGCB closed. The rest of the configured LBO Load Shedding Stages will activate after set delay and activation of the group of LBO Load Shedding Stages.</li></ul></li><li>&gt; <b>IsL+Trip paral</b> – Function behaves same as Load Shedding Active = Island only and adds load shedding when <b>Breaker state</b> is changed from ParalOper/MultParOp to IsOper/MultIsOp .<ul style="list-style-type: none"><li>&gt;&gt; <b>Load shedding outputs</b> are closed/opened one by one in island operations</li><li>&gt;&gt; Setpoint <b>Number Of Tripped Stages (page 1)</b> adjusts number of <b>Load shedding outputs</b> which are closed at once when the BESS source changes into the island operation if MCB and MGCB were opened -&gt; Bus is powered -&gt; BCB closed.</li><li>&gt;&gt; Setpoint <b>Number Of Tripped Stages (page 1)</b> adjusts number of Load Shedding Outputs which are closed at once when the gen-sets change into island operation state in this way: MCB and MGCB were closed -&gt; MCB opened.</li></ul></li><li>&gt; <b>All the time</b> – Function is active regardless of <b>Breaker state</b>.<ul style="list-style-type: none"><li>&gt;&gt; All <b>Load shedding outputs</b> are never tripped at once when BCB is closed into parallel operation.</li><li>&gt;&gt; Setpoint <b>Number Of Tripped Stages (page 1)</b> adjusts number of Load Shedding Outputs which are tripped at once when MGCB is closed into island operation..</li></ul></li></ul>			

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## Auto Load Reconnection

Setpoint group	Load Shedding	Related FW	2.1.0
Range [units]	Disabled / Enabled [-]		
Default value	Disabled	Force value	YES
Step	[-]		
Comm object	9649	Related applications	MINT
Config level	Advanced		
Setpoint visibility	Only if <b>Load Shedding Active</b> is not Disabled		
Description			
This setpoint enables/disables Automatic <b>Load Shedding</b> .			
Disabled	Rising edge of LBI <b>MANUAL LOAD RECONNECTION</b> lowers the load reduction stage by one while <b>BESS P</b> drops under <b>Power P Load Reconnection Level</b> .		
Enabled	Load reduction stage is lowered by one when <b>BESS P</b> drops under <b>Power P Load Reconnection Level</b> and period of <b>Load Reconnection Delay</b> elapsed from last load reduction stage lowering.		

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## Number Of Tripped Stages

Setpoint group	Load Shedding	Related FW	2.1.0
Range [units]	0 .. 5 [-]		
Default value	5 [-]	Force value	YES NO
Step	1 [-]		
Comm object	17588	Related applications	MINT
Config level	Advanced		
Setpoint visibility	Only if <b>Load Shedding Active</b> is not Disabled		
Description			
This setpoint adjusts the number of configured LBO Load Shedding stages which are tripped (closed) at once during specific situations of the setpoint <b>Load Shedding Active</b> . Tripping of stages is conditioned by setpoint <b>Load Shedding Active</b> setting and the state of the system.			

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## Load Reconnection Delay

Setpoint group	Load Shedding	Related FW	2.1.0
Range [units]	0..600 [s]		
Default value	10 s	Force value	YES
Step	1 s		
Comm object	8893	Related applications	MINT
Config level	Advanced		
Setpoint visibility	Only if <b>Load Shedding Active</b> is not Disabled		
Description			
This setpoint adjusts the delay between load reconnection during <b>Load Shedding</b> function.			

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## Subgroup: Power P Load Shedding

### Power P Load Shedding

Setpoint group	Load Shedding	Related FW	2.1.0
Range [units]	Disabled / Enabled [-]		
Default value	Disabled	Force value	YES
Step	[-]		
Comm object	19681	Related applications	MINT
Config level	Advanced		
Setpoint visibility	Always		
Description			
Enables or Disables the Power Load Shedding function.			

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### Power P Load Shedding Level

Setpoint group	Load Shedding	Related FW	2.1.0
Range [units]	Power P Load Reconnection Level .. 200 [%] of BESS Nominal power		
Default value	80 % of BESS Nominal power	Force value	YES
Step	1 % of or BESS Nominal power		
Comm object	8884	Related applications	MINT
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.			

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## Power P Load Shedding Delay

Setpoint group	Load Shedding	Related FW	2.1.0
Range [units]	0.0..600.0 [s]		
Default value	10 s	Force value	YES
Step	1 s		
Comm object	8887	Related applications	MINT
Config level	Advanced		
Setpoint visibility	Only if <b>Load Shedding Active</b> is not Disabled		
Description			
This setpoint adjusts the delay between load disconnections during <b>Load Shedding</b> function.			

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## Power P Load Reconnection Level

Setpoint group	Load Shedding	Related FW	2.1.0
Range [units]	0 .. 20 [%] of <b>BESS Nominal power</b>		
Default value	20 % of <b>BESS Nominal power</b>	Force value	YES
Step	1 % of <b>BESS Nominal power</b>		
Comm object	8890	Related applications	MINT
Config level	Advanced		
Setpoint visibility	Only if <b>Load Shedding Active</b> is not Disabled		
Description			
This setpoint adjusts the decisive level between load reconnection during <b>Load Shedding</b> function.			

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## Subgroup: Power S Load Shedding

### Power S Load Shedding

Setpoint group	Load Shedding	Related FW	2.1.0
Range [units]	Disabled / Enabled [-]		
Default value	Disabled	Force value	YES
Step	[-]		
Comm object	19682	Related applications	MINT
Config level	Advanced		
Setpoint visibility	Always		
Description			
Enables or Disables the Current Load Shedding function.			

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## Power S Load Shedding Level

Setpoint group	Load Shedding	Related FW	2.1.0
Range [units]	20 .. 200 [%] of <b>BESS Nominal power</b>		
Default value	80 % of <b>BESS Nominal power</b>	Force value	YES
Step	1 % of <b>BESS Nominal power</b>		
Comm object	8885	Related applications	MINT
Config level	Advanced		
Setpoint visibility	Only if <b>Load Shedding Active</b> is not Disabled		
Description			
This setpoint adjusts decisive level for current disconnection during <b>Load Shedding</b> function.			

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## Power S Load Shedding Delay

Setpoint group	Load Shedding	Related FW	2.1.0
Range [units]	0.0 .. 600.0 [s]		
Default value	10 s	Force value	YES
Step	1 s		
Comm object	8888	Related applications	MINT
Config level	Advanced		
Setpoint visibility	Only if <b>Load Shedding Active</b> is not Disabled		
Description			
This setpoint adjusts the delay between load disconnections during <b>Load Shedding</b> function.			

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## Power Reconnection Level

Setpoint group	Load Shedding	Related FW	2.1.0
Range [units]	0 .. 20 [%] of <b>BESS Nominal power</b>		
Default value	20 % of <b>BESS Nominal power</b>	Force value	YES
Step	1 % of <b>BESS Nominal power</b>		
Comm object	8891	Related applications	MINT
Config level	Advanced		
Setpoint visibility	Only if <b>Load Shedding Active</b> is not Disabled		
Description			
This setpoint adjusts the decisive level between load reconnection during <b>Load Shedding</b> function.			

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## Subgroup: Frequency Load Shedding

### Frequency Load Shedding

Setpoint group	Load Shedding	Related FW	2.1.0
Range [units]	Disabled / Enabled [-]		
Default value	Disabled	Force value	YES
Step	[-]		
Comm object	19683	Related applications	MINT
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	2.1.0
Range [units]	20 .. 200 [%] of <b>BESS Nominal power</b>		
Default value	80 % of <b>BESS Nominal power</b>	Force value	YES
Step	1 % of <b>BESS Nominal power</b>		
Comm object	8886	Related applications	MINT
Config level	Advanced		
Setpoint visibility	Only if <b>Load Shedding Active</b> != Disabled		
Description			
This setpoint adjusts decisive level for voltage disconnection during <b>Load Shedding</b> function.			

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### Frequency Load Shedding Delay

Setpoint group	Load Shedding	Related FW	2.1.0
Range [units]	0.0..600.0 [s]		
Default value	10 s	Force value	YES
Step	1 s		
Comm object	8889	Related applications	MINT
Config level	Advanced		
Setpoint visibility	Only if <b>Load Shedding Active</b> is not Disabled		
Description			
This setpoint adjusts the delay between load disconnections during <b>Load Shedding</b> function.			

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## Frequency Load Reconnection Level

Setpoint group	Load Shedding	Related FW	2.1.0
Range [units]	0 .. 20 [%] of <b>BESS Nominal power</b>		
Default value	20 % of <b>BESS Nominal power</b>	Force value	YES
Step	1 % of <b>BESS Nominal power</b>		
Comm object	8892	Related applications	MINT
Config level	Advanced		
Setpoint visibility	Only if <b>Load Shedding Active</b> is not Disabled		
Description			
This setpoint adjusts the decisive level between load reconnection during <b>Load Shedding</b> function.			

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## Subgroup: Load Shedding

### Battery SOC Load Shedding

Setpoint group	Load Shedding	Related FW	2.1.0
Range [units]	Disabled / Enabled [-]		
Default value	Disabled	Force value	YES
Step	[-]		
Comm object	19684	Related applications	MINT
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	2.1.0
Range [units]	0.00 .. <b>Battery SOC Shedding Level 1</b> [Hz]		
Default value	0.50 [Hz]	Force value	YES
Step	0.01 [Hz]		
Comm object	19686	Related applications	MINT
Config level	Advanced		
Setpoint visibility	Only if <b>Load Shedding Active</b> is not Disabled		
Description			
<p>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 <b>LBO LOAD SHEDDING STAGE 1</b>, <b>LBO LOAD SHEDDING STAGE 2</b>, <b>LBO LOAD SHEDDING STAGE 3</b>.</p> <p>The Stage 1 is tripped if the SOC Level (Value <b>ES SOC</b>) gets under the limit given by setpoint <b>Battery SOC Shedding Level 1</b> at least for time <b>Battery SOC Shedding Level 1 Delay (page 1)</b>. The Load Shedding Stage 1 is deactivated (the <b>LBO LOAD SHEDDING STAGE 1</b> is inactive) once the SOC rise over the <b>Battery SOC Load Shedding Level 1 Reconnection Level (page 1)</b> for time given by setpoint <b>Load Reconnection Delay</b>.</p>			

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## Battery SOC Shedding Level 1

Setpoint group	Load Shedding	Related FW	2.1.0
Range [units]	Battery SOC Load Shedding Level 1 Reconnection Level (page 1) .. 5.00 [Hz]		
Default value	1.00 [Hz]	Force value	YES
Step	0.01 [Hz]		
Comm object	19688	Related applications	MINT
Config level	Advanced		
Setpoint visibility	Only if Load Shedding Active != Disabled		
Description			
<p>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.</p> <p>The Stage 1 is tripped if the SOC Level (Value ES SOC) gets under the limit given by setpoint Battery SOC Shedding Level 1 at least for time Battery SOC Shedding Level 1 Delay (page 1). 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 (page 1) for time given by setpoint Load Reconnection Delay.</p>			

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## Battery SOC Shedding Level 1 Delay

Setpoint group	Load Shedding	Related FW	2.1.0
Range [units]	0.0 .. 600.0 [s]		
Default value	10 s	Force value	YES
Step	1 s		
Comm object	19687	Related applications	MINT
Config level	Advanced		
Setpoint visibility	Only if <b>Load Shedding Active</b> is not Disabled		
<b>Description</b>			
<p>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 <b>LBO LOAD SHEDDING STAGE 1</b>, <b>LBO LOAD SHEDDING STAGE 2</b>, <b>LBO LOAD SHEDDING STAGE 3</b>.</p> <p>The Stage 1 is tripped if the SOC Level (Value <b>ES SOC</b>) gets under the limit given by setpoint <b>Battery SOC Shedding Level 1</b> at least for time <b>Battery SOC Shedding Level 1 Delay (page 1)</b>. The Load Shedding Stage 1 is deactivated (the <b>LBO LOAD SHEDDING STAGE 1</b> is inactive) once the SOC rise over the <b>Battery SOC Load Shedding Level 1 Reconnection Level (page 1)</b> for time given by setpoint <b>Load Reconnection Delay</b>.</p>			

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## Battery SOC Shedding Level 2

Setpoint group	Load Shedding	Related FW	2.1.0
Range [units]	Battery SOC Load Shedding Level 1 Reconnection Level (page 1) .. 5.00 [Hz]		
Default value	1.00 [Hz]	Force value	YES
Step	0.01 [Hz]		
Comm object	18580	Related applications	MINT
Config level	Advanced		
Setpoint visibility	Only if Load Shedding Active != Disabled		
Description			
<p>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.</p> <p>The Stage 2 is tripped if the SOC Level (Value ES 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.</p>			

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## Battery SOC Shedding Level 2 Delay

Setpoint group	Load Shedding	Related FW	2.1.0
Range [units]	0.0 .. 600.0 [s]		
Default value	10 s	Force value	YES
Step	1 s		
Comm object	18582	Related applications	MINT
Config level	Advanced		
Setpoint visibility	Only if <b>Load Shedding Active</b> is not Disabled		
Description			
<p>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 <b>LBO LOAD SHEDDING STAGE 1</b>, <b>LBO LOAD SHEDDING STAGE 2</b>, <b>LBO LOAD SHEDDING STAGE 3</b>.</p> <p>The Stage 2 is tripped if the SOC Level (Value <b>ES SOC</b>) gets under the limit given by setpoint <b>Battery SOC Shedding Level 2</b> at least for time <b>Battery SOC Shedding Level 2 Delay</b>. The Load Shedding Stage 2 is deactivated (the <b>LBO LOAD SHEDDING STAGE 2</b> is inactive) once the SOC rise over the <b>Battery SOC Shedding Level 1</b> for time given by setpoint <b>Load Reconnection Delay</b>.</p>			

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## Battery SOC Shedding Level 3

Setpoint group	Load Shedding	Related FW	2.1.0
Range [units]	Battery SOC Load Shedding Level 1 Reconnection Level (page 1) .. 5.00 [Hz]		
Default value	1.00 [Hz]	Force value	YES
Step	0.01 [Hz]		
Comm object	18581	Related applications	MINT
Config level	Advanced		
Setpoint visibility	Only if Load Shedding Active != Disabled		
Description			
<p>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.</p> <p>The Stage 2 is tripped if the SOC Level (Value ES 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.</p>			

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## Battery SOC Shedding Level 3 Delay

Setpoint group	Load Shedding	Related FW	2.1.0
Range [units]	0.0 .. 600.0 [s]		
Default value	10 s	Force value	YES
Step	1 s		
Comm object	18583	Related applications	MINT
Config level	Advanced		
Setpoint visibility	Only if <b>Load Shedding Active</b> is not Disabled		
<b>Description</b>			
<p>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 <b>LBO LOAD SHEDDING STAGE 1</b>, <b>LBO LOAD SHEDDING STAGE 2</b>, <b>LBO LOAD SHEDDING STAGE 3</b>.</p> <p>The Stage 1 is tripped if the SOC Level (Value <b>ES SOC</b>) gets under the limit given by setpoint <b>Battery SOC Shedding Level 1</b> at least for time <b>Battery SOC Shedding Level 1 Delay (page 1)</b>. The Load Shedding Stage 1 is deactivated (the <b>LBO LOAD SHEDDING STAGE 1</b> is inactive) once the SOC rise over the <b>Battery SOC Load Shedding Level 1 Reconnection Level (page 1)</b> for time given by setpoint <b>Load Reconnection Delay</b>.</p>			

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### Group: User Buttons

#### Subgroup: User Buttons

#### User Button 1

Setpoint group	User Buttons	Related FW	2.1.0
Range [units]	COMMAND / MAN ON / MAN OFF [-]		
Default value	COMMAND	Force value	YES
Step	[-]		
Comm object	20826	Related applications	MINT
Config level	Standard		
Setpoint visibility	Always		
Description			
This setpoint adjusts behavior of User Button 1 which is part of <b>User Buttons</b> .			
COMMAND	User Button 1 is controlled by command from <b>External display</b> .		
MAN ON	Value of the User Button 1 is still 1.  <b>Note:</b> 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	2.1.0
Range [units]	COMMAND / MAN ON / MAN OFF [-]		
Default value	COMMAND	Force value	YES
Step	[-]		
Comm object	20827	Related applications	MINT
Config level	Standard		
Setpoint visibility	Always		
Description			
This setpoint adjusts behavior of User Button 2 which is part of <b>User Buttons</b> .			
COMMAND	User Button 2 is controlled by command from <b>External display</b> .		
MAN ON	Value of the User Button 2 is still 1.  <b>Note:</b> 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	2.1.0
Range [units]	COMMAND / MAN ON / MAN OFF [-]		
Default value	COMMAND	Force value	YES
Step	[-]		
Comm object	20828	Related applications	MINT
Config level	Standard		
Setpoint visibility	Always		
Description			
This setpoint adjusts behavior of User Button 3 which is part of <b>User Buttons</b> .			
COMMAND	User Button 3 is controlled by command from <b>External display</b> .		
MAN ON	Value of the User Button 3 is still 1.  <b>Note:</b> 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	2.1.0
Range [units]	COMMAND / MAN ON / MAN OFF [-]		
Default value	COMMAND	Force value	YES
Step	[-]		
Comm object	20829	Related applications	MINT
Config level	Standard		
Setpoint visibility	Always		
Description			
This setpoint adjusts behavior of User Button 4 which is part of <b>User Buttons</b> .			
COMMAND	User Button 4 is controlled by command from <b>External display</b> .		
MAN ON	Value of the User Button 4 is still 1.  <b>Note:</b> 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	2.1.0
Range [units]	COMMAND / MAN ON / MAN OFF [-]		
Default value	COMMAND	Force value	YES
Step	[-]		
Comm object	20830	Related applications	MINT
Config level	Standard		
Setpoint visibility	Always		
Description			
This setpoint adjusts behavior of User Button 5 which is part of <b>User Buttons</b> .			
COMMAND	User Button 5 is controlled by command from <b>External display</b> .		
MAN ON	Value of the User Button 5 is still 1.  <b>Note:</b> 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	2.1.0
Range [units]	COMMAND / MAN ON / MAN OFF [-]		
Default value	COMMAND	Force value	YES
Step	[-]		
Comm object	20831	Related applications	MINT
Config level	Standard		
Setpoint visibility	Always		
Description			
This setpoint adjusts behavior of User Button 6 which is part of <b>User Buttons</b> .			
COMMAND	User Button 6 is controlled by command from <b>External display</b> .		
MAN ON	Value of the User Button 6 is still 1.  <b>Note:</b> 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	2.1.0
Range [units]	COMMAND / MAN ON / MAN OFF [-]		
Default value	COMMAND	Force value	YES
Step	[-]		
Comm object	20832	Related applications	MINT
Config level	Standard		
Setpoint visibility	Always		
Description			
This setpoint adjusts behavior of User Button 7 which is part of <b>User Buttons</b> .			
COMMAND	User Button 7 is controlled by command from <b>External display</b> .		
MAN ON	Value of the User Button 7 is still 1.  <b>Note:</b> 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	2.1.0
Range [units]	COMMAND / MAN ON / MAN OFF [-]		
Default value	COMMAND	Force value	YES
Step	[-]		
Comm object	20833	Related applications	MINT
Config level	Standard		
Setpoint visibility	Always		
Description			
This setpoint adjusts behavior of User Button 8 which is part of <b>User Buttons</b> .			
COMMAND	User Button 8 is controlled by command from <b>External display</b> .		
MAN ON	Value of the User Button 8 is still 1.  <b>Note:</b> 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	2.1.0
Range [units]	COMMAND / MAN ON / MAN OFF [-]		
Default value	COMMAND	Force value	YES
Step	[-]		
Comm object	20834	Related applications	MINT
Config level	Standard		
Setpoint visibility	Always		
Description			
This setpoint adjusts behavior of User Button 9 which is part of <b>User Buttons</b> .			
COMMAND	User Button 9 is controlled by command from <b>External display</b> .		
MAN ON	Value of the User Button 9 is still 1.  <b>Note:</b> 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	2.1.0
Range [units]	COMMAND / MAN ON / MAN OFF [-]		
Default value	COMMAND	Force value	YES
Step	[-]		
Comm object	20835	Related applications	MINT
Config level	Standard		
Setpoint visibility	Always		
Description			
This setpoint adjusts behavior of User Button 10 which is part of <b>User Buttons</b> .			
COMMAND	User Button 10 is controlled by command from <b>External display</b> .		
MAN ON	Value of the User Button 10 is still 1.  <b>Note:</b> 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	2.1.0
Range [units]	COMMAND / MAN ON / MAN OFF [-]		
Default value	COMMAND	Force value	YES
Step	[-]		
Comm object	20836	Related applications	MINT
Config level	Standard		
Setpoint visibility	Always		
Description			
This setpoint adjusts behavior of User Button 11 which is part of <b>User Buttons</b> .			
COMMAND	User Button 11 is controlled by command from <b>External display</b> .		
MAN ON	Value of the User Button 11 is still 1.  <b>Note:</b> 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	2.1.0
Range [units]	COMMAND / MAN ON / MAN OFF [-]		
Default value	COMMAND	Force value	YES
Step	[-]		
Comm object	20837	Related applications	MINT
Config level	Standard		
Setpoint visibility	Always		
Description			
This setpoint adjusts behavior of User Button 12 which is part of <b>User Buttons</b> .			
COMMAND	User Button 12 is controlled by command from <b>External display</b> .		
MAN ON	Value of the User Button 12 is still 1.  <b>Note:</b> 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	2.1.0
Range [units]	COMMAND / MAN ON / MAN OFF [-]		
Default value	COMMAND	Force value	YES
Step	[-]		
Comm object	20838	Related applications	MINT
Config level	Standard		
Setpoint visibility	Always		
Description			
This setpoint adjusts behavior of User Button 13 which is part of <b>User Buttons</b> .			
COMMAND	User Button 13 is controlled by command from <b>External display</b> .		
MAN ON	Value of the User Button 13 is still 1.  <b>Note:</b> 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	2.1.0
Range [units]	COMMAND / MAN ON / MAN OFF [-]		
Default value	COMMAND	Force value	YES
Step	[-]		
Comm object	20839	Related applications	MINT
Config level	Standard		
Setpoint visibility	Always		
Description			
This setpoint adjusts behavior of User Button 14 which is part of <b>User Buttons</b> .			
COMMAND	User Button 14 is controlled by command from <b>External display</b> .		
MAN ON	Value of the User Button 14 is still 1.  <b>Note:</b> 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	2.1.0
Range [units]	COMMAND / MAN ON / MAN OFF [-]		
Default value	COMMAND	Force value	YES
Step	[-]		
Comm object	20840	Related applications	MINT
Config level	Standard		
Setpoint visibility	Always		
Description			
This setpoint adjusts behavior of User Button 15 which is part of <b>User Buttons</b> .			
COMMAND	User Button 15 is controlled by command from <b>External display</b> .		
MAN ON	Value of the User Button 15 is still 1.  <b>Note:</b> 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	2.1.0
Range [units]	COMMAND / MAN ON / MAN OFF [-]		
Default value	COMMAND	Force value	YES
Step	[-]		
Comm object	20841	Related applications	MINT
Config level	Standard		
Setpoint visibility	Always		
Description			
This setpoint adjusts behavior of User Button 16 which is part of <b>User Buttons</b> .			
COMMAND	User Button 16 is controlled by command from <b>External display</b> .		
MAN ON	Value of the User Button 16 is still 1.  <b>Note:</b> 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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### Group: Analog Switches

#### Subgroup: Analog Switch 1

#### AIN Switch01 On

Setpoint group	Analog Switches	Related FW	2.1.0
Range [units]	0..32 000 [-]		
Default value	0	Force value	
Step	1		
Comm object	11407	Related applications	MINT
Config level	Standard		
Setpoint visibility	Visible only if the logical analog input AIN Switch01 is configured		
Description			
Threshold level for switching the binary output AIN Switch01 on. The value is measured from AIN Switch01 analog input.			

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## AIN Switch01 Off

Setpoint group	Analog Switches	Related FW	2.1.0
Range [units]	0..32 000 [-]		
Default value	0	Force value	
Step	1		
Comm object	11410	Related applications	MINT
Config level	Standard		
Setpoint visibility	Visible only if the logical analog input AIN Switch01 is configured		
Description			
Threshold level for switching the binary output AIN Switch01 off. The value is measured from AIN Switch01 analog input.			

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## Subgroup: Analog Switch 2

## AIN Switch02 On

Setpoint group	Analog Switches	Related FW	2.1.0
Range [units]	0..32 000 [-]		
Default value	0	Force value	
Step	1		
Comm object	11408	Related applications	MINT
Config level	Standard		
Setpoint visibility	Visible only if the logical analog input AIN Switch02 is configured		
Description			
Threshold level for switching the binary output AIN Switch02 on. The value is measured from AIN Switch02 analog input.			

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## AIN Switch02 Off

Setpoint group	Analog Switches	Related FW	2.1.0
Range [units]	0..32 000 [-]		
Default value	0	Force value	
Step	1		
Comm object	11411	Related applications	MINT
Config level	Standard		
Setpoint visibility	Visible only if the logical analog input AIN Switch02 is configured		
Description			
Threshold level for switching the binary output AIN Switch02 off. The value is measured from AIN Switch02 analog input.			

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## Subgroup: Analog Switch 3

### AIN Switch03 On

Setpoint group	Analog Switches	Related FW	2.1.0
Range [units]	0..32 000 [-]		
Default value	0	Force value	
Step	1		
Comm object	11409	Related applications	MINT
Config level	Standard		
Setpoint visibility	Visible only if the logical analog input AIN Switch03 is configured		
Description			
Threshold level for switching the binary output AIN Switch03 on. The value is measured from AIN Switch03 analog input.			

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### AIN Switch03 Off

Setpoint group	Analog Switches	Related FW	2.1.0
Range [units]	0..32 000 [-]		
Default value	0	Force value	
Step	1		
Comm object	11412	Related applications	MINT
Config level	Standard		
Setpoint visibility	Visible only if the logical analog input AIN Switch03 is configured		
Description			
Threshold level for switching the binary output AIN Switch03 off. The value is measured from AIN Switch03 analog input.			

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## Subgroup: Analog Switch 4

### AIN Switch04 On

Setpoint group	Analog Switches	Related FW	2.1.0
Range [units]	0..32 000 [-]		
Default value	0	Force value	
Step	1		
Comm object	14385	Related applications	MINT
Config level	Standard		
Setpoint visibility	Visible only if the logical analog input AIN Switch04 is configured		
Description			
Threshold level for switching the binary output AIN Switch04 on. The value is measured from AIN Switch04 analog input.			

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### AIN Switch04 Off

Setpoint group	Analog Switches	Related FW	2.1.0
Range [units]	0..32 000 [-]		
Default value	0	Force value	
Step	1		
Comm object	14386	Related applications	MINT
Config level	Standard		
Setpoint visibility	Visible only if the logical analog input AIN Switch04 is configured		
Description			
Threshold level for switching the binary output AIN Switch04 off. The value is measured from AIN Switch04 analog input.			

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## Subgroup: Analog Switch 5

### AIN Switch05 On

Setpoint group	Analog Switches	Related FW	2.1.0
Range [units]	0..32 000 [-]		
Default value	0	Force value	
Step	1		
Comm object	14963	Related applications	MINT
Config level	Standard		
Setpoint visibility	Visible only if the logical analog input AIN Switch05 is configured		
Description			
Threshold level for switching the binary output AIN Switch05 on. The value is measured from AIN Switch05 analog input.			

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### AIN Switch05 Off

Setpoint group	Analog Switches	Related FW	2.1.0
Range [units]	0..32 000 [-]		
Default value	0	Force value	
Step	1		
Comm object	14979	Related applications	MINT
Config level	Standard		
Setpoint visibility	Visible only if the logical analog input AIN Switch05 is configured		
Description			
Threshold level for switching the binary output AIN Switch05 off. The value is measured from AIN Switch05 analog input.			

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## Subgroup: Analog Switch 6

### AIN Switch06 On

Setpoint group	Analog Switches	Related FW	2.1.0
Range [units]	0..32 000 [-]		
Default value	0	Force value	
Step	1		
Comm object	14964	Related applications	MINT
Config level	Standard		
Setpoint visibility	Visible only if the logical analog input AIN Switch06 is configured		
Description			
Threshold level for switching the binary output AIN Switch06 on. The value is measured from AIN Switch06 analog input.			

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### AIN Switch06 Off

Setpoint group	Analog Switches	Related FW	2.1.0
Range [units]	0..32 000 [-]		
Default value	0	Force value	
Step	1		
Comm object	14980	Related applications	MINT
Config level	Standard		
Setpoint visibility	Visible only if the logical analog input AIN Switch06 is configured		
Description			
Threshold level for switching the binary output AIN Switch06 off. The value is measured from AIN Switch06 analog input.			

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## Subgroup: Analog Switch 7

### AIN Switch07 On

Setpoint group	Analog Switches	Related FW	2.1.0
Range [units]	0..32 000 [-]		
Default value	0	Force value	
Step	1		
Comm object	14965	Related applications	MINT
Config level	Standard		
Setpoint visibility	Visible only if the logical analog input AIN Switch07 is configured		
Description			
Threshold level for switching the binary output AIN Switch07 on. The value is measured from AIN Switch07 analog input.			

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### AIN Switch07 Off

Setpoint group	Analog Switches	Related FW	2.1.0
Range [units]	0..32 000 [-]		
Default value	0	Force value	
Step	1		
Comm object	14981	Related applications	MINT
Config level	Standard		
Setpoint visibility	Visible only if the logical analog input AIN Switch07 is configured		
Description			
Threshold level for switching the binary output AIN Switch07 off. The value is measured from AIN Switch07 analog input.			

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## Subgroup: Analog Switch 8

### AIN Switch08 On

Setpoint group	Analog Switches	Related FW	2.1.0
Range [units]	0..32 000 [-]		
Default value	0	Force value	
Step	1		
Comm object	14966	Related applications	MINT
Config level	Standard		
Setpoint visibility	Visible only if the logical analog input AIN Switch08 is configured		
Description			
Threshold level for switching the binary output AIN Switch08 on. The value is measured from AIN Switch08 analog input.			

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### AIN Switch08 Off

Setpoint group	Analog Switches	Related FW	2.1.0
Range [units]	0..32 000 [-]		
Default value	0	Force value	
Step	1		
Comm object	14982	Related applications	MINT
Config level	Standard		
Setpoint visibility	Visible only if the logical analog input AIN Switch08 is configured		
Description			
Threshold level for switching the binary output AIN Switch08 off. The value is measured from AIN Switch08 analog input.			

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## Subgroup: Analog Switch 9

### AIN Switch09 On

Setpoint group	Analog Switches	Related FW	2.1.0
Range [units]	0..32 000 [-]		
Default value	0	Force value	
Step	1		
Comm object	14967	Related applications	MINT
Config level	Standard		
Setpoint visibility	Visible only if the logical analog input AIN Switch09 is configured		
Description			
Threshold level for switching the binary output AIN Switch09 on. The value is measured from AIN Switch09 analog input.			

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### AIN Switch09 Off

Setpoint group	Analog Switches	Related FW	2.1.0
Range [units]	0..32 000 [-]		
Default value	0	Force value	
Step	1		
Comm object	14983	Related applications	MINT
Config level	Standard		
Setpoint visibility	Visible only if the logical analog input AIN Switch09 is configured		
Description			
Threshold level for switching the binary output AIN Switch09 off. The value is measured from AIN Switch09 analog input.			


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## Subgroup: Analog Switch 10

### AIN Switch10 On

Setpoint group	Analog Switches	Related FW	2.1.0
Range [units]	0..32 000 [-]		
Default value	0	Force value	
Step	1		
Comm object	14968	Related applications	MINT
Config level	Standard		
Setpoint visibility	Visible only if the logical analog input AIN Switch10 is configured		
Description			
Threshold level for switching the binary output AIN Switch10 on. The value is measured from AIN Switch10 analog input.			

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### AIN Switch10 Off

Setpoint group	Analog Switches	Related FW	2.1.0
Range [units]	0..32 000 [-]		
Default value	0	Force value	
Step	1		
Comm object	14984	Related applications	MINT
Config level	Standard		
Setpoint visibility	Visible only if the logical analog input AIN Switch10 is configured		
Description			
Threshold level for switching the binary output AIN Switch10 off. The value is measured from AIN Switch10 analog input.			

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## Group: Scheduler

### Subgroup: Time & Date

#### Time

Setpoint group	Scheduler	Related FW	2.1.0
Range [units]	HH:MM:SS [-]		
Default value	0:0:0	Force value	NO
Step	[-]		
Comm object	24554	Related applications	MINT
Config level	Standard		
Setpoint visibility	Always		
Description			
Real time clock adjustment.			

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#### Date

Setpoint group	Scheduler	Related FW	2.1.0
Range [units]	YYYY-MM-DD [-]		
Default value	2017-01-01	Force value	NO
Step	[-]		
Comm object	24553	Related applications	MINT
Config level	Standard		
Setpoint visibility	Always		
Description			
Actual date adjustment.			

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## Time Stamp Act

Setpoint group	Scheduler	Related FW	2.1.0						
Range [units]	Disabled / Condition / Always [-]								
Default value	Enabled	Force value	NO						
Step	[-]								
Comm object	10532	Related applications	MINT						
Config level	Standard								
Setpoint visibility	Always								
Description									
This setpoint adjusts the behavior of periodic history records.									
<table><tr><td>Disabled</td><td>Periodic history records are disabled.</td></tr><tr><td>Condition</td><td>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.</td></tr><tr><td>Always</td><td>Periodic history records are enabled. Records are written to the history according to setpoint Time Stamp Period.</td></tr></table>				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.
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	2.1.0
Range [units]	Off / 1 .. 240 [min]		
Default value	60 min	Force value	YES
Step	1 min		
Comm object	8979	Related applications	MINT
Config level	Standard		
Setpoint visibility	Always		
Description			
Time interval for periodic history records.			
<i><b>Note:</b> History record is made only when BESS is running.</i>			

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## Time Zone

Setpoint group	Scheduler; CM-4G-GPS	Related FW	2.1.0
Range [units]	GMT-12:00 .. GMT+13:00 [hours]		
Default value	GMT+1:00	Force value	NO
Step	[-]		
Comm object	24366	Related applications	MINT
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.			
<b>Note:</b> <i>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.</i>			

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## DST Switching Mode

Setpoint group	Scheduler	Related FW	2.1.0
Range [units]	Disabled / Auto / Manual		
Default value	Disabled	Force value	NO
Step	[-]		
Comm object	20250	Related applications	MINT
Config level	Standard		
Setpoint visibility	Always		
Description			
This setpoints is used to enable or disable daylight saving time.			
<div><div>&gt;</div><div><b>AUTO</b> - 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.</div></div>			
<div><div>&gt;</div><div><b>MANUAL</b> - 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 <b>Time Mode</b>.</div></div>			
<div><div>&gt;</div><div><b>DISABLED</b> - Time mode is fixedly set to STD and the function does not perform any changes of RTC time.</div></div>			

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## Time Mode

Setpoint group	Scheduler	Related FW	2.1.0
Range [units]	STD / DST		
Default value	STD	Force value	NO
Step	[-]		
Comm object	20249	Related applications	MINT
Config level	Standard		
Setpoint visibility	Only if DST Switching Mode = Manual		
Description			
In manual <b>DST Switching Mode</b> 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	2.1.0
Range [units]	Australia / Chile / Europe / Mexico / New Zealand / Paraguay / US/Canada		
Default value	Europe	Force value	NO
Step	[-]		
Comm object	20251	Related applications	MINT
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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## Subgroup: Sunrise/Sunset

### Sunrise/Sunset Function

Setpoint group	Scheduler	Related FW	2.1.0
Range [units]	N/A [-]		
Default value	Disabled	Force value	NO
Step	N/A [-]		
Comm object	20210	Related applications	MINT
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	2.1.0
Range [units]	[° N]		
Default value	-90 ° N	Force value	YES
Step	0,0001 ° N		
Comm object	20214	Related applications	MINT
Config level	Standard		
Setpoint visibility	Only if <b>Sunrise/Sunset Function</b> = Enabled		
Description			
This setpoint is automatically set, if the coordinates from the GPS module are valid. From this setpoint and the setpoint <b>Sunrise/Sunset Longitude</b> are calculated values in function Sunrise/Sunset.			

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## Sunrise/Sunset Longitude

Setpoint group	Scheduler	Related FW	2.1.0
Range [units]	[° E]		
Default value	-180 ° E	Force value	YES
Step	0,0001 ° E		
Comm object	20213	Related applications	MINT
Config level	Standard		
Setpoint visibility	Only if <b>Sunrise/Sunset Function</b> = Enabled		
Description			
This setpoint is automatically set, if the coordinates from the GPS module are valid. From this setpoint and the setpoint <b>Sunrise/Sunset Latitude</b> are calculated values in function Sunrise/Sunset.			

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## Subgroup: Timer 1

### Timer 1 Function

Setpoint group	Scheduler	Related FW	2.1.0
Range [units]	Disabled / Manual On / No Func / Mode OFF [-]		
Default value	Disable	Force value	YES
Step	[-]		
Comm object	15358	Related applications	MINT
Config level	Standard		
Setpoint visibility	Always		
Description			
<p>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 <b>Timer 1 Setup</b>.</p> <p>Once the Timer is activated the LBO <b>EXERCISE TIMER 1</b> 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.</p> <div><b>IMPORTANT: The LBO is activated always when the Timer should be activated e.g. even when controller is in different mode than AUTO.</b></div> <div><b>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.</b></div>			
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	2.1.0
Range [units]	N/A [-]		
Default value	N/A [-]	Force value	NO
Step	N/A [-]		
Comm object	10969	Related applications	MINT
Config level	Standard		
Setpoint visibility	Only if <b>Timer 1 Function</b> is not Disabled or Manual On		
Description			
Use this setpoint to setup the exercise Timer 1. See <b>Exercise Timers</b> for step by step manual.			

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## Subgroup: Timer 2

### Timer 2 Function

Setpoint group	Scheduler	Related FW	2.1.0
Range [units]	Disabled / Manual On / No Func / Mode OFF [-]		
Default value	Disabled [-]	Force value	YES
Step	[-]		
Comm object	15359	Related applications	MINT
Config level	Standard		
Setpoint visibility	Always		
Description			
<p>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 <b>Timer 2 Setup</b>.</p> <p>Once the Timer is activated the LBO <b>EXERCISE TIMER 2</b> 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.</p> <div><b>IMPORTANT: The LBO is activated always when the Timer should be activated e.g. even when controller is in different mode than AUTO.</b></div> <div><b>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.</b></div>			
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	2.1.0
Range [units]	N/A [-]		
Default value	N/A [-]	Force value	NO
Step	N/A [-]		
Comm object	10970	Related applications	MINT
Config level	Standard		
Setpoint visibility	Only if <b>Timer 2 Function</b> is not Disabled or Manual On		
Description			
Use this setpoint to setup the exercise Timer 2. See <b>Exercise Timers</b> for step by step manual.			

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## Subgroup: Timer 3

### Timer 3 Function

Setpoint group	Scheduler	Related FW	2.1.0
Range [units]	Disabled / Manual On / No Func / Mode OFF [-]		
Default value	Disable	Force value	YES
Step	[-]		
Comm object	15360	Related applications	MINT
Config level	Standard		
Setpoint visibility	Always		
Description			
<p>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 <b>Timer 3 Setup</b>.</p> <p>Once the Timer is activated the LBO <b>EXERCISE TIMER 3</b> 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.</p> <div><b>IMPORTANT: The LBO is activated always when the Timer should be activated e.g. even when controller is in different mode than AUTO.</b></div> <div><b>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.</b></div>			
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	2.1.0
Range [units]	N/A [-]		
Default value	N/A [-]	Force value	NO
Step	N/A [-]		
Comm object	10971	Related applications	MINT
Config level	Standard		
Setpoint visibility	Only if <b>Timer 3 Function</b> is not Disabled or Manual On		
Description			
Use this setpoint to setup the exercise Timer 3. See <b>Exercise Timers</b> for step by step manual.			

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## Subgroup: Timer 4

### Timer 4 Function


Setpoint group	Scheduler	Related FW	2.1.0
Range [units]	Disabled / Manual On / No Func / Mode OFF [-]		
Default value	Disable	Force value	YES
Step	[-]		
Comm object	15361	Related applications	MINT
Config level	Standard		
Setpoint visibility	Always		
Description			
<p>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 <b>Timer 4 Setup</b>.</p> <p>Once the Timer is activated the LBO <b>EXERCISE TIMER 4</b> 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.</p> <p><b>IMPORTANT: The LBO is activated always when the Timer should be activated e.g. even when controller is in different mode than AUTO.</b></p> <p><b>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.</b></p>			
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	2.1.0
Range [units]	N/A [-]		
Default value	N/A [-]	Force value	NO
Step	N/A [-]		
Comm object	10973	Related applications	MINT
Config level	Standard		
Setpoint visibility	Only if <b>Timer 4 Function</b> is not Disabled or Manual On		
Description			
Use this setpoint to setup the exercise Timer 4. See <b>Exercise Timers</b> for step by step manual.			

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## Subgroup: Timer 5

### Timer 5 Function

Setpoint group	Scheduler	Related FW	2.1.0
Range [units]	Disabled / Manual On / No Func / Mode OFF [-]		
Default value	Disable	Force value	YES
Step	[-]		
Comm object	15362	Related applications	MINT
Config level	Standard		
Setpoint visibility	Always		
Description			
<p>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 <b>Timer 5 Setup</b>.</p> <p>Once the Timer is activated the LBO <b>EXERCISE TIMER 5</b> 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.</p> <div><b>IMPORTANT: The LBO is activated always when the Timer should be activated e.g. even when controller is in different mode than AUTO.</b></div> <div><b>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.</b></div>			
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	2.1.0
Range [units]	N/A [-]		
Default value	N/A [-]	Force value	NO
Step	N/A [-]		
Comm object	10974	Related applications	MINT
Config level	Standard		
Setpoint visibility	Only if <b>Timer 5 Function</b> is not Disabled or Manual On		
Description			
Use this setpoint to setup the exercise Timer 5. See <b>Exercise Timers</b> for step by step manual.			

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## Subgroup: Timer 6

### Timer 6 Function

Setpoint group	Scheduler	Related FW	2.1.0
Range [units]	Disabled / Manual On / No Func / Mode OFF [-]		
Default value	Disable	Force value	YES
Step	[-]		
Comm object	15363	Related applications	MINT
Config level	Standard		
Setpoint visibility	Always		
Description			
<p>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 <b>Timer 6 Setup</b>.</p> <p>Once the Timer is activated the LBO <b>EXERCISE TIMER 6</b> 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.</p> <div><b>IMPORTANT: The LBO is activated always when the Timer should be activated e.g. even when controller is in different mode than AUTO.</b></div> <div><b>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.</b></div>			
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	2.1.0
Range [units]	N/A [-]		
Default value	N/A [-]	Force value	NO
Step	N/A [-]		
Comm object	10975	Related applications	MINT
Config level	Standard		
Setpoint visibility	Only if <b>Timer 6 Function</b> is not Disabled or Manual On		
Description			
Use this setpoint to setup the exercise Timer 6. See <b>Exercise Timers</b> 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	2.1.0
Range [units]	1 .. 9999 [h] / Disabled		
Default value	Disabled	Force value	NO
Step	1 h		
Comm object	13853	Related applications	MINT
Config level	Standard		
Setpoint visibility	Always		
Description			
<p>This setpoint defines how much BESS running hours (<b>Running Hours</b>) needs to be counted down by the maintenance timer until value <b>Maintenance Timer 1 RunHours</b> reach zero and alarm <b>Maintenance Timer 1 RunHours</b> 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.</p> <p><b>Note:</b> Setpoint itself does not change during countdown of timer.</p>			

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## Maintenance Timer 1 Interval

Setpoint group	Maintenance Timers	Related FW	2.1.0
Range [units]	1 .. 36 [mo] / Disabled		
Default value	Disabled	Force value	NO
Step	1 mo		
Comm object	20583	Related applications	MINT
Config level	Standard		
Setpoint visibility	Always		
Description			
<p>This setpoint defines how much months needs to be counted down by the maintenance timer until value <b>Maintenance Timer 1 Interval</b> reach zero and alarm <b>Maintenance 1 Interval</b> with LBO <b>AL MAINTENANCE 1</b> are activated.</p> <p>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.</p> <p><b>Note:</b> Setpoint itself does not change during countdown of timer.</p>			

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## Maintenance Timer 1 Protection

Setpoint group	Maintenance Timers	Related FW	2.1.0
Range [units]	Warning / Stp [-]		
Default value	Warning	Force value	NO
Step	[-]		
Comm object	20586	Related applications	MINT
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	2.1.0
Range [units]	1 .. 9999 [h] / Disabled		
Default value	Disabled	Force value	NO
Step	1 h		
Comm object	13854	Related applications	MINT
Config level	Standard		
Setpoint visibility	Always		
Description			
<p>This setpoint defines how much BESS running hours (<b>Running Hours</b>) needs to be counted down by the maintenance timer until value <b>Maintenance Timer 2 RunHours</b> reach zero and alarm <b>Maintenance 2 RunHours</b> with LBO <b>AL MAINTENANCE 2</b> 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.</p>			
<b>Note:</b> Setpoint itself does not change during countdown of timer.			

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### Maintenance Timer 2 Interval

Setpoint group	Maintenance Timers	Related FW	2.1.0
Range [units]	1 .. 36 [mo] / Disabled		
Default value	Disabled	Force value	NO
Step	1 mo		
Comm object	20584	Related applications	MINT
Config level	Standard		
Setpoint visibility	Always		
Description			
<p>This setpoint defines how much months needs to be counted down by the maintenance timer until value <b>Maintenance Timer 2 Interval</b> reach zero and alarm <b>Maintenance 2 Interval</b> with LBO <b>AL MAINTENANCE 2</b> are activated.</p> <p>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.</p> <p><b>Note:</b> Setpoint itself does not change during countdown of timer.</p>			

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## Maintenance Timer 2 Protection

Setpoint group	Maintenance Timers	Related FW	2.1.0
Range [units]	Warning / Stp [-]		
Default value	Warning	Force value	NO
Step	[-]		
Comm object	20587	Related applications	MINT
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	2.1.0
Range [units]	1 .. 9999 [h] / Disabled		
Default value	Disabled	Force value	NO
Step	1 h		
Comm object	13855	Related applications	MINT
Config level	Standard		
Setpoint visibility	Always		
Description			
<p>This setpoint defines how much BESS running hours (<b>Running Hours</b>) needs to be counted down by the maintenance timer until value <b>Maintenance Timer 3 RunHours</b> reach zero and alarm <b>Maintenance 3 RunHours</b> with LBO <b>AL MAINTENANCE 3</b> 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.</p>			
<b>Note:</b> Setpoint itself does not change during countdown of timer.			

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## Maintenance Timer 3 Interval

Setpoint group	Maintenance Timers	Related FW	2.1.0
Range [units]	1 .. 36 [mo] / Disabled		
Default value	Disabled	Force value	NO
Step	1 mo		
Comm object	20585	Related applications	MINT
Config level	Standard		
Setpoint visibility	Always		
Description			
<p>This setpoint defines how much months needs to be counted down by the maintenance timer until value <b>Maintenance Timer 3 Interval</b> reach zero and alarm <b>Maintenance 3 Interval</b> with LBO <b>AL MAINTENANCE 3</b> are activated.</p> <p>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.</p> <p><b>Note:</b> Setpoint itself does not change during countdown of timer.</p>			

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## Maintenance Timer 3 Protection

Setpoint group	Maintenance Timers	Related FW	2.1.0
Range [units]	Warning / Stp [-]		
Default value	Warning	Force value	NO
Step	[-]		
Comm object	20588	Related applications	MINT
Config level	Standard		
Setpoint visibility	Always		
Description			
This setpoint defines type of the maintenance timer alarm (Wrn / Stp) for both setpoints / alarms <b>Maintenance Timer 3 RunHours</b> / <b>Maintenance 3 RunHours</b> and <b>Maintenance Timer 3 Interval</b> / <b>Maintenance 3 Interval</b> .			

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## Subgroup: Maintenance Timer 4

### Maintenance Timer 4 RunHours

Setpoint group	Maintenance Timers	Related FW	2.1.0
Range [units]	1 .. 9999 [h] / Disabled		
Default value	Disabled	Force value	NO
Step	1 h		
Comm object	13856	Related applications	MINT
Config level	Standard		
Setpoint visibility	Always		
Description			
<p>This setpoint defines how much BESS running hours (<b>Running Hours</b>) needs to be counted down by the maintenance timer until value <b>Maintenance Timer 4 RunHours</b> reach zero and alarm <b>Maintenance 4 RunHours</b> with LBO <b>AL MAINTENANCE 4</b> are activated.</p> <p>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.</p> <p><b>Note:</b> Setpoint itself does not change during countdown of timer.</p>			

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### Maintenance Timer 4 Interval

Setpoint group	Maintenance Timers	Related FW	2.1.0
Range [units]	1 .. 36 [mo] / Disabled		
Default value	Disabled	Force value	NO
Step	1 mo		
Comm object	20291	Related applications	MINT
Config level	Standard		
Setpoint visibility	Always		
Description			
<p>This setpoint defines how much months needs to be counted down by the maintenance timer until value <b>Maintenance Timer 4 Interval</b> reach zero and alarm <b>Maintenance 4 Interval</b> with LBO <b>AL MAINTENANCE 4</b> are activated.</p> <p>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.</p> <p><i><b>Note:</b> Setpoint itself does not change during countdown of timer.</i></p>			

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## Maintenance Timer 4 Protection

Setpoint group	Maintenance Timers	Related FW	2.1.0
Range [units]	Warning / Stp [-]		
Default value	Warning	Force value	NO
Step	[-]		
Comm object	20290	Related applications	MINT
Config level	Standard		
Setpoint visibility	Always		
Description			
This setpoint defines type of the maintenance timer alarm (Wrn / Stp) for both setpoints / alarms <b>Maintenance Timer 4 RunHours</b> / <b>Maintenance 4 RunHours</b> and <b>Maintenance Timer 4 Interval</b> / <b>Maintenance 4 Interval</b> .			

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Group: **Geo-Fencing**

Subgroup: **Geo-Fencing**

## Geo-Fencing

Setpoint group	Geo-Fencing	Related FW	2.1.0
Range [units]	Disable/Enable/LBI Enable		
Default value	Disable	Force value	
Step			
Comm object	11681	Related applications	MINT
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	2.1.0
Range [units]	-90,0000..90,0000 []		
Default value	0,0000	Force value	
Step	0,0001		
Comm object	14606	Related applications	MINT
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.			
<b>Note:</b> This value with Home Latitude are used for counting Fence Radius 1 and Fence Radius 2.			
<b>Note:</b> 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	2.1.0
Range [units]	-180,0000..180,0000 []		
Default value	0,0000	Force value	
Step	0,0001		
Comm object	14607	Related applications	MINT
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.			
<b>Note:</b> This value with Home Longitude are used for counting Fence Radius 1 and Fence Radius 2.			
<b>Note:</b> 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	2.1.0
Range [units]	HistRecOnl/Wrn/Sd/BOC		
Default value	HistRecOnl	Force value	
Step			
Comm object	14610	Related applications	MINT
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 <b>Fence 1 Radius</b> . Delay for protection is adjusted by setpoint <b>Fence 1 Delay</b> .			
<b><u>Protection Types:</u></b>			
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 <b>Fence 1 Radius</b> .			
Wrn: Position of gen-set is used for warning protection only. Protection is activated when position of the gen-set is out of <b>Fence 1 Radius</b> .			
Sd: Position of BESS is used for shutdown protection. Protection is activated when position of the BESS is out of <b>Fence 1 Radius</b> .			
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 <b>Fence 1 Radius</b> .			
<b>Note:</b> Protection is activated also when GPS signal is lost for <b>Fence 1 Delay</b> .			

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### Fence 1 Radius

Setpoint group	Geo-Fencing	Related FW	2.1.0
Range [units]	0..99,9 [km]		
Default value	0 km	Force value	
Step	0,1 km		
Comm object	11677	Related applications	MINT
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 afterFence 1 Delay.			

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## Fence 1 Delay

Setpoint group	Geo-Fencing	Related FW	2.1.0
Range [units]	0..3600 [s]		
Default value	0 s	Force value	
Step	1 s		
Comm object	11682	Related applications	MINT
Config level	Standard		
Setpoint visibility	Only if relevant modules is installed.		
Description			
Delay for <b>Fence 1 Protection</b> .			

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## Subgroup: Fence 2

## Fence 2 Protection

Setpoint group	Geo-Fencing	Related FW	2.1.0
Range [units]	HistRecOnl/Wrn/Sd/BOC		
Default value	HistRecOnl	Force value	
Step			
Comm object	14611	Related applications	MINT
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 <b>Fence 2 Radius</b> . Delay for protection is adjusted by setpoint <b>Fence 2 Delay</b> .			
<b><u>Protection Types:</u></b>			
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 <b>Fence 2 Radius</b> .			
Wrn: Position of BESS is used for warning protection only. Protection is activated when position of the BESS is out of <b>Fence 2 Radius</b> .			
Sd: Position of BESS is used for shutdown protection. Protection is activated when position of the BESS is out of <b>Fence 2 Radius</b> .			
BOC:Position of BESS is used for BOC (Breaker Open and Cooling) protection. Protection is activated when position of the BESS is out of <b>Fence 1 Radius</b> .			
<b>Note:</b> Protection is activated also when GPS signal is lost for <b>Fence 2 Delay</b> .			

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## Fence 2 Radius

Setpoint group	Geo-Fencing	Related FW	2.1.0
Range [units]	0..99,9 [km]		
Default value	0 km	Force value	
Step	0,1 km		
Comm object	14608	Related applications	MINT
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 afterFence 1 Delay.			

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## Fence 2 Delay

Setpoint group	Geo-Fencing	Related FW	2.1.0
Range [units]	0..3600 [s]		
Default value	0 s	Force value	
Step	1 s		
Comm object	14609	Related applications	MINT
Config level	Standard		
Setpoint visibility	Only if relevant modules is installed.		
Description			
Delay for <b>Fence 2 Protection</b> .			

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## Group: Plug-In Modules

### Subgroup: Slot A

#### Slot A

Setpoint group	Plug-In Modules	Related FW	2.1.0
Range [units]	ENABLED / DISABLED [-]		
Default value	ENABLED	Force value	NO
Step	[-]		
Comm object	24280	Related applications	MINT
Config level	Standard		
Setpoint visibility	Always		
Description			
This setpoint enable or disable module in slot A.			
<b>Note:</b> 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	2.1.0
Range [units]	ENABLED / DISABLED [-]		
Default value	ENABLED	Force value	NO
Step	[-]		
Comm object	24279	Related applications	MINT
Config level	Standard		
Setpoint visibility	Always		
Description			
This setpoint enable or disable module in slot B.			
<b>Note:</b> 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	2.1.0								
Range [units]	Direct / MODBUS / DualSlave / Dual Master [-]										
Default value	Direct	Force value	NO								
Step	[-]										
Comm object	24522	Related applications	MINT								
Config level	Standard										
Setpoint visibility	Only if relevant module is installed										
Description											
Communication protocol switch for the COM1 channel.											
<table><tr><td>Direct</td><td>InteliConfig communication protocol via serial cable.</td></tr><tr><td>MODBUS</td><td>MODBUS protocol.</td></tr><tr><td>DualSlave</td><td>Dual operation protocol – slave function</td></tr><tr><td>DualMaster</td><td>Dual operation protocol – master function</td></tr></table>				Direct	InteliConfig communication protocol via serial cable.	MODBUS	MODBUS protocol.	DualSlave	Dual operation protocol – slave function	DualMaster	Dual operation protocol – master function
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	2.1.0
Range [units]	9600 / 19200 / 38400 / 57600 / 115200[bps]		
Default value	57600 bps	Force value	NO
Step	[-]		
Comm object	24341	Related applications	MINT
Config level	Standard		
Setpoint visibility	Only if relevant module is installed + conditioned by the setpoint <b>COM1 Mode</b>		
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 Communication Speed

Setpoint group	CM-RS232-485	Related FW	2.1.0
Range [units]	9600 / 19200 / 38400 / 57600 / 115200 [bps]		
Default value	9600 bps	Force value	NO
Step	[-]		
Comm object	24477	Related applications	MINT
Config level	Standard		
Setpoint visibility	Only if relevant module is installed + conditioned by the setpoint <b>COM1 Mode</b>		
Description			
If the MODBUS mode is selected on COM1 channel, the MODBUS communication speed can be adjusted here.			

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## COM1 Modbus Mode

Setpoint group	CM-RS232-485	Related FW	2.1.0
Range [units]	8N1 / 8N2 / 8E1 [-]		
Default value	8N1	Force value	NO
Step	[-]		
Comm object	23867	Related applications	MINT
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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## Subgroup: COM2 Setting

### COM2 Mode

Setpoint group	CM-RS232-485	Related FW	2.1.0
Range [units]	Direct / MODBUS / DualSlave / Dual Master [-]		
Default value	Direct	Force value	NO
Step	[-]		
Comm object	24451	Related applications	MINT
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	2.1.0
Range [units]	9600 / 19200 / 38400 / 57600 / 115200[bps]		
Default value	57600 bps	Force value	NO



Step	[-]		
Comm object	24340	Related applications	MINT
Config level	Standard		
Setpoint visibility	Only if relevant module is installed + conditioned by the setpoint <b>COM2 Mode</b>		
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 Communication Speed

Setpoint group	CM-RS232-485	Related FW	2.1.0
Range [units]	9600 / 19200 / 38400 / 57600 / 115200 [bps]		
Default value	9600 bps	Force value	NO
Step	[-]		
Comm object	24420	Related applications	MINT
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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## COM2 Modbus Mode

Setpoint group	CM-RS232-485	Related FW	2.1.0
Range [units]	8N1 / 8N2 / 8E1 [-]		
Default value	8N1	Force value	NO
Step	[-]		
Comm object	23866	Related applications	MINT
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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## Group: CM-4G-GPS

### Subgroup: Cellular Interface

#### Internet Connection

Setpoint group	CM-4G-GPS	Related FW	2.1.0
Range [units]	Enabled / Disabled [-]		
Default value	Enabled	Force value	NO
Step	[-]		
Comm object	24315	Related applications	MINT
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	2.1.0
Range [units]	2G / 3G / 4G / Automatic [-]		
Default value	Automatic	Force value	NO
Step	[-]		
Comm object	24132	Related applications	MINT
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	2.1.0
Range [units]	0 .. 31 characters [-]		
Default value	internet	Force value	NO
Step	[-]		
Comm object	24363	Related applications	MINT
Config level	Standard		
Setpoint visibility	Only if relevant module is installed + conditioned by the setpoint <b>Internet Connection</b>		
Description			
APN (Access Point Name) of the network, provided by GSM operator.			

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## APN Authentication

Setpoint group	CM-4G-GPS	Related FW	2.1.0
Range [units]	[-]		
Default value		Force value	
Step	[-]		
Comm object	23820	Related applications	MINT
Config level	Standard		
Setpoint visibility	Always		
Description			
Type of authentication used for the Access Point Name.			
<b>Note:</b> An Access Point Name (APN) is the name of a gateway between a mobile network (GPRS, 4G, etc.) and another computer network (Internet).			

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## APN User Name

Setpoint group	CM-4G-GPS	Related FW	2.1.0
Range [units]	[-]		
Default value		Force value	
Step	[-]		
Comm object	24361	Related applications	MINT
Config level	Standard		
Setpoint visibility	Always		
Description			
User Name used for the Access Point Name.			

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## APN User Password

Setpoint group	CM-4G-GPS	Related FW	2.1.0
Range [units]	[-]		
Default value		Force value	
Step	[-]		
Comm object	24360	Related applications	MINT
Config level	Standard		
Setpoint visibility	Always		
Description			
Password used for the Access Point Name.			

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## Connection Check IP1

Setpoint group	CM-4G-GPS	Related FW	2.1.0
Range [units]	[-]		
Default value	"empty"	Force value	NO
Step	[-]		
Comm object	23978	Related applications	MINT
Config level	Standard		
Setpoint visibility	Only if relevant module is installed + conditioned by the setpoint <b>Internet Connection</b>		
<b>Description</b>			
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	2.1.0
Range [units]	[-]		
Default value	"empty"	Force value	NO
Step	[-]		
Comm object	23977	Related applications	MINT
Config level	Standard		
Setpoint visibility	Only if relevant module is installed + conditioned by the setpoint <b>Internet Connection</b>		
<b>Description</b>			
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	2.1.0
Range [units]	[-]		
Default value	"empty"	Force value	NO
Step	[-]		
Comm object	23976	Related applications	MINT
Config level	Standard		
Setpoint visibility	Only if relevant module is installed + conditioned by the setpoint <b>Internet Connection</b>		
<b>Description</b>			
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	2.1.0				
Range [units]	Automatic / Manual [-]						
Default value	Automatic	Force value	NO				
Step	[-]						
Comm object	23988	Related applications	MINT				
Config level	Standard						
Setpoint visibility	Only if relevant module is installed						
Description							
This setpoint enables to enter DNS server addresses manually, even with the <b>Internet Connection</b> set to Automatic.							
<table><tr><td>Automatic</td><td>DNS server addresses automatically obtained from a DHCP server are used</td></tr><tr><td>Manual</td><td><b>DNS IP Address 1</b> and <b>DNS IP Address 2</b> 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</td></tr></table>				Automatic	DNS server addresses automatically obtained from a DHCP server are used	Manual	<b>DNS IP Address 1</b> and <b>DNS IP Address 2</b> 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
Automatic	DNS server addresses automatically obtained from a DHCP server are used						
Manual	<b>DNS IP Address 1</b> and <b>DNS IP Address 2</b> 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	2.1.0
Range [units]	Valid IP address [-]		
Default value	8.8.8.8	Force value	NO
Step	[-]		
Comm object	24314	Related applications	MINT
Config level	Standard		
Setpoint visibility	Only if relevant module is installed		
Description			
<p>The setpoint is used to select the method how the DNS Address 1 is adjusted.</p> <p>If <b>DNS Mode</b> 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.</p> <p>If <b>DNS Mode</b> is AUTOMATIC this setpoint is inactive. The DNS server IP address is assigned by the DHCP server.</p>			

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## DNS IP Address 2

Setpoint group	CM-4G-GPS	Related FW	2.1.0
Range [units]	Valid IP address [-]		
Default value	8.8.8.8	Force value	NO
Step	[-]		
Comm object	23986	Related applications	MINT
Config level	Standard		
Setpoint visibility	Only if relevant module is installed		
Description			
<p>The setpoint is used to select the method how the DNS Address 2 is adjusted.</p> <p>If <b>DNS Mode</b> 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.</p> <p>If <b>DNS Mode</b> is AUTOMATIC this setpoint is inactive. The DNS server IP address is assigned by the DHCP server.</p>			

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## IP Firewall

Setpoint group	CM-4G-GPS	Related FW	2.1.0				
Range [units]	ENABLED / DISABLED [-]						
Default value	DISABLED	Force value	NO				
Step	[-]						
Comm object	23959	Related applications	MINT				
Config level	Standard						
Setpoint visibility	Only if relevant module is installed						
Description							
This setpoints enables to switch on the built-in Firewall functionality.							
<table><tr><td>DISABLED</td><td>The firewall function is switched off</td></tr><tr><td>ENABLED</td><td>The firewall function is switched on, use IntelliConfig to setup the firewall rules (configuration card Others – Firewall)</td></tr></table>				DISABLED	The firewall function is switched off	ENABLED	The firewall function is switched on, use IntelliConfig to setup the firewall rules (configuration card Others – Firewall)
DISABLED	The firewall function is switched off						
ENABLED	The firewall function is switched on, use IntelliConfig 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	2.1.0
Range [units]	Disabled/ Enabled [-]		
Default value	Enabled	Force value	NO
Step	[-]		
Comm object	23968	Related applications	MINT
Config level	Standard		
Setpoint visibility	Only if relevant module is installed + conditioned by the setpoint <b>Internet Connection</b>		
<b>Description</b>			
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 <b>AirGate Address</b> .	
<b>IMPORTANT: When this setpoint is changed the controller has to be restarted to apply changes.</b>			

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## AirGate Address

Setpoint group	Ethernet	Related FW	2.1.0
Range [units]	0 .. 31 characters [-]		
Default value	global.airgate.link	Force value	NO
Step	[-]		
Comm object	24364	Related applications	MINT
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	2.1.0
Range [units]	1 .. 65535 [-]		
Default value	54440	Force value	NO
Step	1		
Comm object	24091	Related applications	MINT
Config level	Standard		
Setpoint visibility	Only if relevant module is installed + conditioned by the setpoint <b>Internet Connection</b>		
Description			
This port is used for TCP communication with the AirGate server.			
<b>Note:</b> Use port 54440 for standard ComAp AirGate service.			

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## Subgroup: ComAp Client Settings

### ComAp Client Inactivity Timeout

Setpoint group	EthernetEthernet	Related FW	2.1.0
Range [units]	0 .. 65535 [s]		
Default value	60 s	Force value	YES
Step	1 s		
Comm object	24098	Related applications	MINT
Config level	Standard		
Setpoint visibility	Always		
Description			
Connection (TCP socket) is closed by controller, if a client (e.g. IntelliConfig) does not communicate for this time. This timeout applies to both direct and AirGate connection.			

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### Direct Connection

Setpoint group	Ethernet	Related FW	2.1.0
Range [units]	Disabled / Enabled [-]		
Default value	Enabled	Force value	NO
Step	[-]		
Comm object	23961	Related applications	MINT
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. IntelliConfig) to the IP address of the controller.			
<b>Note:</b> For Direct connection the controller IP address must be reachable from the client IP address.			

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### Direct Connection Port

Setpoint group	Ethernet	Related FW	2.1.0
Range [units]	1 .. 65535 [-]		
Default value	23	Force value	NO
Step	[-]		
Comm object	23960	Related applications	MINT
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	Ethernet	Related FW	2.1.0
Range [units]	0..31 characters [-]		
Default value	global.airgate.link:9925	Force value	NO
Step	[-]		
Comm object	23962	Related applications	MINT
Config level	Standard		
Setpoint visibility	Always		
Description			
<p>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.</p>			
<p><b>Note:</b> You may use also any public SMTP server which does not require connection over SSL/TLS channels.</p>			

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### SMTP Sender Address

Setpoint group	Ethernet	Related FW	2.1.0
Range [units]	0..31 characters [-]		
Default value	[-]	Force value	NO
Step	[-]		
Comm object	23884	Related applications	MINT
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.			
<i><b>Note:</b> It is not needed to enter an existing email address, nevertheless valid email format needs to be followed.</i>			
<b>IMPORTANT:</b> This item is obligatory when emails are configured.			

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## SMTP User Name

Setpoint group	Ethernet	Related FW	2.1.0
Range [units]	0..31 characters [-]		
Default value	[-]	Force value	NO
Step	[-]		
Comm object	23883	Related applications	MINT
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	Ethernet	Related FW	2.1.0
Range [units]	0..15 characters [-]		
Default value	[-]	Force value	NO
Step	[-]		
Comm object	23882	Related applications	MINT
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	Ethernet	Related FW	2.1.0
Range [units]	NONE / SSL/TLS / STARTTLS [-]		
Default value	NONE	Force value	NO
Step	[-]		
Comm object	23965	Related applications	MINT
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	Ethernet	Related FW	2.1.0
Range [units]	0..63 characters [-]		
Default value	[-]	Force value	NO
Step	[-]		
Comm object	24298	Related applications	MINT
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	Ethernet	Related FW	2.1.0
Range [units]	0..63 characters [-]		
Default value	[-]	Force value	NO
Step	[-]		
Comm object	24297	Related applications	MINT
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	Ethernet	Related FW	2.1.0
Range [units]	0..63 characters [-]		
Default value	[-]	Force value	NO
Step	[-]		
Comm object	24145	Related applications	MINT
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	Ethernet	Related FW	2.1.0
Range [units]	0..63 characters [-]		
Default value	[-]	Force value	NO
Step	[-]		
Comm object	24144	Related applications	MINT
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	2.1.0
Range [units]	0 .. 31 characters [-]		
Default value	[-]	Force value	NO
Step	[-]		
Comm object	24296	Related applications	MINT
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	2.1.0
Range [units]	0 .. 31 characters [-]		
Default value	[-]	Force value	NO
Step	[-]		
Comm object	24295	Related applications	MINT
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	2.1.0
Range [units]	0 .. 31 characters [-]		
Default value	[-]	Force value	NO
Step	[-]		
Comm object	24143	Related applications	MINT
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	2.1.0
Range [units]	0 .. 31 characters [-]		
Default value	[-]	Force value	NO
Step	[-]		
Comm object	24142	Related applications	MINT
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

<b>Setpoint group</b>	Ethernet	<b>Related FW</b>	2.1.0
<b>Range [units]</b>	Depends on controller's supported languages. [-]		
<b>Default value</b>	English	<b>Force value</b>	NO
<b>Step</b>	[-]		
<b>Comm object</b>	24299	<b>Related applications</b>	MINT
<b>Config level</b>	Standard		
<b>Setpoint visibility</b>	Always		
<b>Description</b>			
Use this setpoint to set the language of Event, Warning, etc. e-mails.			

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## Event Message

Setpoint group	Ethernet	Related FW	2.1.0
Range [units]	Enabled / Disabled [-]		
Default value	Enabled	Force value	YES
Step	[-]		
Comm object	18971	Related applications	MINT
Config level	Standard		
Setpoint visibility	Always		
Description			
This setpoint enables or disables sending of Event Messages.			

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## Wrn Message

Setpoint group	Ethernet	Related FW	2.1.0
Range [units]	Enabled / Disabled [-]		
Default value	Enabled	Force value	YES
Step	[-]		
Comm object	8482	Related applications	MINT
Config level	Standard		
Setpoint visibility	Always		
Description			
This setpoint enables or disables sending of Warning Messages.			

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## AI Message

Setpoint group	Ethernet	Related FW	2.1.0
Range [units]	Enabled / Disabled [-]		
Default value	Enabled	Force value	YES
Step	[-]		
Comm object	10567	Related applications	MINT
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	Ethernet	Related FW	2.1.0
Range [units]	Enabled / Disabled [-]		
Default value	Enabled	Force value	YES
Step	[-]		
Comm object	10568	Related applications	MINT
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	Ethernet	Related FW	2.1.0
Range [units]	Enabled / Disabled [-]		
Default value	Enabled	Force value	YES
Step	[-]		
Comm object	18993	Related applications	MINT
Config level	Standard		
Setpoint visibility	Always		
Description			
This setpoint enables or disables sending of Alarm List Indication messages.			

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## Sd Message

Setpoint group	Ethernet CM-4G-GPS Ethernet	Related FW	2.1.0
Range [units]	Enabled / Disabled [-]		
Default value	Enabled	Force value	YES
Step	[-]		
Comm object	8484	Related applications	MINT
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	Ethernet CM-4G-GPS Ethernet	Related FW	2.1.0
Range [units]	Enabled / Disabled [-]		
Default value	Enabled	Force value	YES
Step	[-]		
Comm object	11413	Related applications	MINT
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	2.1.0
Range [units]	Enabled/Disabled		
Default value	Enabled	Force value	
Step	[-]		
Comm object	8485	Related applications	MINT
Config level	Standard		
Setpoint visibility	Always		
Description			
This setpoint enables or disables sending of messages.			

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## BP Message

Setpoint group	Ethernet CM-4G-GPS Ethernet	Related FW	2.1.0
Range [units]	Enabled / Disabled [-]		
Default value	Enabled	Force value	YES
Step	[-]		
Comm object	10117	Related applications	MINT
Config level	Standard		
Setpoint visibility	Always		
Description			
This setpoint enables or disables sending of Bus Protection messages.			

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## Subgroup: GPS Settings

### GPS Tracking

Setpoint group	CM-4G-GPS	Related FW	2.1.0
Range [units]	Enabled / Disabled [-]		
Default value	Enabled	Force value	NO
Step	[-]		
Comm object	23975	Related applications	MINT
Config level	Standard		
Setpoint visibility	Only if relevant module is installed + conditioned by the setpoint <b>Internet Connection</b>		
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	2.1.0
Range [units]	GMT-12:00 .. GMT+13:00 [hours]		
Default value	GMT+1:00	Force value	NO
Step	[-]		
Comm object	24366	Related applications	MINT
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.			
<b>Note:</b> 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	2.1.0
Range [units]	DISABLED / ENABLED [-]		
Default value	DISABLED	Force value	NO
Step	[-]		
Comm object	23964	Related applications	MINT
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	2.1.0
Range [units]	[-]		
Default value	pool.ntp.org	Force value	NO
Step	[-]		
Comm object	23963	Related applications	MINT
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	2.1.0
Range [units]	Enabled / Disabled [-]		
Default value	Enabled	Force value	NO
Step	[-]		
Comm object	23974	Related applications	MINT
Config level	Standard		
Setpoint visibility	Only if relevant module is installed + conditioned by the setpoint <b>Internet Connection</b>		
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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## Group: CM-Ethernet

### Subgroup: TCP/IP Settings

#### IP Address Mode

Setpoint group	CM-Ethernet	Related FW	2.1.0
Range [units]	MANUAL / AUTOMATIC / DISABLED [-]		
Default value	AUTOMATIC	Force value	NO
Step	[-]		
Comm object	23939	Related applications	MINT
Config level	Standard		
Setpoint visibility	Only if relevant module is installed		
Description			
The setpoint is used to select the method how the ethernet connection is adjusted.			
MANUAL	The Ethernet connection is fixed by means of the setpoints <u>IP Addr</u> , <u>NetMask</u> , <u>GateIP</u> , <u>DNS IP Address</u> .  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 setting is obtained <b>automatically from the DHCP server</b> . The obtained settings are then copied to the related setpoints. If the process of obtaining the settings from the DHCP server is not successful, the value 000.000.000.000 is copied to the setpoint IP address and the module continues to try to obtain the settings.		
DISABLED	The Ethernet terminal is disabled.		

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## IP Address

Setpoint group	CM-Ethernet	Related FW	2.1.0
Range [units]	0 .. 15 characters [-]		
Default value	192.168.1.254	Force value	NO
Step	[-]		
Comm object	23950	Related applications	MINT
Config level	Standard		
Setpoint visibility	Only if relevant module is installed + conditioned by the setpoint <b>IP Address Mode</b>		
Description			
<p>The setpoint is used to set the address when you are in static mode .</p> <p>If <b>IP Address Mode</b> is MANUAL this setpoint is used to adjust the IP address of the ethernet interface of the controller. Ask your IT specialist for help with this setting.</p> <p>If <b>IP Address Mode</b> is AUTOMATIC this setpoint is inactive. The IP address is assigned by the DHCP server.</p> <p>If <b>IP Address Mode</b> is DISABLED Ethernet terminal is disabled.</p> <p><b>Note:</b> Only valid IP address can be inserted.</p>			

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## Subnet Mask

Setpoint group	CM-Ethernet	Related FW	2.1.0
Range [units]	Valid IP address [-]		
Default value	255.255.255.0	Force value	NO
Step	[-]		
Comm object	23949	Related applications	MINT
Config level	Standard		
Setpoint visibility	Only if relevant module is installed + conditioned by the setpoint <b>IP Address Mode</b>		
Description			
The setpoint is used to select the method how the Subnet Mask is adjusted.			
If <b>IP Address Mode</b> is MANUAL this setpoint is used to adjust the Subnet Mask. Ask your IT specialist for help with this setting.			
If <b>IP Address Mode</b> is AUTOMATIC this setpoint is inactive. The Subnet Mask is assigned by the DHCP server.			
If <b>IP Address Mode</b> is DISABLED Ethernet terminal is disabled.			

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## Gateway IP

Setpoint group	CM-Ethernet	Related FW	2.1.0
Range [units]	Valid IP address [-]		
Default value	192.168.1.1	Force value	NO
Step	[-]		
Comm object	23948	Related applications	MINT
Config level	Standard		
Setpoint visibility	Only if relevant module is installed + conditioned by the setpoint <b>IP Address Mode</b>		
Description			
<p>The setpoint is used to select the method how the Gateway IP is adjusted.</p> <p>If <b>IP Address Mode</b> is MANUAL this setpoint is used to adjust the Subnet Mask. Ask your IT specialist for help with this setting.</p> <p>If <b>IP Address Mode</b> is AUTOMATIC this setpoint is inactive. The Subnet Mask is assigned by the DHCP server.</p> <p>If <b>IP Address Mode</b> is DISABLED Ethernet terminal is disabled.</p> <p>A gateway is a device which connects the respective segment with the other segments and/or Internet.</p>			

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## DNS Mode

Setpoint group	CM-Ethernet	Related FW	2.1.0				
Range [units]	Automatic / Manual [-]						
Default value	Automatic	Force value	NO				
Step	[-]						
Comm object	23921	Related applications	MINT				
Config level	Standard						
Setpoint visibility	Only if relevant module is installed						
Description							
This setpoint enables to enter DNS server addresses manually, even with the <b>IP Address Mode</b> set to Automatic.							
<table><tr><td>Automatic</td><td>DNS server addresses automatically obtained from a DHCP server are used</td></tr><tr><td>Manual</td><td><b>DNS IP Address 1</b> and <b>DNS IP Address 2</b> 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</td></tr></table>				Automatic	DNS server addresses automatically obtained from a DHCP server are used	Manual	<b>DNS IP Address 1</b> and <b>DNS IP Address 2</b> 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
Automatic	DNS server addresses automatically obtained from a DHCP server are used						
Manual	<b>DNS IP Address 1</b> and <b>DNS IP Address 2</b> 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-Ethernet	Related FW	2.1.0
Range [units]	Valid IP address [-]		
Default value	8.8.8.8	Force value	NO
Step	[-]		
Comm object	23947	Related applications	MINT
Config level	Standard		
Setpoint visibility	Only if relevant module is installed		
Description			
<p>The setpoint is used to select the method how the DNS Address 1 is adjusted .</p> <p>If <b>IP Address Mode</b> 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.</p> <p>If <b>IP Address Mode</b> is AUTOMATIC this setpoint is inactive. The DNS server IP address is assigned by the DHCP server.</p> <p>If <b>IP Address Mode</b> is DISABLED Ethernet terminal is disabled.</p>			

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## DNS IP Address 2

Setpoint group	CM-Ethernet	Related FW	2.1.0
Range [units]	Valid IP address [-]		
Default value	8.8.8.8	Force value	NO
Step	[-]		
Comm object	23946	Related applications	MINT
Config level	Standard		
Setpoint visibility	Only if relevant module is installed		
Description			
<p>The setpoint is used to select the method how the DNS Address 2 is adjusted.</p> <p>If <b>IP Address Mode</b> 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.</p> <p>If <b>IP Address Mode</b> is AUTOMATIC this setpoint is inactive. The DNS server IP address is assigned by the DHCP server.</p> <p>If <b>IP Address Mode</b> is DISABLED Ethernet terminal is disabled.</p>			

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## IP Firewall

Setpoint group	CM-Ethernet	Related FW	2.1.0				
Range [units]	ENABLED / DISABLED [-]						
Default value	DISABLED	Force value	NO				
Step	[-]						
Comm object	23920	Related applications	MINT				
Config level	Standard						
Setpoint visibility	Only if relevant module is installed						
Description							
This setpoints enables to switch on the built-in Firewall functionality.							
<table><tr><td>DISABLED</td><td>The firewall function is switched off</td></tr><tr><td>ENABLED</td><td>The firewall function is switched on, use IntelliConfig to setup the firewall rules (configuration card Others – Firewall)</td></tr></table>				DISABLED	The firewall function is switched off	ENABLED	The firewall function is switched on, use IntelliConfig to setup the firewall rules (configuration card Others – Firewall)
DISABLED	The firewall function is switched off						
ENABLED	The firewall function is switched on, use IntelliConfig to setup the firewall rules (configuration card Others – Firewall)						

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## Subgroup: AirGate Settings

### AirGate Connection


Setpoint group	CM-Ethernet	Related FW	2.1.0
Range [units]	Disabled / Enabled [-]		
Default value	Enabled	Force value	YES
Step	[-]		
Comm object	23935	Related applications	MINT
Config level	Standard		
Setpoint visibility	Always		
Description			
This setpoint enables or disables <b>AirGate connection</b> function.			

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## AirGate Address

Setpoint group	Ethernet	Related FW	2.1.0
Range [units]	0 .. 31 characters [-]		
Default value	global.airgate.link	Force value	NO
Step	[-]		
Comm object	24364	Related applications	MINT
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-Ethernet	Related FW	2.1.0
Range [units]	0 .. 65535 [-]		
Default value	54440 [-]	Force value	NO
Step	1 [-]		
Comm object	23919	Related applications	MINT
Config level	Standard		
Setpoint visibility	Always		
Description			
This port is used for TCP communication with the AirGate server.			
<b>Note:</b> Use port 54440 for standard ComAp AirGate service.			

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## Subgroup: ComAp Client Settings

### ComAp Client Inactivity Timeout

Setpoint group	EthernetEthernet	Related FW	2.1.0
Range [units]	0 .. 65535 [s]		
Default value	60 s	Force value	YES
Step	1 s		
Comm object	24098	Related applications	MINT
Config level	Standard		
Setpoint visibility	Always		
Description			
Connection (TCP socket) is closed by controller, if a client (e.g. IntelliConfig) does not communicate for this time. This timeout applies to both direct and AirGate connection.			

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### Direct Connection

Setpoint group	CM-Ethernet	Related FW	2.1.0
Range [units]	Disabled / Enabled [-]		
Default value	Enabled	Force value	NO
Step	[-]		
Comm object	23917	Related applications	MINT
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. IntelliConfig) 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	CM-Ethernet	Related FW	2.1.0
Range [units]	1 .. 65535 [-]		
Default value	23	Force value	NO
Step	[-]		
Comm object	23918	Related applications	MINT
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: Modbus Server Settings

### MODBUS Server

Setpoint group	CM-Ethernet	Related FW	2.1.0
Range [units]	DISABLED / ENABLED [-]		
Default value	Disabled	Force value	NO
Step	[-]		
Comm object	23937	Related applications	MINT
Config level	Standard		
Setpoint visibility	Only if relevant module is installed		
Description			
Enable or disable Modbus communication via ethernet interface.			

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### Modbus Client Inactivity Timeout

Setpoint group	Ethernet Ethernet ETH Interface 3 - Modbus	Related FW	2.1.0
Range [units]	0 .. 65535 [s]		
Default value	60 s	Force value	NO
Step	1 s		
Comm object	24097	Related applications	MINT
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.			
<b>Note:</b> This setpoint is shared with other Modbus Client Inactivity Timeout setpoints.			

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## Subgroup: SNMP Settings

### SNMP Agent

Setpoint group	CM-Ethernet	Related FW	2.1.0
Range [units]	DISABLED / ENABLED [-]		
Default value	DISABLED	Force value	NO
Step	[-]		
Comm object	23936	Related applications	MINT
Config level	Standard		
Setpoint visibility	Only if relevant module is installed		
Description			
Enable or disable SNMP Agent.			

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### SNMP Trap Format

Setpoint group	CM-Ethernet	Related FW	2.1.0
Range [units]	v1Trap / v2Notif / v2Inform [-]		
Default value	v1Trap	Force value	NO
Step	[-]		
Comm object	23922	Related applications	MINT
Config level	Standard		
Setpoint visibility	Only if relevant module is installed		
Description			
This setpoint adjusts type of SNMP traps.			

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### SNMP Traps IP Address 1

Setpoint group	Ethernet	Related FW	2.1.0
Range [units]	0 .. 63 characters [-]		
Default value	-	Force value	NO
Step	[-]		
Comm object	24095	Related applications	MINT
Config level	Standard		
Setpoint visibility	Only if <b>SNMP Agent</b> != 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	Ethernet	Related FW	2.1.0
Range [units]	Valid IP address [-]		
Default value	-	Force value	NO
Step	[-]		
Comm object	24094	Related applications	MINT
Config level	Standard		
Setpoint visibility	Only if <b>SNMP Agent</b> != 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 RD Community String

Setpoint group	Ethernet	Related FW	2.1.0
Range [units]	0..31 characters [-]		
Default value	public	Force value	NO
Step	[-]		
Comm object	24335	Related applications	MINT
Config level	Standard		
Setpoint visibility	Only if <b>SNMP Agent</b> != Disabled		
Description			
SNMP Community String only for reading.			

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## SNMP WR Community String

Setpoint group	Ethernet	Related FW	2.1.0
Range [units]	0..31 characters [-]		
Default value	private	Force value	NO
Step	[-]		
Comm object	24334	Related applications	MINT
Config level	Standard		
Setpoint visibility	Only if <b>SNMP Agent</b> = SNMP v1/v2c		
Description			
SNMP Community String for writing and reading.			

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## SNMP Engine User Name

Setpoint group	Ethernet	Related FW	2.1.0
Range [units]	0 .. 31 characters [-]		
Default value	-	Force value	NO
Step	[-]		
Comm object	23851	Related applications	MINT
Config level	Standard		
Setpoint visibility	Only if <b>SNMP Agent</b> = SNMP v3		
Description			
Defines SNMP v3 Engine User Name.			

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## SNMP Privacy Protocol

Setpoint group	CM-Ethernet	Related FW	2.1.0
Range [units]	DES / 3DES / AES128 / AES256 [-]		
Default value	AES128	Force value	NO
Step	[-]		
Comm object	23853	Related applications	MINT
Config level	Standard		
Setpoint visibility	Only if <b>SNMP Agent</b> = SNMP v3		
Description			
Selects SNMP v3 Privacy Protocol.			

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## SNMP Authentication Protocol

Setpoint group	CM-Ethernet	Related FW	2.1.0
Range [units]	MD5 / SHA / SHA256[-]		
Default value	SHA	Force value	NO
Step	[-]		
Comm object	23854	Related applications	MINT
Config level	Standard		
Setpoint visibility	Only if <b>SNMP Agent</b> = SNMP v3		
Description			
Selects SNMP v3 Authentication Protocol.			

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## SNMP Security Level

Setpoint group	CM-Ethernet	Related FW	2.1.0
Range [units]	NONE/ AUTH-NOPRIV / AUTH-PRIV [-]		
Default value	NONE	Force value	NO
Step	[-]		
Comm object	23852	Related applications	MINT
Config level	Standard		
Setpoint visibility	Only if <b>SNMP Agent</b> = SNMP v3		
Description			
Selects SNMP v3 security level. If NONE the agent will work in SNMP v2c mode..			

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## Subgroup: E-mail Settings

### SMTP Server Address

Setpoint group	Ethernet	Related FW	2.1.0
Range [units]	0..31 characters [-]		
Default value	global.airgate.link:9925	Force value	NO
Step	[-]		
Comm object	24093	Related applications	MINT
Config level	Standard		
Setpoint visibility	Always		
Description			
<p>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.</p> <p><b>Example:</b> Enter the IP address "74.125.39.109" and port number "9925" as "74.125.39.109:9925".</p> <p><b>Note:</b> You may use also any public SMTP server which does not require connection over SSL/TLS channels.</p>			

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## SMTP Sender Address

Setpoint group	Ethernet	Related FW	2.1.0
Range [units]	0..31 characters [-]		
Default value	[-]	Force value	NO
Step	[-]		
Comm object	23878	Related applications	MINT
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.			
<i><b>Note:</b> It is not needed to enter an existing email address, nevertheless valid email format needs to be followed.</i>			
<b>IMPORTANT:</b> This item is obligatory when emails are configured.			

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## SMTP User Name

Setpoint group	Ethernet	Related FW	2.1.0
Range [units]	0..31 characters [-]		
Default value	[-]	Force value	NO
Step	[-]		
Comm object	23877	Related applications	MINT
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	Ethernet	Related FW	2.1.0
Range [units]	0..15 characters [-]		
Default value	[-]	Force value	NO
Step	[-]		
Comm object	23876	Related applications	MINT
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 Type

Setpoint group	Ethernet	Related FW	2.1.0
Range [units]	NONE / SSL/TLS / STARTTLS [-]		
Default value	NONE	Force value	NO
Step	[-]		
Comm object	24076	Related applications	MINT
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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## SMTP User Name

Setpoint group	CM-Ethernet	Related FW	2.1.0
Range [units]	0..31 characters [-]		
Default value	[-]	Force value	NO
Step	[-]		
Comm object	23880	Related applications	MINT
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	CM-Ethernet	Related FW	2.1.0
Range [units]	0..15 characters [-]		
Default value	[-]	Force value	NO
Step	[-]		
Comm object	23879	Related applications	MINT
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	CM-Ethernet	Related FW	2.1.0
Range [units]	NONE / SSL/TLS / STARTTLS [-]		
Default value	NONE	Force value	NO
Step	[-]		
Comm object	23938	Related applications	MINT
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	Ethernet	Related FW	2.1.0
Range [units]	0..63 characters [-]		
Default value	[-]	Force value	NO
Step	[-]		
Comm object	24298	Related applications	MINT
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	Ethernet	Related FW	2.1.0
Range [units]	0..63 characters [-]		
Default value	[-]	Force value	NO
Step	[-]		
Comm object	24297	Related applications	MINT
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	Ethernet	Related FW	2.1.0
Range [units]	0..63 characters [-]		
Default value	[-]	Force value	NO
Step	[-]		
Comm object	24145	Related applications	MINT
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

<b>Setpoint group</b>	Ethernet	<b>Related FW</b>	2.1.0
<b>Range [units]</b>	0..63 characters [-]		
<b>Default value</b>	[-]	<b>Force value</b>	NO
<b>Step</b>	[-]		
<b>Comm object</b>	24144	<b>Related applications</b>	MINT
<b>Config level</b>	Standard		
<b>Setpoint visibility</b>	Always		
<b>Description</b>			
Enter a valid e-mail address where event and alarm messages will be sent.			

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### Subgroup: Messages Settings

### E-mail Language

<b>Setpoint group</b>	Ethernet	<b>Related FW</b>	2.1.0
<b>Range [units]</b>	Depends on controller's supported languages. [-]		
<b>Default value</b>	English	<b>Force value</b>	NO
<b>Step</b>	[-]		
<b>Comm object</b>	24299	<b>Related applications</b>	MINT
<b>Config level</b>	Standard		
<b>Setpoint visibility</b>	Always		
<b>Description</b>			
Use this setpoint to set the language of Event, Warning, etc. e-mails.			

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## Event Message

Setpoint group	Ethernet	Related FW	2.1.0
Range [units]	Enabled / Disabled [-]		
Default value	Enabled	Force value	YES
Step	[-]		
Comm object	18971	Related applications	MINT
Config level	Standard		
Setpoint visibility	Always		
Description			
This setpoint enables or disables sending of Event Messages.			

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## Wrn Message

Setpoint group	Ethernet	Related FW	2.1.0
Range [units]	Enabled / Disabled [-]		
Default value	Enabled	Force value	YES
Step	[-]		
Comm object	8482	Related applications	MINT
Config level	Standard		
Setpoint visibility	Always		
Description			
This setpoint enables or disables sending of Warning Messages.			

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## Al Message

Setpoint group	Ethernet	Related FW	2.1.0
Range [units]	Enabled / Disabled [-]		
Default value	Enabled	Force value	YES
Step	[-]		
Comm object	10567	Related applications	MINT
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	Ethernet	Related FW	2.1.0
Range [units]	Enabled / Disabled [-]		
Default value	Enabled	Force value	YES
Step	[-]		
Comm object	10568	Related applications	MINT
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	Ethernet	Related FW	2.1.0
Range [units]	Enabled / Disabled [-]		
Default value	Enabled	Force value	YES
Step	[-]		
Comm object	18993	Related applications	MINT
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	Ethernet	Related FW	2.1.0
Range [units]	Enabled / Disabled [-]		
Default value	Enabled	Force value	YES
Step	[-]		
Comm object	18994	Related applications	MINT
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	Ethernet CM-4G-GPS Ethernet	Related FW	2.1.0
Range [units]	Enabled / Disabled [-]		
Default value	Enabled	Force value	YES
Step	[-]		
Comm object	8484	Related applications	MINT
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	Ethernet CM-4G-GPS Ethernet	Related FW	2.1.0
Range [units]	Enabled / Disabled [-]		
Default value	Enabled	Force value	YES
Step	[-]		
Comm object	11413	Related applications	MINT
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	2.1.0
Range [units]	Enabled/Disabled		
Default value	Enabled	Force value	
Step	[-]		
Comm object	8485	Related applications	MINT
Config level	Standard		
Setpoint visibility	Always		
Description			
This setpoint enables or disables sending of messages.			

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## BP Message

Setpoint group	Ethernet CM-4G-GPS Ethernet	Related FW	2.1.0
Range [units]	Enabled / Disabled [-]		
Default value	Enabled	Force value	YES
Step	[-]		
Comm object	10117	Related applications	MINT
Config level	Standard		
Setpoint visibility	Always		
Description			
This setpoint enables or disables sending of Bus Protection messages.			

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## Subgroup: RTC Synchronization

### Time Zone

Setpoint group	Scheduler; CM-4G-GPS	Related FW	2.1.0
Range [units]	GMT-12:00 .. GMT+13:00 [hours]		
Default value	GMT+1:00	Force value	NO
Step	[-]		
Comm object	24366	Related applications	MINT
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.			
<b>Note:</b> <i>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.</i>			

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## NTP Clock Synchronization

Setpoint group	CM-4G-GPS	Related FW	2.1.0
Range [units]	DISABLED / ENABLED [-]		
Default value	DISABLED	Force value	NO
Step	[-]		
Comm object	23934	Related applications	MINT
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-Ethernet	Related FW	2.1.0
Range [units]	[-]		
Default value	pool.ntp.org	Force value	NO
Step	[-]		
Comm object	23933	Related applications	MINT
Config level	Standard		
Setpoint visibility	Only if relevant module is installed		
Description			
NTP server address.			

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**Group: EM-BIO8-EFCP**



## Subgroup: EFCP Settings



## Earth Fault Current Protection

Setpoint group	Protections	Related FW	2.1.0
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
Config level	Standard		
Setpoint visibility	Always		

### Description

This setpoint enables or disables Earth Fault Current Protection.

Behavior is adjusted via setpoints **Earth Fault Sd** and **Earth Fault Delay**. When the protection is triggered the alarm **Sd IDMT Earth Fault Current** is activated.

The reaction time is calculated by this formula:

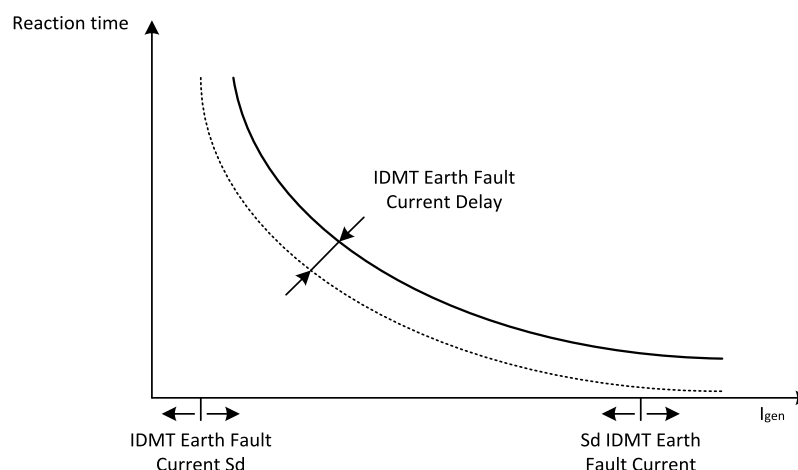
$$\text{Reaction time} = \frac{\text{IDMT Earth Fault Current Delay} \times \text{IDMT Earth Fault Current Sd}}{I_{\text{gen}} - \text{IDMT Earth Fault Current Sd}}$$

$I_{\text{gen}}$  = Maximum (BESS Current L1, BESS Current L2, BESS Current L3)

#### Example:

Earth Fault Sd = 10 A

	Delay [s]	$I_{\text{gen}}$ [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



#### 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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## Earth Fault Delay

Setpoint group	BESS Protections	Related FW	2.1.0
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
Config level	Standard		
Setpoint visibility	Always		
Description			
This setpoint specifies the delay for <b>Earth Fault Current Protection</b> .			

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## Earth Fault CT Input Range

Setpoint group	EM-BIO8-EFCP	Related FW	2.1.0
Range [units]	1 [A] / 5 [A]		
Default value	5 A	Force value	NO
Step	[-]		
Comm object	14340	Related applications	MINT
Config level	Standard		
Setpoint visibility	Only if relevant module is installed		
Description			
There are 2 physical inputs for <b>Earth Fault Current Protection</b> . Value of this setpoint has to be set on value of physical input which is presently in use.			

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## Earth Fault CT Ratio


Setpoint group	EM-BIO8-EFCP	Related FW	2.1.0
Range [units]	1 .. 2000 [1/(1or5) A]		
Default value	500 1/(1or5)A	Force value	NO
Step	1 A/ 1A; 1 A/5 A		
Comm object	14339	Related applications	MINT
Config level	Standard		
Setpoint visibility	Only if relevant module is installed		
Description			
Earth Fault current transformer ratio.			
<b>Note:</b> Type of units depends on setpoint <b>Earth Fault CT Input Range</b> which have to be set before this setpoint.			

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## Earth Fault Sd

Setpoint group	BESS Protections	Related FW	2.1.0
Range [units]	0 .. 1000 [A]		
Default value	10 A	Force value	YES
Step	1 [A]		
Comm object	11632	Related applications	MINT
Config level	Standard		
Setpoint visibility	Always		
Description			
This setpoint specifies the current threshold level for <b>Earth Fault Current Protection</b> .			

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## 9.1.4 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 IntelliConfig 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.

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## Group: Energy Storage

### ES Nominal Capacity

Value group	Value Group BESS	Related FW	2.1.0
Units	kWh		
Comm object	17553	Related applications	MINT
<b>Description</b>			
This value represents nominal capacity of the Energy Storage. The value is taken from the LAI <b>ES kWh NOMINALCAPACITY</b> .			

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### ES SOC

Value group	Value Group BESS	Related FW	2.1.0
Units	%		
Comm object	15857	Related applications	MINT
<b>Description</b>			
Actual state of charge of the Energy Storage. The value is taken from the LAI <b>ES SOC</b> . More information can be seen in chapter <b>BESS SOC Control</b> .			

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### ES Voltage Meas

Value group	Energy Storage	Related FW	2.1.0
Units	V		
Comm object	19653	Related applications	MINT
<b>Description</b>			
Energy Storage DC Voltage measured by physical AIN with the function from LAI <b>ES VOLTAGE MEAS</b> . This values is used for ES protections and also for DC synchronization (evaluation based on setpoint <b>DC Voltage Window</b> ).			
<i><b>Note:</b> In order to physically measure high DC voltage the InteliDC 4/4 module can provide such need. For more information see <b>Inteli DC4/4</b>.</i>			

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### ES Voltage

Value group	Energy Storage	Related FW	2.1.0
Units	V		
Comm object	14371	Related applications	MINT
<b>Description</b>			
Energy Storage DC Voltage measured by BMS. The value is taken from the LAI <b>ES VOLTAGE</b> .			

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## ES Current

<b>Value group</b>	Energy Storage	<b>Related FW</b>	2.1.0
<b>Units</b>	A		
<b>Comm object</b>	19618	<b>Related applications</b>	MINT
<b>Description</b>			
Energy Storage DC Voltage measured by BMS or by physical input. The value is taken from the LAI <b>ES CURRENT</b> .			
<i><b>Note:</b> In order to physically measure high DC current the InteliDC 4/4 module can provide such need. For more information see <b>Inteli DC4/4</b>.</i>			

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## ES Max Charging Power

<b>Value group</b>	Energy Storage	<b>Related FW</b>	2.1.0
<b>Units</b>	kW		
<b>Comm object</b>	19617	<b>Related applications</b>	MINT
<b>Description</b>			
Maximal charging power of the Energy Storage computed by the InteliNeo 530 BESS. This value is calculated either from the LAI <b>ES MAX CHARGING CURRENT</b> or by setpoint <b>ES Safety Charging Current</b> if the value source from the LAI fails.			

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## ES Max Discharging Power

<b>Value group</b>	Energy Storage	<b>Related FW</b>	2.1.0
<b>Units</b>	kW		
<b>Comm object</b>	19616	<b>Related applications</b>	MINT
<b>Description</b>			
Maximal discharging power of the Energy Storage computed by the InteliNeo 530 BESS. This value is calculated either from the LAI <b>ES Max Discharging Current</b> or setpoint <b>ES Safety Discharging Current</b> if the value source from the LAI fails..			

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## ES Temperature

<b>Value group</b>	Value Group BESS	<b>Related FW</b>	2.1.0
<b>Units</b>	[°C / °F] (based on Units selected in configuration)		
<b>Comm object</b>	15861	<b>Related applications</b>	MINT
<b>Description</b>			
Actual BESS temperature. The value is taken from the LAI <b>ES TEMPERATUREES TEMPERATURE</b> .			

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### Cell Min Voltage

<b>Value group</b>	Energy Storage	<b>Related FW</b>	2.1.0
<b>Units</b>	V		
<b>Comm object</b>	62711	<b>Related applications</b>	MINT
<b>Description</b>			
Value that is received from the LAI <b>CELL MIN VOLTAGE</b> . Wrn or a SD protection can be activated depending on the value number and setpoints settings.			

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### Cell Max Voltage

<b>Value group</b>	Energy Storage	<b>Related FW</b>	2.1.0
<b>Units</b>	V		
<b>Comm object</b>	62710	<b>Related applications</b>	MINT
<b>Description</b>			
Value that is received from the LAI <b>CELL MAX VOLTAGE</b> . Wrn or a SD protection can be activated depending on the value number and setpoints settings.			

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### Cell Min Temperature

<b>Value group</b>	Energy Storage	<b>Related FW</b>	2.1.0
<b>Units</b>	°C / °F (based on Units selected in configuration)		
<b>Comm object</b>	62709	<b>Related applications</b>	MINT
<b>Description</b>			
Value that is received from the LAI <b>CELL MIN TEMPERATURE</b> . Wrn or a SD protection can be activated depending on the value number and setpoints settings.			

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### Cell Max Temperature

<b>Value group</b>	Energy Storage	<b>Related FW</b>	2.1.0
<b>Units</b>	°C / °F (based on Units selected in configuration)		
<b>Comm object</b>	62708	<b>Related applications</b>	MINT
<b>Description</b>			
Value that is received from the LAI <b>CELL MAX TEMPERATURE</b> . Wrn or a SD protection can be activated depending on the value number and setpoints settings.			

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## Operational Strings

<b>Value group</b>	Energy Storage	<b>Related FW</b>	2.1.0
<b>Units</b>			
<b>Comm object</b>	17645	<b>Related applications</b>	MINT
<b>Description</b>			
The value shows the amount of Battery Strings that are connected on to the DC bus.			

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## String Voltage 1

<b>Value group</b>	Energy Storage	<b>Related FW</b>	2.1.0
<b>Units</b>	V		
<b>Comm object</b>	17653	<b>Related applications</b>	MINT
<b>Description</b>			
DC Voltage measured by BMS for a given Battery String. Visualizes the number of the LAI <b>STRING VOLTAGE 1</b> .			

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## String Voltage 2

<b>Value group</b>	Energy Storage	<b>Related FW</b>	2.1.0
<b>Units</b>	V		
<b>Comm object</b>	17652	<b>Related applications</b>	MINT
<b>Description</b>			
DC Voltage measured by BMS for a given Battery String. Visualizes the number of the LAI <b>STRING VOLTAGE 2</b> .			

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## String Voltage 3

<b>Value group</b>	Energy Storage	<b>Related FW</b>	2.1.0
<b>Units</b>	V		
<b>Comm object</b>	17651	<b>Related applications</b>	MINT
<b>Description</b>			
DC Voltage measured by BMS for a given Battery String. Visualizes the number of the LAI <b>STRING VOLTAGE 3</b> .			

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### String Voltage 4

<b>Value group</b>	Energy Storage	<b>Related FW</b>	2.1.0
<b>Units</b>	V		
<b>Comm object</b>	17650	<b>Related applications</b>	MINT
<b>Description</b>			
DC Voltage measured by BMS for a given Battery String. Visualizes the number of the LAI <b>STRING VOLTAGE 4</b> .			

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### String Voltage 5

<b>Value group</b>	Energy Storage	<b>Related FW</b>	2.1.0
<b>Units</b>	V		
<b>Comm object</b>	17649	<b>Related applications</b>	MINT
<b>Description</b>			
DC Voltage measured by BMS for a given Battery String. Visualizes the number of the LAI <b>STRING VOLTAGE 5</b> .			

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### String Voltage 6

<b>Value group</b>	Energy Storage	<b>Related FW</b>	2.1.0
<b>Units</b>	V		
<b>Comm object</b>	17648	<b>Related applications</b>	MINT
<b>Description</b>			
DC Voltage measured by BMS for a given Battery String. Visualizes the number of the LAI <b>STRING VOLTAGE 6</b> .			

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### String Voltage 7

<b>Value group</b>	Energy Storage	<b>Related FW</b>	2.1.0
<b>Units</b>	V		
<b>Comm object</b>	17647	<b>Related applications</b>	MINT
<b>Description</b>			
DC Voltage measured by BMS for a given Battery String. Visualizes the number of the LAI <b>STRING VOLTAGE 7</b> .			

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## String Voltage 8

Value group	Energy Storage	Related FW	2.1.0
Units	V		
Comm object	17646	Related applications	MINT
Description			
DC Voltage measured by BMS for a given Battery String. Visualizes the number of the LAI <b>STRING VOLTAGE 8</b> .			

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## Group: Power Conversion System

### PCS Voltage Meas

Value group	Power Conversion System	Related FW	2.1.0
Units	[]		
Comm object	19650	Related applications	MINT
Description			
Power Conversion System DC Voltage measured by physical AIN with the function from LAI <b>PCS VOLTAGE MEAS</b> . This value is used for PCS DC protections.			
<b>Note:</b> In order to physically measure high DC voltage the InteliDC 4/4 module can provide such need. For more information see <b>Inteli DC4/4</b> .			

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### PCS Current Meas

Value group	Power Conversion System	Related FW	2.1.0
Units	[]		
Comm object	19649	Related applications	MINT
Description			
Power Conversion System DC Current measured by physical AIN with the function from LAI <b>PCS CURRENT MEAS</b> . This value is used for PCS DC protections.			
<b>Note:</b> In order to physically measure high DC current the InteliDC 4/4 module can provide such need. For more information see <b>Inteli DC4/4</b> .			

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## PCS Power Meas

<b>Value group</b>	Power Conversion System	<b>Related FW</b>	2.1.0
<b>Units</b>	[]		
<b>Comm object</b>	19648	<b>Related applications</b>	MINT
<b>Description</b>			
Power Conversion System DC Power computed from <b>PCS Current Meas</b> and <b>PCS Voltage Meas</b> . This values is used for PCS DC protections.			

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## Group: DC PV Monitoring

### DC PV P

<b>Value group</b>	DC PV Monitoring	<b>Related FW</b>	2.1.0
<b>Units</b>	kW		
<b>Comm object</b>	17546	<b>Related applications</b>	MINT
<b>Description</b>			
Value that is received from the LAI DC PV P. This value can be also switched into one decimal see <b>Power Formats And Units</b> .			

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### DC PV kWh P

<b>Value group</b>	DC PV Monitoring	<b>Related FW</b>	2.1.0
<b>Units</b>	kWh		
<b>Comm object</b>	17548	<b>Related applications</b>	MINT
<b>Description</b>			
Value that is received from the LAI DC PV kWh. This value provides the accumulated energy value from the DC PV site control device.			

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### DC PV Nominal P

<b>Value group</b>	DC PV Monitoring	<b>Related FW</b>	2.1.0
<b>Units</b>	kW		
<b>Comm object</b>	17547	<b>Related applications</b>	MINT
<b>Description</b>			
Value that is received from the LAI DC PV Nominal P. This value can be also switched into one decimal see <b>Power Formats And Units</b> .			

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## Group: BESS

### BESS P

Value group	BESS	Related FW	2.1.0
Units	kW		
Comm object	8202	Related applications	MINT
Description			
Active power of the BESS.			
<b>Note:</b> This value can be also switched into one decimal see <i>Power Formats And Units</i> .			

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### BESS P L1

Value group	Value Group BESS	Related FW	2.1.0
Units	kW		
Comm object	8524	Related applications	MINT
Description			
Active power of the L1 phase of the BESS.			
<b>Note:</b> This value can be also switched into one decimal see <i>Power Formats And Units</i> .			

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### BESS P L2

Value group	Value Group BESS	Related FW	2.1.0
Units	kW		
Comm object	8525	Related applications	MINT
Description			
Active power of the L2 phase of the BESS.			
<b>Note:</b> This value can be also switched into one decimal see <i>Power Formats And Units</i> .			

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### BESS P L3

Value group	Value Group BESS	Related FW	2.1.0
Units	kW		
Comm object	8526	Related applications	MINT
Description			
Active power of the L3 phase of the BESS.			
<b>Note:</b> This value can be also switched into one decimal see <i>Power Formats And Units</i> .			

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## BESS Q

Value group	Value Group BESS	Related FW	2.1.0
Units	kVAr		
Comm object	8203	Related applications	MINT
Description			
Reactive power of the BESS.			
<b>Note:</b> This value can be also switched into one decimal see <i>Power Formats And Units</i> .			

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## BESS Q L1

Value group	Value Group BESS	Related FW	2.1.0
Units	kVAr		
Comm object	8527	Related applications	MINT
Description			
Reactive power of the L1 phase of the BESS.			
<b>Note:</b> This value can be also switched into one decimal see <i>Power Formats And Units</i> .			

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## BESS Q L2

Value group	Value Group BESS	Related FW	2.1.0
Units	kVAr		
Comm object	8528	Related applications	MINT
Description			
Reactive power of the L2 phase of the BESS.			
<b>Note:</b> This value can be also switched into one decimal see <i>Power Formats And Units</i> .			

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## BESS Q L3

Value group	Value Group BESS	Related FW	2.1.0
Units	kVAr		
Comm object	8529	Related applications	MINT
Description			
Reactive power of the L3 phase of the BESS.			
<b>Note:</b> This value can be also switched into one decimal see <i>Power Formats And Units</i> .			

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## BESS S

Value group	Value Group BESS	Related FW	2.1.0
Units	kVA		
Comm object	8565	Related applications	MINT
Description			
Apparent power of the BESS.			
<b>Note:</b> This value can be also switched into one decimal see <i>Power Formats And Units</i> .			

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## BESS S L1

Value group	Value Group BESS	Related FW	2.1.0
Units	kVA		
Comm object	8530	Related applications	MINT
Description			
Apparent power of the L1 phase of the BESS.			
<b>Note:</b> This value can be also switched into one decimal see <i>Power Formats And Units</i> .			

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## BESS S L2

Value group	Value Group BESS	Related FW	2.1.0
Units	kVA		
Comm object	8531	Related applications	MINT
Description			
Apparent power of the L2 phase of the BESS.			
<b>Note:</b> This value can be also switched into one decimal see <i>Power Formats And Units</i> .			

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## BESS S L3

Value group	Value Group BESS	Related FW	2.1.0
Units	kVA		
Comm object	8532	Related applications	MINT
Description			
Apparent power of the L3 phase of the BESS.			
<b>Note:</b> This value can be also switched into one decimal see <i>Power Formats And Units</i> .			

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## BESS Power Factor

Value group	BESS	Related FW	2.1.0
Units	[-]		
Comm object	16156	Related applications	MINT
Description			
Power factor of the BESS.			

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## BESS Load Character

Value group	BESS	Related FW	2.1.0
Units	[-]		
Comm object	8395	Related applications	MINT
Description			
Load character of the BESS.			
L = inductive load, C = capacitive load, and R = resistive load ( <b>BESS Power Factor = 1</b> ).			

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## BESS Power Factor L1

Value group	BESS	Related FW	2.1.0
Units	[-]		
Comm object	16160	Related applications	MINT
Description			
Power factor of the L1 phase of the BESS.			

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## BESS Load Character L1

Value group	BESS	Related FW	2.1.0
Units	[-]		
Comm object	8626	Related applications	MINT
Description			
Load character of the L1 phase of the BESS.			
L = inductive load, C = capacitive load, and R = resistive load ( <b>BESS Power Factor L1 = 1</b> ).			

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## BESS Power Factor L2

Value group	BESS	Related FW	2.1.0
Units	[-]		
Comm object	16161	Related applications	MINT
Description			
Power factor of the L2 phase of the BESS.			

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## BESS Load Character L2

Value group	BESS	Related FW	2.1.0
Units	[-]		
Comm object	8627	Related applications	MINT
<b>Description</b>			
Load character of the L2 phase of the BESS. L = inductive load, C = capacitive load, and R = resistive load ( <b>BESS Power Factor L2 = 1</b> ).			

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## BESS Power Factor L3

Value group	BESS	Related FW	2.1.0
Units	[-]		
Comm object	16162	Related applications	MINT
<b>Description</b>			
Power factor of the L3 phase of the BESS.			

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## BESS Load Character L3

Value group	BESS	Related FW	2.1.0
Units	[-]		
Comm object	8628	Related applications	MINT
<b>Description</b>			
Load character of the L3 phase of the BESS. L = inductive load, C = capacitive load, and R = resistive load ( <b>BESS Power Factor L3 = 1</b> ).			

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## BESS Voltage THD L1

Value group	BESSMains/Bus	Related FW	2.1.0
Units	%		
Comm object	16052	Related applications	MINT
<b>Description</b>			
This value represents <b>Voltage Total Harmonic Distortion</b> of <b>BESS Voltage L1-N</b> .			

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## BESS Voltage THD L2

Value group	BESSMains/Bus	Related FW	2.1.0
Units	%		
Comm object	16053	Related applications	MINT
<b>Description</b>			
This value represents <b>Voltage Total Harmonic Distortion</b> of <b>BESS Voltage L2-N</b> .			

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### BESS Voltage THD L3

Value group	BESSMains/Bus	Related FW	2.1.0
Units	%		
Comm object	16054	Related applications	MINT
Description			
This value represents <b>Voltage Total Harmonic Distortion</b> of <b>BESS Voltage L3-N</b> .			

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### BESS Current THD L1

Value group	Value Group BESS	Related FW	2.1.0
Units	%		
Comm object	16056	Related applications	MINT
Description			
This value represents <b>Current Total Harmonic Distortion</b> of <b>BESS Current L1</b> .			

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### BESS Current THD L2

Value group	Value Group BESS	Related FW	2.1.0
Units	%		
Comm object	16057	Related applications	MINT
Description			
This value represents <b>Current Total Harmonic Distortion</b> of <b>BESS Current L2</b> .			

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### BESS Current THD L3

Value group	Value Group BESS	Related FW	2.1.0
Units	%		
Comm object	16058	Related applications	MINT
Description			
This value represents <b>Current Total Harmonic Distortion</b> of <b>BESS Current L3</b> .			

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### BESS Frequency

Value group	Value Group BESS	Related FW	2.1.0
Units	Hz		
Comm object	20799	Related applications	MINT
Description			
This is the value of BESS Frequency. Frequency measurement is limited to 80Hz and higher frequency stops being measured via the physical input of the controller.			

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### BESS Voltage L1-N

Value group	BESS	Related FW	2.1.0
Units	V		
Comm object	8192	Related applications	MINT
Description			
Voltage of the L1 phase of the BESS.			

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### BESS Voltage L2-N

Value group	BESS	Related FW	2.1.0
Units	V		
Comm object	8193	Related applications	MINT
Description			
Voltage of the L2 phase of the BESS.			

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### BESS Voltage L3-N

Value group	BESS	Related FW	2.1.0
Units	V		
Comm object	8194	Related applications	MINT
Description			
Voltage of the L3 phase of the BESS.			

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### BESS Voltage L1-L2

Value group	BESSMains/Bus	Related FW	2.1.0
Units	V		
Comm object	9628	Related applications	MINT
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	2.1.0
Units	V		
Comm object	9629	Related applications	MINT
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	2.1.0
Units	V		
Comm object	9630	Related applications	MINT
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	2.1.0
Units	V		
Comm object	10645	Related applications	MINT
Description			
Average value of all voltage phases of the BESS.			

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## BESS V Unbalance Ph-N

Value group	BESS	Related FW	2.1.0
Units	V		
Comm object	10548	Related applications	MINT
Description			
This value contains the maximum difference of values <b>BESS Voltage L1-N</b> , <b>BESS Voltage L2-N</b> , <b>BESS Voltage L3-N</b> at a given moment.			
<b>Note:</b> 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	2.1.0
Units	V		
Comm object	17336	Related applications	MINT
Description			
This value contains the maximum difference of values <b>BESS Voltage L1-L2</b> , <b>BESS Voltage L2-L3</b> , <b>BESS Voltage L3-L1</b> at a given moment.			
<b>Note:</b> 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	2.1.0
Units	A		
Comm object	8198	Related applications	MINT
<b>Description</b>			
Current of the L1 phase of the BESS.			
<i><b>Note:</b> This value can be also switched into one decimal see <b>Power Formats And Units</b>.</i>			

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### BESS Current L2

Value group	Value Group BESS	Related FW	2.1.0
Units	A		
Comm object	8199	Related applications	MINT
<b>Description</b>			
Current of the L2 phase of the BESS.			
<i><b>Note:</b> This value can be also switched into one decimal see <b>Power Formats And Units</b>.</i>			

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### BESS Current L3

Value group	Value Group BESS	Related FW	2.1.0
Units	A		
Comm object	8200	Related applications	MINT
<b>Description</b>			
Current of the L3 phase of the BESS.			
<i><b>Note:</b> This value can be also switched into one decimal see <b>Power Formats And Units</b>.</i>			

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### BESS Current Unbalance

Value group	Value Group BESS	Related FW	2.1.0
Units	A		
Comm object	10550	Related applications	MINT
<b>Description</b>			
This value contains the maximum difference of values <b>BESS Current L1</b> , <b>BESS Current L2</b> and <b>BESS Current L3</b> .			
<i><b>Note:</b> Difference of the values and the evaluation of the protection is influenced by the setpoint <b>Connection type</b>.</i>			

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## Earth Fault Current

Value group	BESS	Related FW	2.1.0
Units	A		
Comm object	14996	Related applications	MINT
<b>Description</b>			
Measured fault value for evaluation of <b>Earth Fault Current Protection</b> . This value represents the measured value on the terminals T35 and T34 of the controller.			

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## Nominal Power

Value group	BESS Power Management	Related FW	2.1.0
Units	[kW]		
Comm object	9018	Related applications	MINT
<b>Description</b>			
This value is used for adjusting the BESS's nominal (rated) power. The value is taken from the setpoint <b>BESS Nominal power</b> .			

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## Nominal Voltage

Value group	BESS	Related FW	2.1.0
Units	[V]		
Comm object	9917	Related applications	MINT
<b>Description</b>			
This setpoint is used for adjusting the BESS's nominal voltage.			

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## Nominal Current

Value group	BESS	Related FW	2.1.0
Units	[A]		
Comm object	9978	Related applications	MINT
<b>Description</b>			
This setpoint is used for adjusting the BESS's nominal current. This value changes based on the setting of setpoint <b>BESS Nominal Current</b> .			

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## BESS Max Charging P

Value group	Value Group BESS	Related FW	2.1.0
Units	kW		
Comm object	17893	Related applications	MINT
<b>Description</b>			
<p>This value reflects the input of LAI <b>BESS MAX CHARGE P (PAGE 1)</b>. It defines the maximum charging power of the BESS.</p> <p>This value also reflects the ability of the BESS to continue charging. 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.</p> <p>See the chapter on <b>Max. charging/discharging power of the BESS</b>.</p>			

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## BESS Max Discharging P

Value group	Value Group BESS	Related FW	2.1.0
Units	kW		
Comm object	17892	Related applications	MINT
<b>Description</b>			
<p>This value reflects the input of LAI <b>BESS MAX DISCHARGE P (PAGE 1)</b>. It defines the maximum charging power of the BESS.</p> <p>This value also reflects the ability of the BESS to continue discharging. 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.</p> <p>See the chapter on <b>Max. charging/discharging power of the BESS</b>.</p>			

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## Slip Frequency

Value group	Mains/Bus	Related FW	2.1.0
Units	Hz		
Comm object	8224	Related applications	MINT
<b>Description</b>			
Slip frequency during synchronization.			

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## Slip Angle

Value group	Mains/Bus	Related FW	2.1.0
Units	°		
Comm object	8225	Related applications	MINT
Description			
Slip angle during synchronization.			

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## BESS P 10min Avg

Value group	BESS	Related FW	2.1.0
Units	kW		
Comm object	16073	Related applications	
Description			
This value contains 10-minutes average of <b>BESS P</b> .			
See <b>10-minutes averages (page 1)</b> for more information.			
<b>Note:</b> This value can be also switched into one decimal see <b>Power Formats And Units</b> . Value is reset to 0 with opening of BCB.			

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## BESS Q 10min Avg

Value group	BESS	Related FW	2.1.0
Units	kVAr		
Comm object	16080	Related applications	
Description			
This value contains 10-minutes average of <b>BESS Q</b> .			
See <b>10-minutes averages (page 1)</b> for more information.			
<b>Note:</b> This value can be also switched into one decimal see <b>Power Formats And Units</b> . Value is reset to 0 with opening of BCB.			

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## BESS S 10min Avg

Value group	Value Group BESS	Related FW	2.1.0
Units	kVA		
Comm object	16081	Related applications	
Description			
This value contains 10-minutes average of <b>BESS S</b> .			
See <b>10-minutes averages (page 1)</b> for more information.			
<b>Note:</b> This value can be also switched into one decimal see <b>Power Formats And Units</b> . Value is reset to 0 with opening of BCB.			

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## Earth Fault Current - BIO8

Value group	BESS	Related FW	2.1.0
Units	[A]		
Comm object	14325	Related applications	MINT
Description			
Measured fault value for evaluation of <b>Earth Fault Current Protection</b> from the <b>Subgroup: EFCP Settings</b> . This value is taken from the physical AIN of plug-in module EM-BIO8-EFCP.			

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## Group: Sources

### Source 1 Power

Value group	Sources	Related FW	2.1.0
Units	kW		
Comm object	10935	Related applications	MINT
Description			
This value contains actual active power of Source which has <b>ICC Address = 1</b> .			

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### Source 1 Load Reserve

Value group	Sources	Related FW	2.1.0
Units	kW		
Comm object	19052	Related applications	MINT
Description			
This value contains actual load reserve of Source which has <b>ICC Address = 1</b> .			

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### Source 2 Power

Value group	Sources	Related FW	2.1.0
Units	kW		
Comm object	10936	Related applications	MINT
Description			
This value contains actual active power of Source which has <b>ICC Address = 2</b> .			

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### Source 2 Load Reserve

Value group	Sources	Related FW	2.1.0
Units	kW		
Comm object	19053	Related applications	MINT
Description			
This value contains actual load reserve of Source which has <b>ICC Address</b> = 2.			

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### Source 3 Power

Value group	Sources	Related FW	2.1.0
Units	kW		
Comm object	10937	Related applications	MINT
Description			
This value contains actual active power of Source which has <b>ICC Address</b> = 3.			

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### Source 3 Load Reserve

Value group	Sources	Related FW	2.1.0
Units	kW		
Comm object	19054	Related applications	MINT
Description			
This value contains actual load reserve of Source which has <b>ICC Address</b> = 3.			

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### Source 4 Power

Value group	Sources	Related FW	2.1.0
Units	kW		
Comm object	10938	Related applications	MINT
Description			
This value contains actual active power of Source which has <b>ICC Address</b> = 4.			

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### Source 4 Load Reserve

Value group	Sources	Related FW	2.1.0
Units	kW		
Comm object	19055	Related applications	MINT
Description			
This value contains actual load reserve of Source which has <b>ICC Address</b> = 4.			

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### Source 5 Power

Value group	Sources	Related FW	2.1.0
Units	kW		
Comm object	10939	Related applications	MINT
Description			
This value contains actual active power of Source which has <b>ICC Address = 5</b> .			

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### Source 5 Load Reserve

Value group	Sources	Related FW	2.1.0
Units	kW		
Comm object	19056	Related applications	MINT
Description			
This value contains actual load reserve of Source which has <b>ICC Address = 5</b> .			

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### Source 6 Power

Value group	Sources	Related FW	2.1.0
Units	kW		
Comm object	10940	Related applications	MINT
Description			
This value contains actual active power of Source which has <b>ICC Address = 6</b> .			

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### Source 6 Load Reserve

Value group	Sources	Related FW	2.1.0
Units	kW		
Comm object	19057	Related applications	MINT
Description			
This value contains actual load reserve of Source which has <b>ICC Address = 6</b> .			

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### Source 7 Power

Value group	Sources	Related FW	2.1.0
Units	kW		
Comm object	10941	Related applications	MINT
Description			
This value contains actual active power of Source which has <b>ICC Address = 7</b> .			

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### Source 7 Load Reserve

Value group	Sources	Related FW	2.1.0
Units	kW		
Comm object	19058	Related applications	MINT
Description			
This value contains actual load reserve of Source which has <b>ICC Address = 7</b> .			

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### Source 8 Power

Value group	Sources	Related FW	2.1.0
Units	kW		
Comm object	10942	Related applications	MINT
Description			
This value contains actual active power of Source which has <b>ICC Address = 8</b> .			

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### Source 8 Load Reserve

Value group	Sources	Related FW	2.1.0
Units	kW		
Comm object	19059	Related applications	MINT
Description			
This value contains actual load reserve of Source which has <b>ICC Address = 8</b> .			

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### Source 9 Power

Value group	Sources	Related FW	2.1.0
Units	kW		
Comm object	10943	Related applications	MINT
Description			
This value contains actual active power of Source which has <b>ICC Address = 9</b> .			

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### Source 9 Load Reserve

Value group	Sources	Related FW	2.1.0
Units	kW		
Comm object	19060	Related applications	MINT
Description			
This value contains actual load reserve of Source which has <b>ICC Address = 9</b> .			

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### Source 10 Power

Value group	Sources	Related FW	2.1.0
Units	kW		
Comm object	10944	Related applications	MINT
Description			
This value contains actual active power of Source which has <b>ICC Address</b> = 10.			

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### Source 10 Load Reserve

Value group	Sources	Related FW	2.1.0
Units	kW		
Comm object	19061	Related applications	MINT
Description			
This value contains actual load reserve of Source which has <b>ICC Address</b> = 10.			

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### Source 11 Power

Value group	Sources	Related FW	2.1.0
Units	kW		
Comm object	10945	Related applications	MINT
Description			
This value contains actual active power of Source which has <b>ICC Address</b> = 11.			

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### Source 11 Load Reserve

Value group	Sources	Related FW	2.1.0
Units	kW		
Comm object	19062	Related applications	MINT
Description			
This value contains actual load reserve of Source which has <b>ICC Address</b> = 11.			

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### Source 12 Power

Value group	Sources	Related FW	2.1.0
Units	kW		
Comm object	10946	Related applications	MINT
Description			
This value contains actual active power of Source which has <b>ICC Address</b> = 12.			

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### Source 12 Load Reserve

Value group	Sources	Related FW	2.1.0
Units	kW		
Comm object	19063	Related applications	MINT
Description			
This value contains actual load reserve of Source which has <b>ICC Address</b> = 12.			

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### Source 13 Power

Value group	Sources	Related FW	2.1.0
Units	kW		
Comm object	10947	Related applications	MINT
Description			
This value contains actual active power of Source which has <b>ICC Address</b> = 13.			

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### Source 13 Load Reserve

Value group	Sources	Related FW	2.1.0
Units	kW		
Comm object	19064	Related applications	MINT
Description			
This value contains actual load reserve of Source which has <b>ICC Address</b> = 13.			

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### Source 14 Power

Value group	Sources	Related FW	2.1.0
Units	kW		
Comm object	10948	Related applications	MINT
Description			
This value contains actual active power of Source which has <b>ICC Address</b> = 14.			

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### Source 14 Load Reserve

Value group	Sources	Related FW	2.1.0
Units	kW		
Comm object	19065	Related applications	MINT
Description			
This value contains actual load reserve of Source which has <b>ICC Address</b> = 14.			

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### Source 15 Power

Value group	Sources	Related FW	2.1.0
Units	kW		
Comm object	10949	Related applications	MINT
Description			
This value contains actual active power of Source which has <b>ICC Address</b> = 15.			

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### Source 15 Load Reserve

Value group	Sources	Related FW	2.1.0
Units	kW		
Comm object	19066	Related applications	MINT
Description			
This value contains actual load reserve of Source which has <b>ICC Address</b> = 15.			

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### Source 16 Power

Value group	Sources	Related FW	2.1.0
Units	kW		
Comm object	10950	Related applications	MINT
Description			
This value contains actual active power of Source which has <b>ICC Address</b> = 16.			

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### Source 16 Load Reserve

Value group	Sources	Related FW	2.1.0
Units	kW		
Comm object	19067	Related applications	MINT
Description			
This value contains actual load reserve of Source which has <b>ICC Address</b> = 16.			

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### Source 17 Power

Value group	Sources	Related FW	2.1.0
Units	kW		
Comm object	10951	Related applications	MINT
Description			
This value contains actual active power of Source which has <b>ICC Address</b> = 17.			

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### Source 17 Load Reserve

Value group	Sources	Related FW	2.1.0
Units	kW		
Comm object	19068	Related applications	MINT
Description			
This value contains actual load reserve of Source which has <b>ICC Address</b> = 17.			

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### Source 18 Power

Value group	Sources	Related FW	2.1.0
Units	kW		
Comm object	10952	Related applications	MINT
Description			
This value contains actual active power of Source which has <b>ICC Address</b> = 18.			

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### Source 18 Load Reserve

Value group	Sources	Related FW	2.1.0
Units	kW		
Comm object	19069	Related applications	MINT
Description			
This value contains actual load reserve of Source which has <b>ICC Address</b> = 18.			

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### Source 19 Power

Value group	Sources	Related FW	2.1.0
Units	kW		
Comm object	10953	Related applications	MINT
Description			
This value contains actual active power of Source which has <b>ICC Address</b> = 19.			

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### Source 19 Load Reserve

Value group	Sources	Related FW	2.1.0
Units	kW		
Comm object	19070	Related applications	MINT
Description			
This value contains actual load reserve of Source which has <b>ICC Address</b> = 19.			

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### Source 20 Power

Value group	Sources	Related FW	2.1.0
Units	kW		
Comm object	10954	Related applications	MINT
Description			
This value contains actual active power of Source which has <b>ICC Address</b> = 20.			

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### Source 20 Load Reserve

Value group	Sources	Related FW	2.1.0
Units	kW		
Comm object	19071	Related applications	MINT
Description			
This value contains actual load reserve of Source which has <b>ICC Address</b> = 20.			

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### Source 21 Power

Value group	Sources	Related FW	2.1.0
Units	kW		
Comm object	10955	Related applications	MINT
Description			
This value contains actual active power of Source which has <b>ICC Address</b> = 21.			

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### Source 21 Load Reserve

Value group	Sources	Related FW	2.1.0
Units	kW		
Comm object	19072	Related applications	MINT
Description			
This value contains actual load reserve of Source which has <b>ICC Address</b> = 21.			

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### Source 22 Power

Value group	Sources	Related FW	2.1.0
Units	kW		
Comm object	10956	Related applications	MINT
Description			
This value contains actual active power of Source which has <b>ICC Address</b> = 22.			

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### Source 22 Load Reserve

Value group	Sources	Related FW	2.1.0
Units	kW		
Comm object	19073	Related applications	MINT
Description			
This value contains actual load reserve of Source which has <b>ICC Address</b> = 22.			

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### Source 23 Power

Value group	Sources	Related FW	2.1.0
Units	kW		
Comm object	10957	Related applications	MINT
Description			
This value contains actual active power of Source which has <b>ICC Address</b> = 23.			

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### Source 23 Load Reserve

Value group	Sources	Related FW	2.1.0
Units	kW		
Comm object	19074	Related applications	MINT
Description			
This value contains actual load reserve of Source which has <b>ICC Address</b> = 23.			

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### Source 24 Power

Value group	Sources	Related FW	2.1.0
Units	kW		
Comm object	10958	Related applications	MINT
Description			
This value contains actual active power of Source which has <b>ICC Address</b> = 24.			

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### Source 24 Load Reserve

Value group	Sources	Related FW	2.1.0
Units	kW		
Comm object	19075	Related applications	MINT
Description			
This value contains actual load reserve of Source which has <b>ICC Address</b> = 24.			

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### Source 25 Power

Value group	Sources	Related FW	2.1.0
Units	kW		
Comm object	10959	Related applications	MINT
Description			
This value contains actual active power of Source which has <b>ICC Address</b> = 25.			

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### Source 25 Load Reserve

Value group	Sources	Related FW	2.1.0
Units	kW		
Comm object	19076	Related applications	MINT
Description			
This value contains actual load reserve of Source which has <b>ICC Address</b> = 25.			

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### Source 26 Power

Value group	Sources	Related FW	2.1.0
Units	kW		
Comm object	10960	Related applications	MINT
Description			
This value contains actual active power of Source which has <b>ICC Address</b> = 26.			

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### Source 26 Load Reserve

Value group	Sources	Related FW	2.1.0
Units	kW		
Comm object	19077	Related applications	MINT
Description			
This value contains actual load reserve of Source which has <b>ICC Address</b> = 26.			

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### Source 27 Power

Value group	Sources	Related FW	2.1.0
Units	kW		
Comm object	10961	Related applications	MINT
Description			
This value contains actual active power of Source which has <b>ICC Address</b> = 27.			

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### Source 27 Load Reserve

Value group	Sources	Related FW	2.1.0
Units	kW		
Comm object	19078	Related applications	MINT
Description			
This value contains actual load reserve of Source which has <b>ICC Address</b> = 27.			

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### Source 28 Power

Value group	Sources	Related FW	2.1.0
Units	kW		
Comm object	10962	Related applications	MINT
Description			
This value contains actual active power of Source which has <b>ICC Address</b> = 28.			

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### Source 28 Load Reserve

Value group	Sources	Related FW	2.1.0
Units	kW		
Comm object	19079	Related applications	MINT
Description			
This value contains actual load reserve of Source which has <b>ICC Address</b> = 28.			

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### Source 29 Power

Value group	Sources	Related FW	2.1.0
Units	kW		
Comm object	10963	Related applications	MINT
Description			
This value contains actual active power of Source which has <b>ICC Address</b> = 29.			

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### Source 29 Load Reserve

Value group	Sources	Related FW	2.1.0
Units	kW		
Comm object	19080	Related applications	MINT
Description			
This value contains actual load reserve of Source which has <b>ICC Address</b> = 29.			

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### Source 30 Power

Value group	Sources	Related FW	2.1.0
Units	kW		
Comm object	10964	Related applications	MINT
Description			
This value contains actual active power of Source which has <b>ICC Address</b> = 30.			

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### Source 30 Load Reserve

Value group	Sources	Related FW	2.1.0
Units	kW		
Comm object	19081	Related applications	MINT
Description			
This value contains actual load reserve of Source which has <b>ICC Address</b> = 30.			

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### Source 31 Power

Value group	Sources	Related FW	2.1.0
Units	kW		
Comm object	10965	Related applications	MINT
Description			
This value contains actual active power of Source which has <b>ICC Address</b> = 31.			

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### Source 31 Load Reserve

Value group	Sources	Related FW	2.1.0
Units	kW		
Comm object	19082	Related applications	MINT
Description			
This value contains actual load reserve of Source which has <b>ICC Address</b> = 31.			

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### Source 32 Power

Value group	Sources	Related FW	2.1.0
Units	kW		
Comm object	10966	Related applications	MINT
Description			
This value contains actual active power of Source which has <b>ICC Address</b> = 32.			

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### Source 32 Load Reserve

Value group	Sources	Related FW	2.1.0
Units	kW		
Comm object	19083	Related applications	MINT
Description			
This value contains actual load reserve of Source which has ICC Address = 32.			

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### Group: Bus

#### Mains/Bus Frequency

Value group	Mains/Bus	Related FW	2.1.0
Units	Hz		
Comm object	20800	Related applications	MINT
Description			
Frequency of Mains/Bus.			

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#### Mains/Bus Voltage L1-N

Value group	Value Group Mains/Bus	Related FW	2.1.0
Units	V		
Comm object	8195	Related applications	MINT
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	2.1.0
Units	V		
Comm object	8196	Related applications	MINT
Description			
Value of Mains/Bus voltage on phase 2.			

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### Mains/Bus Voltage L3-N

<b>Value group</b>	Value Group Mains/Bus	<b>Related FW</b>	2.1.0
<b>Units</b>	V		
<b>Comm object</b>	8197	<b>Related applications</b>	MINT
<b>Description</b>			
Value of Mains/Bus voltage on phase 3.			

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### Mains/Bus Voltage L1-L2

<b>Value group</b>	Mains/Bus	<b>Related FW</b>	2.1.0
<b>Units</b>	V		
<b>Comm object</b>	9631	<b>Related applications</b>	MINT
<b>Description</b>			
Value of Mains/Bus phase to phase voltage between L1 and L2 phases.			

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### Mains/Bus Voltage L2-L3

<b>Value group</b>	Mains/Bus	<b>Related FW</b>	2.1.0
<b>Units</b>	V		
<b>Comm object</b>	9632	<b>Related applications</b>	MINT
<b>Description</b>			
Value of Mains/Bus phase to phase voltage between L2 and L3 phases.			

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### Mains/Bus Voltage L3-L1

<b>Value group</b>	Mains/Bus	<b>Related FW</b>	2.1.0
<b>Units</b>	V		
<b>Comm object</b>	9633	<b>Related applications</b>	MINT
<b>Description</b>			
Value of Mains/Bus phase to phase voltage between L3 and L1 phases.			

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### Mains/Bus Voltage

<b>Value group</b>	Mains/Bus	<b>Related FW</b>	2.1.0
<b>Units</b>	V		
<b>Comm object</b>	10666	<b>Related applications</b>	MINT
<b>Description</b>			
Average value of all Mains/BusVoltage phases.			

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## Mains/Bus V Unbalance Ph-N

Value group	Value Group Mains/Bus	Related FW	2.1.0
Units	V		
Comm object	10549	Related applications	MINT
<b>Description</b>			
This value contains the maximum difference of values <b>Mains/Bus Voltage L1-N, Mains/Bus Voltage L2-N, Mains/Bus Voltage L3-N</b> at a given moment.			
<i><b>Note:</b> Difference of the values and the evaluation of the protection is influenced by the setpoint Connection type.</i>			

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## Mains/Bus V Unbalance Ph-Ph

Value group	Mains/Bus	Related FW	2.1.0
Units	V		
Comm object	17337	Related applications	MINT
<b>Description</b>			
This value contains the maximum difference of values <b>Mains/Bus Voltage L1-L2, Mains/Bus Voltage L2-L3, Mains/Bus Voltage L3-L1</b> at a given moment.			
<i><b>Note:</b> Difference of the values and the evaluation of the protection is influenced by the setpoint Connection type.</i>			

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## Bus Voltage

Value group	Mains/Bus	Related FW	2.1.0
Units	V		
Comm object	16615	Related applications	MINT
<b>Description</b>			
Value of Bus Voltage voltage measured by <b>Symmetrical components</b>			

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## Bus Voltage Relative

Value group	Mains/Bus	Related FW	2.1.0
Units	%		
Comm object	16616	Related applications	MINT
<b>Description</b>			
Value of Bus Voltage Relative voltage measured by <b>Symmetrical components</b> which is related to <b>Mains/Bus Nominal Voltage Ph-N</b> or <b>Bus Nominal Voltage Ph-Ph</b> .			

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## Max Vector Shift

Value group	Mains/Bus	Related FW	2.1.0
Units	°		
Comm object	9847	Related applications	MINT
<b>Description</b>			
Maximal measured value of <b>Vector shift</b> of the Mains. It is reset to zero always when: <ul style="list-style-type: none"> <li>&gt; <b>Vector Shift Protection</b> = Parallel Only - controller goes to parallel to Mains operation</li> <li>&gt; <b>Vector Shift Protection</b> = Enabled - MCB gets closed</li> </ul>			

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## ROCOF1

Value group	Mains/Bus	Related FW	2.1.0
Units	Hz/s		
Comm object	9848	Related applications	MINT
<b>Description</b>			
This value contains actual rate of change of frequency measured by <b>ROCOF1 Protection</b> . See <b>ROCOF</b> for more information.			

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## Max ROCOF1

Value group	Mains/Bus	Related FW	2.1.0
Units	Hz/s		
Comm object	10049	Related applications	MINT
<b>Description</b>			
This value contains maximal rate of change of frequency measured by <b>ROCOF1 Protection</b> since the protection got active. See <b>ROCOF</b> for more information.			
<b>Setting</b>		<b>Reset of value</b>	
<b>ROCOF1 Protection</b> = Enabled		When MCB closes.	
		When BCB closes.	
<b>ROCOF1 Protection</b> = Parallel Only		After entering parallel operation ( <b>Breaker state</b> = ParalOper)	

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## ROCOF2

Value group	Mains/Bus	Related FW	2.1.0
Units	Hz/s		
Comm object	16153	Related applications	MINT
<b>Description</b>			
This value contains actual rate of change of frequency measured by <b>ROCOF2 Protection</b> . See <b>ROCOF</b> for more information.			

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## Max ROCOF2

Value group	Mains/Bus	Related FW	2.1.0
Units	Hz/s		
Comm object	16163	Related applications	MINT
Description			
This value contains maximal rate of change of frequency measured by <b>ROCOF2 Protection</b> since the protection got active.			
See <b>ROCOF</b> for more information.			
Setting		Reset of value	
ROCOF2 Protection = Enabled		When MCB closes.	
		When BCB closes.	
ROCOF2 Protection = Parallel Only		After entering parallel operation ( <b>Breaker state</b> = ParalOper)	

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## ROCOF3

Value group	Mains/Bus	Related FW	2.1.0
Units	Hz/s		
Comm object	16154	Related applications	MINT
<b>Description</b>			
This value contains actual rate of change of frequency measured by <b>ROCOF3 Protection</b> . See <b>ROCOF</b> for more information.			

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## Max ROCOF3

Value group	Mains/Bus	Related FW	2.1.0
Units	Hz/s		
Comm object	16164	Related applications	MINT
<b>Description</b>			
This value contains maximal rate of change of frequency measured by <b>ROCOF3 Protection</b> since the protection got active. See <b>ROCOF</b> for more information.			
<b>Setting</b>		<b>Reset of value</b>	
<b>ROCOF3 Protection</b> = Enabled		When MCB closes.	
		When BCB closes.	
<b>ROCOF3 Protection</b> = Parallel Only		After entering parallel operation ( <b>Breaker state</b> = ParalOper)	

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## ROCOF4

Value group	Mains/Bus	Related FW	2.1.0
Units	Hz/s		
Comm object	16155	Related applications	MINT
<b>Description</b>			
This value contains actual rate of change of frequency measured by <b>ROCOF4 Protection</b> . See <b>ROCOF</b> for more information.			

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## Max ROCOF4

Value group	Mains/Bus	Related FW	2.1.0
Units	Hz/s		
Comm object	16165	Related applications	MINT
<b>Description</b>			
This value contains maximal rate of change of frequency measured by <b>ROCOF4 Protection</b> since the protection got active. See <b>ROCOF</b> for more information.			
<b>Setting</b>		<b>Reset of value</b>	
<b>ROCOF4 Protection</b> = Enabled		When MCB closes.	
		When BCB closes.	
<b>ROCOF4 Protection</b> = Parallel Only		After entering parallel operation ( <b>Breaker state</b> = ParalOper)	

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## Group: Power Management

### Actual Reserve

Value group	Power Management	Related FW	2.1.0
Units	kW		
Comm object	15805	Related applications	MINT
<b>Description</b>			
Actual absolute reserve in <b>Power Management</b> . 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 dispatchable 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	2.1.0
Units	kW		
Comm object	15806	Related applications	MINT
<b>Description</b>			
Required minimal <b>Actual Reserve</b> for starting of next unit in the <b>Power Management</b> . 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	2.1.0
Units	kW		
Comm object	15807	Related applications	MINT
<b>Description</b>			
Required maximal <b>Actual Reserve</b> for stopping of next unit in the <b>Power Management</b> .			

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### Dynamic Spinning Reserve

Value group	Power Management	Related FW	2.1.0
Units	kW		
Comm object	15673	Related applications	MINT
<b>Description</b>			
The value <b>Dynamic Spinning Reserve</b> is added to required load reserve given by setpoints <b>#Starting Load Reserve 1</b> and <b>#Stopping Load Reserve 1</b> (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	2.1.0
Units	kW		
Comm object	15674	Related applications	MINT
Description			
The value <b>Dynamic Spinning Reserve Offset</b> is added only to required stopping load reserve given by setpoints <b>#Stopping Load Reserve 1</b> (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	2.1.0
Units	%		
Comm object	10788	Related applications	MINT
Description			
Actual relative reserve in <b>Power Management</b> .			

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## Start Relative Reserve

Value group	Power Management	Related FW	2.1.0
Units	%		
Comm object	10786	Related applications	MINT
Description			
Required minimal <b>Actual Relative Reserve</b> for starting of next unit in the <b>Power Management</b> .			

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## Stop Relative Reserve

Value group	Power Management	Related FW	2.1.0
Units	%		
Comm object	10787	Related applications	MINT
Description			
Required maximal <b>Actual Relative Reserve</b> for stopping of next unit in the <b>Power Management</b> .			

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## Total Running P

Value group	Power Management	Related FW	2.1.0
Units	kW		
Comm object	10657	Related applications	MINT
Description			
Actual value of active power from all controllers running in <b>Power Management</b> .			

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## Total Running Q

Value group	Power Management	Related FW	2.1.0
Units	kVAr		
Comm object	10656	Related applications	MINT
Description			
Actual value of reactive power from all controllers running in <b>Power Management</b> .			

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## Running Nominal Power In PM

Value group	Power Management	Related FW	2.1.0
Units	kW		
Comm object	10999	Related applications	MINT
Description			
Actual nominal power of all running controllers on inter-controller CAN in <b>Power Management</b> .			

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## Running Nominal Power Of All

Value group	Power Management	Related FW	2.1.0
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	2.1.0
Units	kW		
Comm object	10998	Related applications	MINT
Description			
Available nominal power of all controllers on inter-controller CAN in <b>Power Management</b> .			

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## Minimal Running Nominal Power

Value group	Power Management	Related FW	2.1.0
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

Value group	Power Management	Related FW	2.1.0
Units	[-]		
Comm object	8974	Related applications	MINT
<b>Description</b> Required state of the Controllers with CAN address between 1 .. 32 in the actual power band of <b>Power Management</b> . <ul style="list-style-type: none"> <li>&gt; Log 0: Controller should be stopped</li> <li>&gt; Log 1: Controller should be running</li> </ul> <p><b>Note:</b> Actual power band = group of Controllers which should be running with actual load.</p> <p><b>Note:</b> Value is taken into account only if #Priority Auto Swap = Efficient.</p>			

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## Next Power Band

Value group	Power Management	Related FW	2.1.0
Units	-		
Comm object	8975	Related applications	MINT
<b>Description</b> Required state of the Gen-sets with CAN address between 1 .. 32 in the next power band of <b>Power Management</b> . <ul style="list-style-type: none"> <li>&gt; Log 0: Gen-set should be stopped if load is decreased</li> <li>&gt; Log 1: Gen-set should be started if load is increased</li> </ul> <p><b>Note:</b> Next power band = group of Gen-sets which should be running after load change.</p> <p><b>Note:</b> Value is taken into account only if #Priority Auto Swap = Efficient.</p>			

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## Gen P Min

Value group	Power ManagementGensets	Related FW	2.1.0
Units	%		
Comm object	17668	Related applications	MINT
<b>Description</b> 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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## Group: Frequency/Load Control

### BESS Required P Target

Value group	Frequency/Load Control	Related FW	2.1.0
Units	kW		
Comm object	8663	Related applications	MINT
<b>Description</b>			
This value shows required active power at the end of ramping. This value regulation limits set by values <b>ES Max Charging Power</b> or <b>ES Max Discharging Power</b> or <b>Nominal Power</b> .			

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### BESS Required P

Value group	Frequency/Load Control	Related FW	2.1.0
Units	kW		
Comm object	13105	Related applications	MINT
<b>Description</b>			
This value shows required active power relative to the ramping procedure i.e. required active power right now.			

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### HLC P Request

Value group	Load Control	Related FW	2.1.0
Units	% of <b>BESS Nominal power</b>		
Comm object	15900	Related applications	MINT
<b>Description</b>			
Relative value of requested power from HLC. For more information see <b>BESS Output Control</b> on page 250.			

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### Frequency Regulator Output

Value group	Frequency/Load Control	Related FW	2.1.0
Units	V		
Comm object	9052	Related applications	MINT
<b>Description</b>			
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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## PCS Frequency Request

<b>Value group</b>	Speed/Load Control	<b>Related FW</b>	2.1.0
<b>Units</b>	Hz		
<b>Comm object</b>	19446	<b>Related applications</b>	
<b>Description</b>			
Requested PCS frequency in Hz. Intended for BESS P control when operating in U-f control mode.			

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## PCS Frequency Offset Request

<b>Value group</b>	Speed/Load Control	<b>Related FW</b>	2.1.0
<b>Units</b>	Hz		
<b>Comm object</b>	19447	<b>Related applications</b>	
<b>Description</b>			
Relative value of requested power of the PCS. Intended for BESS P control when operating in U-f control mode. See chapter <b>BESS output control methods P-Q / U-f</b> . BESS output control methods P-Q / U-f.			

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## PCS P Request %

<b>Value group</b>	Speed/Load Control	<b>Related FW</b>	2.1.0
<b>Units</b>	%		
<b>Comm object</b>	19448	<b>Related applications</b>	
<b>Description</b>			
Relative request for PCS kW/Hz output in %. Intended for BESS P control when operating in U-f control mode. See chapter <b>BESS output control methods P-Q / U-f</b> . BESS output control methods P-Q / U-f			

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## Frequency Balancing Weight

Setpoint group	Speed/Load Control	Related FW	2.1.0
Range [units]	0.000 .. 10.000 [-]		
Default value	1.000	Force value	YES
Step	0.001		
Comm object	18574	Related applications	MINT
Config level	Standard		
Setpoint visibility	Always		
Description			
<p>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.</p> <p>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 <b>Frequency Balancing Weight</b>. 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.</p>			

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## Group: Voltage/PF Control

### BESS Required Q

Value group	Voltage/PF Control	Related FW	2.1.0
Units	kVAr		
Comm object	12877	Related applications	MINT
<b>Description</b>			
Required reactive power.			

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### BESS Required Qrel Lim

Value group	Voltage/PF Control	Related FW	2.1.0
Units	%		
Comm object	13169	Related applications	MINT
<b>Description</b>			
Required relative reactive power.			

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## HLC Q Request

Value group	Voltage/PF Control	Related FW	2.1.0
Units	%		
Comm object	15901	Related applications	MINT
<b>Description</b>			
Relative value of requested reactive power from HLC. For more information see <b>BESS Output Control</b> on page 250.			

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## BESS Required PF

Value group	Voltage/PF Control	Related FW	2.1.0
Units	[-]		
Comm object	16159	Related applications	MINT
<b>Description</b>			
Required Power Factor.			

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## BESS Required PF Character

Value group	Voltage/PF Control	Related FW	2.1.0
Units	[-]		
Comm object	9033	Related applications	MINT
<b>Description</b>			
Required Power Factor Character.			

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## Voltage Regulator Output

Value group	Voltage/PF Control	Related FW	2.1.0
Units	V		
Comm object	9053	Related applications	MINT
<b>Description</b>			
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	2.1.0
Units	%		
Comm object	14997	Related applications	MINT
<b>Description</b>			
This value contains the voltage control signal expressed in % for internal Voltage Request of internal Voltage Regulator.			

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## PCS Voltage Request

Value group	Voltage/PF Control	Related FW	2.1.0
Units	V		
Comm object	19443	Related applications	MINT
<b>Description</b>			
Requested PCS output Voltage in V. Intended for BESS Q/PF control when operating in U-f control mode. See chapter <b>BESS output control methods P-Q / U-f</b> . BESS output control methods P-Q / U-f			

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## PCS Voltage Offset Request

Value group	Voltage/PF Control	Related FW	2.1.0
Units	%		
Comm object	19444	Related applications	MINT
<b>Description</b>			
Requested offset from the PCS nominal output Voltage in V (positive or negative). Intended for BESS Q/PF control when operating in U-f control mode. See chapter <b>BESS output control methods P-Q / U-f</b> . BESS output control methods P-Q / U-f			

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## PCS Q Request %

Value group	Voltage/PF Control	Related FW	2.1.0
Units	%		
Comm object	19445	Related applications	MINT
<b>Description</b>			
Relative value of requested reactive power of the PCS.			

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## Voltage Balancing Weight

Setpoint group	Voltage/PF Control	Related FW	2.1.0
Range [units]	0.000 .. 10.000 [-]		
Default value	1.000	Force value	YES
Step	0.001		
Comm object	18573	Related applications	MINT
Config level	Standard		
Setpoint visibility	Always		
Description			
<p>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.</p> <p>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 "<b>Voltage Balancing Weight</b>". 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.</p>			

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## Group: User Buttons

### User Buttons 1-32

<b>Value group</b>	User Buttons	<b>Related FW</b>	2.1.0
<b>Units</b>	[-]		
<b>Comm object</b>	20743	<b>Related applications</b>	MINT
<b>Description</b>			
State of <b>User Buttons</b> .			
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			

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## Group: Controller I/O

### Battery Voltage

<b>Value group</b>	Controller I/O	<b>Related FW</b>	2.1.0
<b>Units</b>	V		
<b>Comm object</b>	8213	<b>Related applications</b>	MINT
<b>Description</b>			
Controller's supply voltage.			

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## D+

<b>Value group</b>	Controller I/O	<b>Related FW</b>	2.1.0
<b>Units</b>	V		
<b>Comm object</b>	10603	<b>Related applications</b>	MINT
<b>Description</b>			
D+ terminal voltage.			

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## CU-AIN-01

<b>Value group</b>	Controller I/O	<b>Related FW</b>	2.1.0
<b>Units</b>	Configurable		
<b>Comm object</b>	9151	<b>Related applications</b>	MINT
<b>Description</b>			
This is the value of the analog input 1 of the controller.			

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## CU-AIN-02

<b>Value group</b>	Controller I/O	<b>Related FW</b>	2.1.0
<b>Units</b>	Configurable		
<b>Comm object</b>	9152	<b>Related applications</b>	MINT
<b>Description</b>			
This is the value of the analog input 2 of the controller.			

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## CU-AIN-03

<b>Value group</b>	Controller I/O	<b>Related FW</b>	2.1.0
<b>Units</b>	Configurable		
<b>Comm object</b>	9153	<b>Related applications</b>	MINT
<b>Description</b>			
This is the value of the analog input 3 of the controller.			

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## CU-AIN-04

<b>Value group</b>	Controller I/O	<b>Related FW</b>	2.1.0
<b>Units</b>	Configurable		
<b>Comm object</b>	9154	<b>Related applications</b>	MINT
<b>Description</b>			
This is the value of the analog input 4 of the controller.			

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## Binary Inputs

Value group	Controller I/O	Related FW	2.1.0
Units	[-]		
Comm object	8235	Related applications	MINT
<b>Description</b>			
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			
<b>Note:</b> 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	2.1.0
Units	[-]		
Comm object	15780	Related applications	MINT
<b>Description</b>			
Value of .			
➤ Log .1 - E-STOP has voltage - alarm <b>E-STOP</b> is inactive			
➤ Log .0 - E-STOP has no voltage - alarm <b>E-STOP</b> is active			

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## Binary Outputs

Value group	Controller I/O	Related FW	2.1.0
Units	[-]		
Comm object	8239	Related applications	MINT
<b>Description</b> <p>State of the binary outputs of the controller.</p> <p>01. CU-BOUT-01</p> <p>02. CU-BOUT-02</p> <p>03. CU-BOUT-03</p> <p>04. CU-BOUT-04</p> <p>05. CU-BOUT-05</p> <p>06. CU-BOUT-06</p> <p>07. CU-BOUT-07</p> <p>08. CU-BOUT-08</p> <p><b>Note:</b> Names are changed based on names of representative binary outputs.</p>			

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## Group: Statistics

### BESS Cycles

Value group	Statistics	Related FW	2.1.0
Units	[-]		
Comm object	20230	Related applications	MINT
<b>Description</b> <p>This statistical value shows the charging cycles of the BESS. It is incremented together with LAI <b>BESS CYCLES</b> which is the input for this value. For more information see <b>Daily BESS cycles control</b>.</p> <p><b>Note:</b> 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.</p>			

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## BESS Cycles Daily Evaluated

Value group	Statistics	Related FW	2.1.0
Units	[-]		
Comm object	17552	Related applications	MINT
<b>Description</b> <p>This statistical value shows the discharging cycles of the BESS that were done per day. It is incremented together with LAI <b>BESS CYCLES</b> which is the input for this value. For more information see <b>Daily BESS cycles control</b>.</p> <p><b>Note:</b> 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.</p> <p>The value BESS Cycles Daily Evaluated is reset to 0 at the change of time to the next day. (change occurs at 00:00) or with reset of the value BESS Cycles.</p> <p><b>Note:</b> It is expected that if the value BESS Cycles Daily Evaluated <math>\geq</math> setpoint <b>Max BESS Cycles Per Day</b> that the alarm <b>Daily Battery Cycles Reached</b> should be present in the alarm list until a new day appears. The evaluation of the alarm is from the value <b>BESS Cycles</b>.</p>			

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## BESS Discharge kWh

Value group	Statistics	Related FW	2.1.0
Units	kWh		
Comm object	15829	Related applications	MINT
<b>Description</b> <p>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.</p> <p><b>Note:</b> BESS statistics are based on reading the energy data directly from the BESS units. IntelliNeo does not support calculating BESS energy values by integrating the current active power of the BESS system over time.</p>			

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## BESS Discharge Annual kWh

Value group	Statistics	Related FW	2.1.0
Units	kWh		
Comm object	15830	Related applications	MINT
<b>Description</b> <p>Total energy discharged from the battery over the past year. The calculation is based on the value <b>BESS Discharge kWh</b>.</p>			

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## BESS Discharge Month kWh

Value group	Statistics	Related FW	2.1.0
Units	kWh		
Comm object	15831	Related applications	MINT
Description			
Total energy discharged from the battery during the current or selected month. The calculation is based on the value <b>BESS Discharge kWh</b> .			

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## BESS Discharge Week kWh

Value group	Statistics	Related FW	2.1.0
Units	kWh		
Comm object	15832	Related applications	MINT
Description			
Total energy discharged from the battery during the current or selected week. The calculation is based on the value <b>BESS Discharge kWh</b> .			

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## BESS Discharge Daily kWh

Value group	Statistics	Related FW	2.1.0
Units	kWh		
Comm object	15833	Related applications	MINT
Description			
Total energy discharged from the battery during the current or selected day. The calculation is based on the value <b>BESS Discharge kWh</b> .			

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## BESS Charge kWh

Value group	Statistics	Related FW	2.1.0
Units	kWh		
Comm object	15824	Related applications	MINT
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.			
<p><b>Note:</b> BESS statistics are based on reading the energy data directly from the BESS units. IntelliNeo does not support calculating BESS energy values by integrating the current active power of the BESS system over time.</p>			

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## BESS Charge Annual kWh

Value group	Statistics	Related FW	2.1.0
Units	kWh		
Comm object	15825	Related applications	MINT
<b>Description</b>			
Total energy charged into the battery over the past year. The calculation is based on the value <b>BESS Charge kWh</b> .			

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## BESS Charge Month kWh

Value group	Statistics	Related FW	2.1.0
Units	kWh		
Comm object	15826	Related applications	MINT
<b>Description</b>			
Total energy charged into the battery during the current or selected month. The calculation is based on the value <b>BESS Charge kWh</b> .			

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## BESS Charge Week kWh

Value group	Statistics	Related FW	2.1.0
Units	kWh		
Comm object	15827	Related applications	MINT
<b>Description</b>			
Total energy charged into the battery during the current or selected week. The calculation is based on the value <b>BESS Charge kWh</b> .			

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## BESS Charge Daily kWh

Value group	Statistics	Related FW	2.1.0
Units	kWh		
Comm object	15828	Related applications	MINT
<b>Description</b>			
Total energy charged into the battery during the current or selected day. The calculation is based on the value <b>BESS Charge kWh</b> .			

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## PCC kWh

Value group	Statistics	Related FW	2.1.0
Units	kWh		
Comm object	8205	Related applications	MINT
<b>Description</b>			
This statistical value is showing the total kWh produced by the BESS. The value is obtained by counting the active power ( <b>BESS P</b> ) of the BESS.			

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## PCC kVarh

Value group	Statistics	Related FW	2.1.0
Units	kVarh		
Comm object	8539	Related applications	MINT
<b>Description</b>			
This statistical value is showing the total kVarh produced by the BESS. The value is obtained by counting the reactive power ( <b>BESS Q</b> ) of the BESS.			

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## PCC kVAh

Value group	Statistics	Related FW	2.1.0
Units	kVAh		
Comm object	13663	Related applications	MINT
<b>Description</b>			
This statistical value is showing the total kVAh produced by the BESS. The value is obtained by counting the apparent power ( <b>BESS S</b> ) of the BESS.			

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## Running Hours

Value group	Statistics	Related FW	2.1.0
Units	hours		
Comm object	8206	Related applications	MINT
<b>Description</b>			
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 <b>Run Hours Source</b> .			

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## Num Starts

Value group	Statistics	Related FW	2.1.0
Units	[-]		
Comm object	8207	Related applications	MINT
<b>Description</b>			
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	2.1.0
Units	hours		
Comm object	11616	Related applications	MINT
<b>Description</b>			
Countdown running hours until next maintenance. Initial value can be set in <b>Maintenance Timer 1 RunHours</b> .			

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## Maintenance Timer 1 Interval

Value group	Statistics	Related FW	2.1.0
Units	hours		
Comm object	16387	Related applications	MINT
<b>Description</b>			
Countdown days until next maintenance. Initial value can be set in <b>Maintenance Timer 1 Interval</b> .			

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## Maintenance Timer 2 RunHours

Value group	Statistics	Related FW	2.1.0
Units	hours		
Comm object	11617	Related applications	MINT
<b>Description</b>			
Countdown running hours until next maintenance. Initial value can be set in <b>Maintenance Timer 2 RunHours</b> .			

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### Maintenance Timer 2 Interval

Value group	Statistics	Related FW	2.1.0
Units	hours		
Comm object	16388	Related applications	MINT
Description			
Countdown days until next maintenance. Initial value can be set in <b>Maintenance Timer 2 Interval</b> .			

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### Maintenance Timer 3 RunHours

Value group	Statistics	Related FW	2.1.0
Units	hours		
Comm object	11618	Related applications	MINT
Description			
Countdown running hours until next maintenance. Initial value can be set in <b>Maintenance Timer 3 RunHours</b> .			

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### Maintenance Timer 3 Interval

Value group	Statistics	Related FW	2.1.0
Units	hours		
Comm object	16389	Related applications	MINT
Description			
Countdown days until next maintenance. Initial value can be set in <b>Maintenance Timer 3 Interval</b> .			

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### Maintenance Timer 4 RunHours

Value group	Statistics	Related FW	2.1.0
Units	hours		
Comm object	11619	Related applications	MINT
Description			
Countdown running hours until next maintenance. Initial value can be set in <b>Maintenance Timer 4 RunHours</b> .			

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### Maintenance Timer 4 Interval

Value group	Statistics	Related FW	2.1.0
Units	hours		
Comm object	20288	Related applications	MINT
Description			
Countdown days until next maintenance. Initial value can be set in <b>Maintenance Timer 4 Interval</b> .			

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## Num E-Stops

Value group	Statistics	Related FW	2.1.0
Units	[-]		
Comm object	11195	Related applications	MINT
<b>Description</b>			
This value counts amount of BESS shutdowns which are triggered by <b>E-STOP</b> or <b>Emergency Stop</b> .			
<i><b>Note:</b> Value is incremented only if BESS was running during alarm activation.</i>			

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## Shutdowns

Value group	Statistics	Related FW	2.1.0
Units	[-]		
Comm object	11196	Related applications	MINT
<b>Description</b>			
This counter counts occurrences of a <b>Shutdown</b> alarm which actually shutdowns the BESS. If 2 shutdown alarms are received at the same time, this value is increased only by 1.			
<i><b>Note:</b> This value does not count occurrences of <b>E-STOP</b> and <b>Emergency Stop</b>. These are counted separately in <b>Num E-Stops</b>.</i>			

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## Group: Info

### Active Application

Value group	Info	Related FW	2.1.0
Units	[-]		
Comm object	14446	Related applications	MINT
<b>Description</b>			
This value reflects which application is used for the controller at the moment.			

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## Screen Mask

Value group	Info	Related FW	2.1.0
Units	[-]		
Comm object	20164	Related applications	MINT
<b>Description</b>			
This value consist of information about each type of source integrated by IntelliNeo. Most of the instruments in IV5.2 screens, in Inteli SCADA od screens of InteliConfig refers to this value.			

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## Controller Mode

Value group	Info	Related FW	2.1.0
Units	[-]		
Comm object	9887	Related applications	MINT
Description			
This value displays the setting of the setpoint <b>Controller Mode</b> .			

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## Load Shedding Status

Value group	Info	Related FW	2.1.0
Units	[-]		
Comm object	9591	Related applications	MINT
Description			
This value contains actual active highest stage of <b>Load shedding stages</b> . Value has range from 0 to 5, where 0 means no load shedding stage is active.			

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## BESS state

Value group	Info	Related FW	2.1.0
Units	[-]		
Comm object	9244	Related applications	MINT
Description			
This value contains actual BESS state message. For more information see <b>BESS state machine</b> .			

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## Breaker state

Value group	Info	Related FW	2.1.0
Units	[-]		
Comm object	9245	Related applications	MINT
Description			
This value contains actual breaker state message. For more information see <b>Electric state machine</b> .			

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## Timer Text

Value group	Info	Related FW	2.1.0
Units	[-]		
Comm object	10040	Related applications	MINT
<b>Description</b>			
This value contains actual timer text message. <ul style="list-style-type: none"><li>&gt; No Timer</li><li>&gt; ES Ready To Load</li><li>&gt; Stop Time</li><li>&gt; Precharging TO</li><li>&gt; Start Delay</li><li>&gt; SyncTOut</li><li>&gt; Unloading</li><li>&gt; Ready To Start</li><li>&gt; BESS Start TO</li><li>&gt; Soft Unld TO</li><li>&gt; MinStabTO</li><li>&gt; MaxStabTO</li><li>&gt; Next Start Del</li><li>&gt; Next Stop Del</li></ul>			

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## Connection Type

Value group	Info	Related FW	2.1.0
Units	[-]		
Comm object	12944	Related applications	MINT
<b>Description</b>			
This value contains name of currently selected connection type, which is adjusted via <b>Connection type</b> .			

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## SPI Module A

Value group	Info	Related FW	2.1.0
Units	[-]		
Comm object	14447	Related applications	MINT
<b>Description</b>			
Detected Plug-in module in the slot A.			

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## SPI Module B

Value group	Info	Related FW	2.1.0
Units	[-]		
Comm object	14448	Related applications	MINT
Description			
Detected Plug-in module in the slot B.			

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## Timer Value

Value group	Info	Related FW	2.1.0
Units	[MM:SS]		
Comm object	14147	Related applications	MINT
Description			
This value contains time of active timer which is counted down, name of the timer is in value <b>Timer Text</b> .			

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## ID String

Value group	Info	Related FW	2.1.0
Units	[-]		
Comm object	24501	Related applications	MINT
Description			
Name of controller which is used in IntelliConfig in command bar.			

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## FW Version

Value group	Info	Related FW	2.1.0
Units	[-]		
Comm object	24339	Related applications	MINT
Description			
Major and minor firmware version number.			

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## Application

Value group	Info	Related FW	2.1.0
Units	[-]		
Comm object	8480	Related applications	MINT
Description			
The value contains actual application in controller.			

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## FW Branch

Value group	Info	Related FW	2.1.0
Units	[-]		
Comm object	8707	Related applications	MINT
Description			
The value contains actual branch of firmware in controller.			

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## BESS State Machine

Value group	Info	Related FW	2.1.0
Units	[-]		
Comm object	19126	Related applications	MINT
Description			
This value show bits for each state in the internal BESS state machine.For more information see <b>Electric state machine</b> .			

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## Breaker State Machine

Value group	Info	Related FW	2.1.0
Units	[-]		
Comm object	19127	Related applications	MINT
Description			
This value show bits for each state in the internal breaker state machine.For more information see <b>Electric state machine</b> .			

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## BESS Info

Value group	Info	Related FW	2.1.0
Units	[-]		
Comm object	19131	Related applications	MINT
Description			
This value show general information about Battery Energy Storage System based on internal logic of controller unit. Bits of this value can be used for any PLC logic or 3rd party devices.			

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### PCS Info

Value group	Info	Related FW	2.1.0
Units	[-]		
Comm object	19128	Related applications	MINT
<b>Description</b>			
This value show information about Power Conversion System which is obtained from 3rd party devices via LBIs. Bits of this value can be used for any PLC logic or 3rd party devices.			

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### BMS Info

Value group	Info	Related FW	2.1.0
Units	[-]		
Comm object	19129	Related applications	MINT
<b>Description</b>			
This value show information about Battery Management System which is obtained from 3rd party devices via LBIs. Bits of this value can be used for any PLC logic or 3rd party devices.			

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### AUX Info

Value group	Info	Related FW	2.1.0
Units	[-]		
Comm object	19130	Related applications	MINT
<b>Description</b>			
This value show information about auxiliary systems such as HVAC, PSU, transformer, etc. which is obtained from 3rd party devices via LBIs. Bits of this value can be used for any PLC logic or 3rd party devices.			

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### Forced Value Status

Value group	Info	Related FW	2.1.0
Units	[-]		
Comm object	20544	Related applications	MINT
<b>Description</b>			
This value contains list of all 32 LBIs for <b>Forced Value</b> . Logical 1 means that the respective LBI is currently activated.			

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## SW Key Feature List

Value group	Info	Related FW	2.1.0
Units	[-]		
Comm object	20591	Related applications	MINT
<b>Description</b> <p>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.</p> <ol style="list-style-type: none"> <li>1. Multi BMS Control 8 BMS</li> </ol>			

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## CAN ICC Mode

Value group	Info	Related FW	2.1.0
Units	[-]		
Comm object	23969	Related applications	MINT
<b>Description</b> <p>This value contains actual mode of setpoint <b>CAN ICC Mode</b>.For more information see <b>CAN Intercontroller Communication</b>.</p> <p><b>Note:</b> In case that there is a mismatch between this value and setpoint <b>CAN ICC Mode</b>, alarm <b>ALI ICC Mode Inconsistency</b> is activated.</p>			

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## CAN ICC 16

Value group	Info	Related FW	2.1.0
Units	[-]		
Comm object	8546	Related applications	MINT
<b>Description</b> <p>This value contains binary information about controllers connected via <b>CAN2</b> and/or <b>Communication peripherals</b> with <b>ICC Address</b> = &lt;1,16&gt;. Each bit represent controller with the same CAN address as number of the bit.</p> <ul style="list-style-type: none"> <li>➤ Log. 1 - this controller receives messages from the controller with specific CAN address</li> <li>➤ Log. 0 - this controller does not receive messages from the controller with specific CAN address</li> </ul>			

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## CAN ICC 32

Value group	Info	Related FW	2.1.0
Units	[-]		
Comm object	8827	Related applications	MINT
<b>Description</b>			
This value contains binary information about controllers connected via <b>CAN2</b> and/or <b>Communication peripherals</b> with <b>ICC Address</b> = <17,32>. Each bit represent controller with the same CAN address as number of the bit.			
<ul style="list-style-type: none"><li>&gt; Log. 1 - this controller receives messages from the controller with specific CAN address</li><li>&gt; Log. 0 - this controller does not receive messages from the controller with specific CAN address</li></ul>			

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## Reg16

Value group	Info	Related FW	2.1.0
Units	[-]		
Comm object	11081	Related applications	MINT
<b>Description</b>			
This value contains binary information about controllers connected via <b>CAN2</b> and/or <b>Communication peripherals</b> with <b>ICC Address</b> = <1,16>. Each bit represent controller with the same CAN address as number of the bit.			
<ul style="list-style-type: none"><li>&gt; Log. 1 - controller with this CAN address is in the same group (is connected to the same bus).</li><li>&gt; Log. 0 - controller with this CAN address is <b>NOT</b> in the same group (is <b>NOT</b> connected to the same bus).</li></ul>			

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## Reg32

Value group	Info	Related FW	2.1.0
Units	[-]		
Comm object	11082	Related applications	MINT
<b>Description</b>			
This value contains binary information about controllers connected via <b>CAN2</b> and/or <b>Communication peripherals</b> with <b>ICC Address</b> = <17,32>. Each bit represent controller with the same CAN address as number of the bit.			
<ul style="list-style-type: none"><li>&gt; Log. 1 - controller with this CAN address is in the same group (is connected to the same bus).</li><li>&gt; Log. 0 - controller with this CAN address is <b>NOT</b> in the same group (is <b>NOT</b> connected to the same bus).</li></ul>			

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## Gen Loaded 16

Value group	Info	Related FW	2.1.0
Units	[-]		
Comm object	10196	Related applications	MINT
<b>Description</b>			
This value contains binary information about controllers connected via <b>CAN2</b> and/or <b>Communication peripherals</b> with <b>ICC Address</b> = <1,16>. Each bit represent controller with the same CAN address as number of the bit. <ul style="list-style-type: none"><li>&gt; Log. 1 - controller with this CAN address is currently loaded</li><li>&gt; Log. 0 - controller with this CAN address is currently not loaded</li></ul>			

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## Gen Loaded 32

Value group	Info	Related FW	2.1.0
Units	[-]		
Comm object	10197	Related applications	MINT
<b>Description</b>			
This value contains binary information about controllers connected via <b>CAN2</b> and/or <b>Communication peripherals</b> with <b>ICC Address</b> = <17,32>. Each bit represent controller with the same CAN address as number of the bit. <ul style="list-style-type: none"><li>&gt; Log. 1 - controller with this CAN address is currently loaded</li><li>&gt; Log. 0 - controller with this CAN address is currently not loaded</li></ul>			

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## Group: Log Bout

### Log Bout 1

Value group	Log Bout	Related FW	2.1.0
Units	[-]		
Comm object	9143	Related applications	MINT
<b>Description</b>			
State of binary outputs.			

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### Log Bout 2

Value group	Log Bout	Related FW	2.1.0
Units	[-]		
Comm object	9144	Related applications	MINT
<b>Description</b>			
State of binary outputs.			

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### Log Bout 3

<b>Value group</b>	Log Bout	<b>Related FW</b>	2.1.0
<b>Units</b>	[-]		
<b>Comm object</b>	9145	<b>Related applications</b>	MINT
<b>Description</b>			
State of binary outputs.			

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### Log Bout 4

<b>Value group</b>	Log Bout	<b>Related FW</b>	2.1.0
<b>Units</b>	[-]		
<b>Comm object</b>	9146	<b>Related applications</b>	MINT
<b>Description</b>			
State of binary outputs.			

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### Log Bout 5

<b>Value group</b>	Log Bout	<b>Related FW</b>	2.1.0
<b>Units</b>	[-]		
<b>Comm object</b>	9147	<b>Related applications</b>	MINT
<b>Description</b>			
State of binary outputs.			

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### Log Bout 6

<b>Value group</b>	Log Bout	<b>Related FW</b>	2.1.0
<b>Units</b>	[-]		
<b>Comm object</b>	9148	<b>Related applications</b>	MINT
<b>Description</b>			
State of binary outputs.			

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### Log Bout 7

<b>Value group</b>	Log Bout	<b>Related FW</b>	2.1.0
<b>Units</b>	[-]		
<b>Comm object</b>	9149	<b>Related applications</b>	MINT
<b>Description</b>			
State of binary outputs.			

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## Log Bout 8

<b>Value group</b>	Log Bout	<b>Related FW</b>	2.1.0
<b>Units</b>	[-]		
<b>Comm object</b>	9150	<b>Related applications</b>	MINT
<b>Description</b>			
State of binary outputs.			

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## Log Bout 9

<b>Value group</b>	Log Bout	<b>Related FW</b>	2.1.0
<b>Units</b>	[-]		
<b>Comm object</b>	11896	<b>Related applications</b>	MINT
<b>Description</b>			
State of binary outputs.			

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## Log Bout 10

<b>Value group</b>	Log Bout	<b>Related FW</b>	2.1.0
<b>Units</b>	[-]		
<b>Comm object</b>	11897	<b>Related applications</b>	MINT
<b>Description</b>			
State of binary outputs.			

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## Log Bout 11

<b>Value group</b>	Log Bout	<b>Related FW</b>	2.1.0
<b>Units</b>	[-]		
<b>Comm object</b>	11898	<b>Related applications</b>	MINT
<b>Description</b>			
State of binary outputs.			

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## Log Bout 12

<b>Value group</b>	Log Bout	<b>Related FW</b>	2.1.0
<b>Units</b>	[-]		
<b>Comm object</b>	11899	<b>Related applications</b>	MINT
<b>Description</b>			
State of binary outputs.			

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### Log Bout 13

<b>Value group</b>	Log Bout	<b>Related FW</b>	2.1.0
<b>Units</b>	[-]		
<b>Comm object</b>	11900	<b>Related applications</b>	MINT
<b>Description</b>			
State of binary outputs.			

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### Log Bout 14

<b>Value group</b>	Log Bout	<b>Related FW</b>	2.1.0
<b>Units</b>	[-]		
<b>Comm object</b>	11901	<b>Related applications</b>	MINT
<b>Description</b>			
State of binary outputs.			

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### Log Bout 15

<b>Value group</b>	Log Bout	<b>Related FW</b>	2.1.0
<b>Units</b>	[-]		
<b>Comm object</b>	11902	<b>Related applications</b>	MINT
<b>Description</b>			
State of binary outputs.			

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### Log Bout 16

<b>Value group</b>	Log Bout	<b>Related FW</b>	2.1.0
<b>Units</b>	[-]		
<b>Comm object</b>	11903	<b>Related applications</b>	MINT
<b>Description</b>			
State of binary outputs.			

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### Log Bout 18

<b>Value group</b>	Log Bout	<b>Related FW</b>	2.1.0
<b>Units</b>	[-]		
<b>Comm object</b>	16537	<b>Related applications</b>	MINT
<b>Description</b>			
State of binary outputs.			

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## Group: Scheduler

### Time

Setpoint group	Scheduler	Related FW	2.1.0
Range [units]	HH:MM:SS [-]		
Default value	0:0:0	Force value	NO
Step	[-]		
Comm object	24554	Related applications	MINT
Config level	Standard		
Setpoint visibility	Always		
Description			
Real time clock adjustment.			

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### Date

Setpoint group	Scheduler	Related FW	2.1.0
Range [units]	YYYY-MM-DD [-]		
Default value	2017-01-01	Force value	NO
Step	[-]		
Comm object	24553	Related applications	MINT
Config level	Standard		
Setpoint visibility	Always		
Description			
Actual date adjustment.			

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### Time Mode

<b>Value group</b>	Scheduler	<b>Related FW</b>	2.1.0
<b>Units</b>	[-]		
<b>Comm object</b>	20252	<b>Related applications</b>	MINT
<b>Description</b>			
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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### Real Sunrise Time

<b>Value group</b>	Scheduler	<b>Related FW</b>	2.1.0
<b>Units</b>	[hh:mm:ss]		
<b>Comm object</b>	20223	<b>Related applications</b>	MINT
<b>Description</b>			
This value indicates the time until sunrise.			

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### Real Sunset Time

<b>Value group</b>	Scheduler	<b>Related FW</b>	2.1.0
<b>Units</b>	[hh:mm:ss]		
<b>Comm object</b>	20221	<b>Related applications</b>	MINT
<b>Description</b>			
This value indicates the time until sunset.			

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### Time To Sunrise

<b>Value group</b>	Scheduler	<b>Related FW</b>	2.1.0
<b>Units</b>	[min]		
<b>Comm object</b>	19046	<b>Related applications</b>	MINT
<b>Description</b>			
This value shows remaining time until sunrise.			

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### Time To Sunset

<b>Value group</b>	Scheduler	<b>Related FW</b>	2.1.0
<b>Units</b>	[min]		
<b>Comm object</b>	19047	<b>Related applications</b>	MINT
<b>Description</b>			
This value shows remaining time until sunset.			

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### Exercise Timer 1

<b>Value group</b>	Scheduler	<b>Related FW</b>	2.1.0
<b>Units</b>	[hh:mm:ss]		
<b>Comm object</b>	19664	<b>Related applications</b>	MINT
<b>Description</b>			
Value for Exercise Timer 1.			

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### Exercise Timer 2

<b>Value group</b>	Scheduler	<b>Related FW</b>	2.1.0
<b>Units</b>	[hh:mm:ss]		
<b>Comm object</b>	19665	<b>Related applications</b>	MINT
<b>Description</b>			
Value for Exercise Timer 2.			

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### Exercise Timer 3

<b>Value group</b>	Scheduler	<b>Related FW</b>	2.1.0
<b>Units</b>	[hh:mm:ss]		
<b>Comm object</b>	19666	<b>Related applications</b>	MINT
<b>Description</b>			
Value for Exercise Timer 3.			

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### Exercise Timer 4

<b>Value group</b>	Scheduler	<b>Related FW</b>	2.1.0
<b>Units</b>	[hh:mm:ss]		
<b>Comm object</b>	19667	<b>Related applications</b>	MINT
<b>Description</b>			
Value for Exercise Timer 4.			

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### Exercise Timer 5

<b>Value group</b>	Scheduler	<b>Related FW</b>	2.1.0
<b>Units</b>	[hh:mm:ss]		
<b>Comm object</b>	19668	<b>Related applications</b>	MINT
<b>Description</b>			
Value for Exercise Timer 5.			

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### Exercise Timer 6

<b>Value group</b>	Scheduler	<b>Related FW</b>	2.1.0
<b>Units</b>	[hh:mm:ss]		
<b>Comm object</b>	19669	<b>Related applications</b>	MINT
<b>Description</b>			
Value for Exercise Timer 6.			

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### Group: CM-4G-GPS

#### Signal Strength

<b>Value group</b>	CM-4G-GPS	<b>Related FW</b>	2.1.0
<b>Units</b>	[%]		
<b>Comm object</b>	24302	<b>Related applications</b>	MINT
<b>Description</b>			
This value represents signal strenght in the percentage.			

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#### Network Status

<b>Value group</b>	CM-4G-GPS	<b>Related FW</b>	2.1.0
<b>Units</b>			
<b>Comm object</b>	23972	<b>Related applications</b>	MINT
<b>Description</b>			
Status of attachment into packet data network (status of PDP context).			

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### Network Name

<b>Value group</b>	CM-4G-GPS	<b>Related FW</b>	2.1.0
<b>Units</b>			
<b>Comm object</b>	24147	<b>Related applications</b>	MINT
<b>Description</b>			
Operator name or MCC-MNC code.			

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### Network Mode

<b>Value group</b>	CM-4G-GPS	<b>Related FW</b>	2.1.0
<b>Units</b>			
<b>Comm object</b>	24146	<b>Related applications</b>	MINT
<b>Description</b>			
Mode of the network (2G/3G/4G).			

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### Modem Status

<b>Value group</b>	CM-4G-GPS	<b>Related FW</b>	2.1.0
<b>Units</b>			
<b>Comm object</b>	24288	<b>Related applications</b>	MINT
<b>Description</b>			
The text of this value represents the status of the modem.			

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### IP Address

<b>Value group</b>	CM-4G-GPS	<b>Related FW</b>	2.1.0
<b>Units</b>			
<b>Comm object</b>	23971	<b>Related applications</b>	MINT
<b>Description</b>			
IP address of the module.			

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## Primary DNS

<b>Value group</b>	CM-4G-GPS	<b>Related FW</b>	2.1.0
<b>Units</b>			
<b>Comm object</b>	23984	<b>Related applications</b>	MINT
<b>Description</b>			
Address of the primary DNS.			

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## Secondary DNS

<b>Value group</b>	CM-4G-GPS	<b>Related FW</b>	2.1.0
<b>Units</b>			
<b>Comm object</b>	23983	<b>Related applications</b>	MINT
<b>Description</b>			
Address of the secondary DNS.			

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## Last E-mail Result

<b>Value group</b>	CM-4G-GPS	<b>Related FW</b>	2.1.0
<b>Units</b>			
<b>Comm object</b>	24307	<b>Related applications</b>	MINT
<b>Description</b>			
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).		

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## GPS Status

<b>Value group</b>	CM-4G-GPS	<b>Related FW</b>	2.1.0								
<b>Units</b>											
<b>Comm object</b>	23973	<b>Related applications</b>	MINT								
<b>Description</b>											
Value describing the GPS signal status.											
<table><tr><th>Code</th><th>Description</th></tr><tr><td>Undefined</td><td>GPS signal is not available. Check antenna connection.</td></tr><tr><td>Searching</td><td>Looking up for signal from available satellites.</td></tr><tr><td>Fixed</td><td>GPS signal available.</td></tr></table>				Code	Description	Undefined	GPS signal is not available. Check antenna connection.	Searching	Looking up for signal from available satellites.	Fixed	GPS signal available.
Code	Description										
Undefined	GPS signal is not available. Check antenna connection.										
Searching	Looking up for signal from available satellites.										
Fixed	GPS signal available.										

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## Latitude

<b>Value group</b>	CM-4G-GPS	<b>Related FW</b>	2.1.0
<b>Units</b>			
<b>Comm object</b>	24268	<b>Related applications</b>	MINT
<b>Description</b>			
Actual GPS latitude. Positions on north hemisphere have positive value, position on south hemisphere have negative value.			

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## Longitude

<b>Value group</b>	CM-4G-GPS	<b>Related FW</b>	2.1.0
<b>Units</b>			
<b>Comm object</b>	24267	<b>Related applications</b>	MINT
<b>Description</b>			
Actual GPS longitude. Positions on east hemisphere have positive value, position on west hemisphere have negative value.			

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## HomePosDist

<b>Value group</b>	CM-4G-GPS	<b>Related FW</b>	2.1.0
<b>Units</b>			
<b>Comm object</b>	11680	<b>Related applications</b>	MINT
<b>Description</b>			
Actual distance from home position. Home position is adjusted via setpoints <b>Home Latitude</b> and <b>Home Longitude</b> or by binary input <b>GEO HOME POSITION</b> .			

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## Active Satellites

<b>Value group</b>	CM-4G-GPS	<b>Related FW</b>	2.1.0
<b>Units</b>			
<b>Comm object</b>	24265	<b>Related applications</b>	MINT
<b>Description</b>			
Number of available satellites for GPS location.			

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## Speed

<b>Value group</b>	CM-4G-GPS	<b>Related FW</b>	2.1.0
<b>Units</b>			
<b>Comm object</b>	24264	<b>Related applications</b>	MINT
<b>Description</b>			
Actual speed of the controller calculated from the GPS coordinates.			

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## AirGate ID

<b>Value group</b>	CM-4G-GPS	<b>Related FW</b>	2.1.0
<b>Units</b>			
<b>Comm object</b>	24309	<b>Related applications</b>	MINT
<b>Description</b>			
Identification string generated by AirGate server for the purpose of establishing communication via IntelliConfig or any other supported PC tool.			

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### AirGate Status

<b>Value group</b>	CM-4G-GPS	<b>Related FW</b>	2.1.0
<b>Units</b>			
<b>Comm object</b>	23967	<b>Related applications</b>	MINT
<b>Description</b>			
Diagnostic code for AirGate connection. Helps in troubleshooting.			

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### AirGate Servicing Node

<b>Value group</b>	CM-4G-GPS	<b>Related FW</b>	2.1.0
<b>Units</b>			
<b>Comm object</b>	23991	<b>Related applications</b>	MINT
<b>Description</b>			
IP address of AirGate 2 node to which the module is currently attached.			

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### Modem FW Version

<b>Value group</b>	CM-4G-GPS	<b>Related FW</b>	2.1.0
<b>Units</b>			
<b>Comm object</b>	24149	<b>Related applications</b>	MINT
<b>Description</b>			
FW Version of the modem.			

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### Group: CM-Ethernet

### ETH Interface Status

<b>Value group</b>	CM-Ethernet	<b>Related FW</b>	2.1.0
<b>Units</b>			
<b>Comm object</b>	23924	<b>Related applications</b>	MINT
<b>Description</b>			
Description.			

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### Current IP Address

<b>Value group</b>	CM-Ethernet	<b>Related FW</b>	2.1.0
<b>Units</b>			
<b>Comm object</b>	23931	<b>Related applications</b>	MINT
<b>Description</b>			
Description.			

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### Current Subnet Mask

<b>Value group</b>	CM-Ethernet	<b>Related FW</b>	2.1.0
<b>Units</b>			
<b>Comm object</b>	23930	<b>Related applications</b>	MINT
<b>Description</b>			
Description.			

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### Current Gateway

<b>Value group</b>	CM-Ethernet	<b>Related FW</b>	2.1.0
<b>Units</b>			
<b>Comm object</b>	23929	<b>Related applications</b>	MINT
<b>Description</b>			
Description.			

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### Primary DNS

<b>Value group</b>	CM-Ethernet	<b>Related FW</b>	2.1.0
<b>Units</b>			
<b>Comm object</b>	23928	<b>Related applications</b>	MINT
<b>Description</b>			
Description.			

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## Secondary DNS

<b>Value group</b>	CM-Ethernet	<b>Related FW</b>	2.1.0
<b>Units</b>			
<b>Comm object</b>	23927	<b>Related applications</b>	MINT
<b>Description</b>			
Description.			

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## AirGate ID

<b>Value group</b>	CM-Ethernet	<b>Related FW</b>	2.1.0
<b>Units</b>			
<b>Comm object</b>	23926	<b>Related applications</b>	MINT
<b>Description</b>			
Description.			

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## AirGate Status

<b>Value group</b>	CM-Ethernet	<b>Related FW</b>	2.1.0
<b>Units</b>			
<b>Comm object</b>	23910	<b>Related applications</b>	MINT
<b>Description</b>			
Description.			

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## AirGate Servicing Node

<b>Value group</b>	CM-Ethernet	<b>Related FW</b>	2.1.0
<b>Units</b>			
<b>Comm object</b>	23915	<b>Related applications</b>	MINT
<b>Description</b>			
Description.			

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### Last E-mail Result

<b>Value group</b>	CM-Ethernet	<b>Related FW</b>	2.1.0
<b>Units</b>			
<b>Comm object</b>	23925	<b>Related applications</b>	MINT
<b>Description</b>			
Description.			

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### MAC Address

<b>Value group</b>	CM-Ethernet	<b>Related FW</b>	2.1.0
<b>Units</b>			
<b>Comm object</b>	23932	<b>Related applications</b>	MINT
<b>Description</b>			
Description.			

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### Ethernet PHY mode

<b>Value group</b>	CM-Ethernet	<b>Related FW</b>	2.1.0
<b>Units</b>			
<b>Comm object</b>	23916	<b>Related applications</b>	MINT
<b>Description</b>			
Description.			

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## Group: Ethernet

### AirGate Status

Value group	Ethernet	Related FW	2.1.0
Units	[-]		
Comm object	24007	Related applications	MINT
Description			
Diagnostic code for AirGate connection. Helps with troubleshooting.			
<b>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.</b>			
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 establish TCP link to the node.	
4	Creating secure channel	Encrypted channel is being negotiated.	
5	Registration	Encrypted channel has been established.	
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	2.1.0
Units	[-]		
Comm object	24345	Related applications	MINT
<b>Description</b>			
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	2.1.0
Units	[-]		
Comm object	24010	Related applications	MINT
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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## MAC Address

Value group	Ethernet	Related FW	2.1.0
Units	[-]		
Comm object	24333	Related applications	MINT
Description			
MAC address of the controller's untrusted interface.			
MAC address of the controller's ethernet interface.			

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## ETH Port 2 StatusEthernet PHY modeETH Port 3 Status

Value group	Ethernet	Related FW	2.1.0										
Units	[-]												
Comm object	24088	Related applications	MINT										
Description													
This value reflects what communication mode is used on the Ethernet Port 2.													
<table><tr><td>Link Down</td><td>There is no connected cable to the Ethernet Port (socket) or the cable is broken.</td></tr><tr><td>10- HD</td><td>10 Mbit Half-Duplex</td></tr><tr><td>10- FD</td><td>10 Mbit Full-Duplex</td></tr><tr><td>100- HD</td><td>100 Mbit Half-Duplex</td></tr><tr><td>100- FD</td><td>100 Mbit Full-Duplex</td></tr></table>				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
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												
<b>Note:</b> 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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### Current IP Address

Value group	Ethernet	Related FW	2.1.0
Units	[-]		
Comm object	24184	Related applications	MINT
Description			
Current IP address of the <b>Ethernet</b> interface.			

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### Current Subnet Mask

Value group	Ethernet	Related FW	2.1.0
Units	[-]		
Comm object	24183	Related applications	MINT
Description			
Current subnet mask of the <b>Ethernet</b> interface.			

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### Current Gateway

Value group	Ethernet	Related FW	2.1.0
Units	[-]		
Comm object	24182	Related applications	MINT
Description			
Current IP gateway address of the <b>Ethernet</b> communications.			

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### Primary DNS

Value group	Ethernet	Related FW	2.1.0
Units	[-]		
Comm object	24181	Related applications	MINT
Description			
Current domain name server of the <b>Ethernet</b> interface.			

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### Secondary DNS

Value group	Ethernet	Related FW	2.1.0
Units	[-]		
Comm object	24100	Related applications	MINT
Description			
Backup domain name server of the <b>Ethernet</b> interface.			

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**ETH Interface Status**

Value group	Ethernet	Related FW	2.1.0
Units	[-]		
Comm object	24180	Related applications	MINT
Description			
Current status of the <b>Ethernet</b> communication.			

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## Last E-mail Result

<b>Value group</b>	Ethernet	<b>Related FW</b>	2.1.0
<b>Units</b>	[-]		
<b>Comm object</b>	24332	<b>Related applications</b>	MINT
<b>Description</b>			
Result of last email, which was sent by controller.			
<b>Code</b>	<b>Description</b>		
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.

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## Group: PLC

### PLC-AOUT 1

<b>Value group</b>	PLC	<b>Related FW</b>	2.1.0
<b>Units</b>	[-]		
<b>Comm object</b>	21248	<b>Related applications</b>	MINT
<b>Description</b>			
State of analog output of PLC.			

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### PLC-AOUT 2

<b>Value group</b>	PLC	<b>Related FW</b>	2.1.0
<b>Units</b>	[-]		
<b>Comm object</b>	21249	<b>Related applications</b>	MINT
<b>Description</b>			
State of analog output of PLC.			

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### PLC-AOUT 3

<b>Value group</b>	PLC	<b>Related FW</b>	2.1.0
<b>Units</b>	[-]		
<b>Comm object</b>	21250	<b>Related applications</b>	MINT
<b>Description</b>			
State of analog output of PLC.			

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### PLC-AOUT 4

<b>Value group</b>	PLC	<b>Related FW</b>	2.1.0
<b>Units</b>	[-]		
<b>Comm object</b>	21251	<b>Related applications</b>	MINT
<b>Description</b>			
State of analog output of PLC.			

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### PLC-AOUT 5

<b>Value group</b>	PLC	<b>Related FW</b>	2.1.0
<b>Units</b>	[-]		
<b>Comm object</b>	21252	<b>Related applications</b>	MINT
<b>Description</b>			
State of analog output of PLC.			

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### PLC-AOUT 6

<b>Value group</b>	PLC	<b>Related FW</b>	2.1.0
<b>Units</b>	[-]		
<b>Comm object</b>	21253	<b>Related applications</b>	MINT
<b>Description</b>			
State of analog output of PLC.			

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### PLC-AOUT 7

<b>Value group</b>	PLC	<b>Related FW</b>	2.1.0
<b>Units</b>	[-]		
<b>Comm object</b>	21254	<b>Related applications</b>	MINT
<b>Description</b>			
State of analog output of PLC.			

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### PLC-AOUT 8

<b>Value group</b>	PLC	<b>Related FW</b>	2.1.0
<b>Units</b>	[-]		
<b>Comm object</b>	21255	<b>Related applications</b>	MINT
<b>Description</b>			
State of analog output of PLC.			

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### PLC-AOUT 9

<b>Value group</b>	PLC	<b>Related FW</b>	2.1.0
<b>Units</b>	[-]		
<b>Comm object</b>	21256	<b>Related applications</b>	MINT
<b>Description</b>			
State of analog output of PLC.			

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### PLC-AOUT 10

<b>Value group</b>	PLC	<b>Related FW</b>	2.1.0
<b>Units</b>	[-]		
<b>Comm object</b>	21257	<b>Related applications</b>	MINT
<b>Description</b>			
State of analog output of PLC.			

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### PLC-AOUT 11

<b>Value group</b>	PLC	<b>Related FW</b>	2.1.0
<b>Units</b>	[-]		
<b>Comm object</b>	21258	<b>Related applications</b>	MINT
<b>Description</b>			
State of analog output of PLC.			

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### PLC-AOUT 12

<b>Value group</b>	PLC	<b>Related FW</b>	2.1.0
<b>Units</b>	[-]		
<b>Comm object</b>	21259	<b>Related applications</b>	MINT
<b>Description</b>			
State of analog output of PLC.			

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### PLC-AOUT 13

<b>Value group</b>	PLC	<b>Related FW</b>	2.1.0
<b>Units</b>	[-]		
<b>Comm object</b>	21260	<b>Related applications</b>	MINT
<b>Description</b>			
State of analog output of PLC.			

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### PLC-AOUT 14

<b>Value group</b>	PLC	<b>Related FW</b>	2.1.0
<b>Units</b>	[-]		
<b>Comm object</b>	21261	<b>Related applications</b>	MINT
<b>Description</b>			
State of analog output of PLC.			

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### PLC-AOUT 15

<b>Value group</b>	PLC	<b>Related FW</b>	2.1.0
<b>Units</b>	[-]		
<b>Comm object</b>	21262	<b>Related applications</b>	MINT
<b>Description</b>			
State of analog output of PLC.			

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### PLC-AOUT 16

<b>Value group</b>	PLC	<b>Related FW</b>	2.1.0
<b>Units</b>	[-]		
<b>Comm object</b>	21263	<b>Related applications</b>	MINT
<b>Description</b>			
State of analog output of PLC.			

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### PLC-AOUT 17

<b>Value group</b>	PLC	<b>Related FW</b>	2.1.0
<b>Units</b>	[-]		
<b>Comm object</b>	21264	<b>Related applications</b>	MINT
<b>Description</b>			
State of analog output of PLC.			

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### PLC-AOUT 18

<b>Value group</b>	PLC	<b>Related FW</b>	2.1.0
<b>Units</b>	[-]		
<b>Comm object</b>	21265	<b>Related applications</b>	MINT
<b>Description</b>			
State of analog output of PLC.			

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### PLC-AOUT 19

<b>Value group</b>	PLC	<b>Related FW</b>	2.1.0
<b>Units</b>	[-]		
<b>Comm object</b>	21266	<b>Related applications</b>	MINT
<b>Description</b>			
State of analog output of PLC.			

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## PLC-AOUT 20

<b>Value group</b>	PLC	<b>Related FW</b>	2.1.0
<b>Units</b>	[-]		
<b>Comm object</b>	21267	<b>Related applications</b>	MINT
<b>Description</b>			
State of analog output of PLC.			

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## PLC-AOUT 21

<b>Value group</b>	PLC	<b>Related FW</b>	2.1.0
<b>Units</b>	[-]		
<b>Comm object</b>	21268	<b>Related applications</b>	MINT
<b>Description</b>			
State of analog output of PLC.			

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## PLC-AOUT 22

<b>Value group</b>	PLC	<b>Related FW</b>	2.1.0
<b>Units</b>	[-]		
<b>Comm object</b>	21269	<b>Related applications</b>	MINT
<b>Description</b>			
State of analog output of PLC.			

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## PLC-AOUT 23

<b>Value group</b>	PLC	<b>Related FW</b>	2.1.0
<b>Units</b>	[-]		
<b>Comm object</b>	21270	<b>Related applications</b>	MINT
<b>Description</b>			
State of analog output of PLC.			

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## PLC-AOUT 24

<b>Value group</b>	PLC	<b>Related FW</b>	2.1.0
<b>Units</b>	[-]		
<b>Comm object</b>	21271	<b>Related applications</b>	MINT
<b>Description</b>			
State of analog output of PLC.			

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### PLC-AOUT 25

<b>Value group</b>	PLC	<b>Related FW</b>	2.1.0
<b>Units</b>	[-]		
<b>Comm object</b>	21272	<b>Related applications</b>	MINT
<b>Description</b>			
State of analog output of PLC.			

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### PLC-AOUT 26

<b>Value group</b>	PLC	<b>Related FW</b>	2.1.0
<b>Units</b>	[-]		
<b>Comm object</b>	21273	<b>Related applications</b>	MINT
<b>Description</b>			
State of analog output of PLC.			

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### PLC-AOUT 27

<b>Value group</b>	PLC	<b>Related FW</b>	2.1.0
<b>Units</b>	[-]		
<b>Comm object</b>	21274	<b>Related applications</b>	MINT
<b>Description</b>			
State of analog output of PLC.			

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### PLC-AOUT 28

<b>Value group</b>	PLC	<b>Related FW</b>	2.1.0
<b>Units</b>	[-]		
<b>Comm object</b>	21275	<b>Related applications</b>	MINT
<b>Description</b>			
State of analog output of PLC.			

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### PLC-AOUT 29

<b>Value group</b>	PLC	<b>Related FW</b>	2.1.0
<b>Units</b>	[-]		
<b>Comm object</b>	21276	<b>Related applications</b>	MINT
<b>Description</b>			
State of analog output of PLC.			

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### PLC-AOUT 30

<b>Value group</b>	PLC	<b>Related FW</b>	2.1.0
<b>Units</b>	[-]		
<b>Comm object</b>	21277	<b>Related applications</b>	MINT
<b>Description</b>			
State of analog output of PLC.			

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### PLC-AOUT 31

<b>Value group</b>	PLC	<b>Related FW</b>	2.1.0
<b>Units</b>	[-]		
<b>Comm object</b>	21278	<b>Related applications</b>	MINT
<b>Description</b>			
State of analog output of PLC.			

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### PLC-AOUT 32

<b>Value group</b>	PLC	<b>Related FW</b>	2.1.0
<b>Units</b>	[-]		
<b>Comm object</b>	21279	<b>Related applications</b>	MINT
<b>Description</b>			
State of analog output of PLC.			

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### PLC-AOUT 33

<b>Value group</b>	PLC	<b>Related FW</b>	2.1.0
<b>Units</b>	[-]		
<b>Comm object</b>	21280	<b>Related applications</b>	MINT
<b>Description</b>			
State of analog output of PLC.			

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### PLC-AOUT 34

<b>Value group</b>	PLC	<b>Related FW</b>	2.1.0
<b>Units</b>	[-]		
<b>Comm object</b>	21281	<b>Related applications</b>	MINT
<b>Description</b>			
State of analog output of PLC.			

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### PLC-AOUT 35

Value group	PLC	Related FW	2.1.0
Units	[-]		
Comm object	21282	Related applications	MINT
Description			
State of analog output of PLC.			

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### PLC-AOUT 36

Value group	PLC	Related FW	2.1.0
Units	[-]		
Comm object	21283	Related applications	MINT
Description			
State of analog output of PLC.			

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### PLC-AOUT 37

Value group	PLC	Related FW	2.1.0
Units	[-]		
Comm object	21284	Related applications	MINT
Description			
State of analog output of PLC.			

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### PLC-AOUT 38

Value group	PLC	Related FW	2.1.0
Units	[-]		
Comm object	21285	Related applications	MINT
Description			
State of analog output of PLC.			

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### PLC-AOUT 39

Value group	PLC	Related FW	2.1.0
Units	[-]		
Comm object	21286	Related applications	MINT
Description			
State of analog output of PLC.			

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### PLC-AOUT 40

Value group	PLC	Related FW	2.1.0
Units	[-]		
Comm object	21287	Related applications	MINT
Description			
State of analog output of PLC.			

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### PLC-AOUT 41

Value group	PLC	Related FW	2.1.0
Units	[-]		
Comm object	21288	Related applications	MINT
Description			
State of analog output of PLC.			

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### PLC-AOUT 42

Value group	PLC	Related FW	2.1.0
Units	[-]		
Comm object	21289	Related applications	MINT
Description			
State of analog output of PLC.			

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### PLC-AOUT 43

Value group	PLC	Related FW	2.1.0
Units	[-]		
Comm object	21290	Related applications	MINT
Description			
State of analog output of PLC.			

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### PLC-AOUT 44

Value group	PLC	Related FW	2.1.0
Units	[-]		
Comm object	21291	Related applications	MINT
Description			
State of analog output of PLC.			

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### PLC-AOUT 45

<b>Value group</b>	PLC	<b>Related FW</b>	2.1.0
<b>Units</b>	[-]		
<b>Comm object</b>	21292	<b>Related applications</b>	MINT
<b>Description</b>			
State of analog output of PLC.			

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### PLC-AOUT 46

<b>Value group</b>	PLC	<b>Related FW</b>	2.1.0
<b>Units</b>	[-]		
<b>Comm object</b>	21293	<b>Related applications</b>	MINT
<b>Description</b>			
State of analog output of PLC.			

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### PLC-AOUT 47

<b>Value group</b>	PLC	<b>Related FW</b>	2.1.0
<b>Units</b>	[-]		
<b>Comm object</b>	21294	<b>Related applications</b>	MINT
<b>Description</b>			
State of analog output of PLC.			

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### PLC-AOUT 48

<b>Value group</b>	PLC	<b>Related FW</b>	2.1.0
<b>Units</b>	[-]		
<b>Comm object</b>	21295	<b>Related applications</b>	MINT
<b>Description</b>			
State of analog output of PLC.			

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### PLC-AOUT 49

<b>Value group</b>	PLC	<b>Related FW</b>	2.1.0
<b>Units</b>	[-]		
<b>Comm object</b>	21296	<b>Related applications</b>	MINT
<b>Description</b>			
State of analog output of PLC.			

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### PLC-AOUT 50

Value group	PLC	Related FW	2.1.0
Units	[-]		
Comm object	21297	Related applications	MINT
Description			
State of analog output of PLC.			

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### PLC-AOUT 51

Value group	PLC	Related FW	2.1.0
Units	[-]		
Comm object	21298	Related applications	MINT
Description			
State of analog output of PLC.			

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### PLC-AOUT 52

Value group	PLC	Related FW	2.1.0
Units	[-]		
Comm object	21299	Related applications	MINT
Description			
State of analog output of PLC.			

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### PLC-AOUT 53

Value group	PLC	Related FW	2.1.0
Units	[-]		
Comm object	21300	Related applications	MINT
Description			
State of analog output of PLC.			

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### PLC-AOUT 54

Value group	PLC	Related FW	2.1.0
Units	[-]		
Comm object	21301	Related applications	MINT
Description			
State of analog output of PLC.			

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### PLC-AOUT 55

<b>Value group</b>	PLC	<b>Related FW</b>	2.1.0
<b>Units</b>	[-]		
<b>Comm object</b>	21302	<b>Related applications</b>	MINT
<b>Description</b>			
State of analog output of PLC.			

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### PLC-AOUT 56

<b>Value group</b>	PLC	<b>Related FW</b>	2.1.0
<b>Units</b>	[-]		
<b>Comm object</b>	21303	<b>Related applications</b>	MINT
<b>Description</b>			
State of analog output of PLC.			

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### PLC-AOUT 57

<b>Value group</b>	PLC	<b>Related FW</b>	2.1.0
<b>Units</b>	[-]		
<b>Comm object</b>	21304	<b>Related applications</b>	MINT
<b>Description</b>			
State of analog output of PLC.			

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### PLC-AOUT 58

<b>Value group</b>	PLC	<b>Related FW</b>	2.1.0
<b>Units</b>	[-]		
<b>Comm object</b>	21305	<b>Related applications</b>	MINT
<b>Description</b>			
State of analog output of PLC.			

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### PLC-AOUT 59

<b>Value group</b>	PLC	<b>Related FW</b>	2.1.0
<b>Units</b>	[-]		
<b>Comm object</b>	21306	<b>Related applications</b>	MINT
<b>Description</b>			
State of analog output of PLC.			

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### PLC-AOUT 60

<b>Value group</b>	PLC	<b>Related FW</b>	2.1.0
<b>Units</b>	[-]		
<b>Comm object</b>	21307	<b>Related applications</b>	MINT
<b>Description</b>			
State of analog output of PLC.			

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### PLC-AOUT 61

<b>Value group</b>	PLC	<b>Related FW</b>	2.1.0
<b>Units</b>	[-]		
<b>Comm object</b>	21308	<b>Related applications</b>	MINT
<b>Description</b>			
State of analog output of PLC.			

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### PLC-AOUT 62

<b>Value group</b>	PLC	<b>Related FW</b>	2.1.0
<b>Units</b>	[-]		
<b>Comm object</b>	21309	<b>Related applications</b>	MINT
<b>Description</b>			
State of analog output of PLC.			

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### PLC-AOUT 63

<b>Value group</b>	PLC	<b>Related FW</b>	2.1.0
<b>Units</b>	[-]		
<b>Comm object</b>	21310	<b>Related applications</b>	MINT
<b>Description</b>			
State of analog output of PLC.			

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### PLC-AOUT 64

<b>Value group</b>	PLC	<b>Related FW</b>	2.1.0
<b>Units</b>	[-]		
<b>Comm object</b>	21311	<b>Related applications</b>	MINT
<b>Description</b>			
State of analog output of PLC.			

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## PLC-BOUT 1

<b>Value group</b>	PLC	<b>Related FW</b>	2.1.0
<b>Units</b>	[-]		
<b>Comm object</b>	10424	<b>Related applications</b>	MINT
<b>Description</b>			
State of binary outputs of PLC.			

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## PLC-BOUT 2

<b>Value group</b>	PLC	<b>Related FW</b>	2.1.0
<b>Units</b>	[-]		
<b>Comm object</b>	10425	<b>Related applications</b>	MINT
<b>Description</b>			
State of binary outputs of PLC.			

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## PLC-BOUT 3

<b>Value group</b>	PLC	<b>Related FW</b>	2.1.0
<b>Units</b>	[-]		
<b>Comm object</b>	10426	<b>Related applications</b>	MINT
<b>Description</b>			
State of binary outputs of PLC.			

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## PLC-BOUT 4

<b>Value group</b>	PLC	<b>Related FW</b>	2.1.0
<b>Units</b>	[-]		
<b>Comm object</b>	10427	<b>Related applications</b>	MINT
<b>Description</b>			
State of binary outputs of PLC.			

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## PLC-BOUT 5

<b>Value group</b>	PLC	<b>Related FW</b>	2.1.0
<b>Units</b>	[-]		
<b>Comm object</b>	10428	<b>Related applications</b>	MINT
<b>Description</b>			
State of binary outputs of PLC.			

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## PLC-BOUT 6

<b>Value group</b>	PLC	<b>Related FW</b>	2.1.0
<b>Units</b>	[-]		
<b>Comm object</b>	10429	<b>Related applications</b>	MINT
<b>Description</b>			
State of binary outputs of PLC.			

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## PLC-BOUT 7

<b>Value group</b>	PLC	<b>Related FW</b>	2.1.0
<b>Units</b>	[-]		
<b>Comm object</b>	10430	<b>Related applications</b>	MINT
<b>Description</b>			
State of binary outputs of PLC.			

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## PLC-BOUT 8

<b>Value group</b>	PLC	<b>Related FW</b>	2.1.0
<b>Units</b>	[-]		
<b>Comm object</b>	10431	<b>Related applications</b>	MINT
<b>Description</b>			
State of binary outputs of PLC.			

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## PLC-BOUT 9

<b>Value group</b>	PLC	<b>Related FW</b>	2.1.0
<b>Units</b>	[-]		
<b>Comm object</b>	10432	<b>Related applications</b>	MINT
<b>Description</b>			
State of binary outputs of PLC.			

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## PLC-BOUT 10

<b>Value group</b>	PLC	<b>Related FW</b>	2.1.0
<b>Units</b>	[-]		
<b>Comm object</b>	10433	<b>Related applications</b>	MINT
<b>Description</b>			
State of binary outputs of PLC.			

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## PLC-BOUT 11

<b>Value group</b>	PLC	<b>Related FW</b>	2.1.0
<b>Units</b>	[-]		
<b>Comm object</b>	10434	<b>Related applications</b>	MINT
<b>Description</b>			
State of binary outputs of PLC.			

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## PLC-BOUT 12

<b>Value group</b>	PLC	<b>Related FW</b>	2.1.0
<b>Units</b>	[-]		
<b>Comm object</b>	10435	<b>Related applications</b>	MINT
<b>Description</b>			
State of binary outputs of PLC.			

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## PLC-BOUT 13

<b>Value group</b>	PLC	<b>Related FW</b>	2.1.0
<b>Units</b>	[-]		
<b>Comm object</b>	10436	<b>Related applications</b>	MINT
<b>Description</b>			
State of binary outputs of PLC.			

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## PLC-BOUT 14

<b>Value group</b>	PLC	<b>Related FW</b>	2.1.0
<b>Units</b>	[-]		
<b>Comm object</b>	10437	<b>Related applications</b>	MINT
<b>Description</b>			
State of binary outputs of PLC.			

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## PLC-BOUT 15

<b>Value group</b>	PLC	<b>Related FW</b>	2.1.0
<b>Units</b>	[-]		
<b>Comm object</b>	10438	<b>Related applications</b>	MINT
<b>Description</b>			
State of binary outputs of PLC.			

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## PLC-BOUT 16

<b>Value group</b>	PLC	<b>Related FW</b>	2.1.0
<b>Units</b>	[-]		
<b>Comm object</b>	10439	<b>Related applications</b>	MINT
<b>Description</b>			
State of binary outputs of PLC.			

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## PLC-BOUT 17

<b>Value group</b>	PLC	<b>Related FW</b>	2.1.0
<b>Units</b>	[-]		
<b>Comm object</b>	14570	<b>Related applications</b>	MINT
<b>Description</b>			
State of binary outputs of PLC.			

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## PLC-BOUT 18

<b>Value group</b>	PLC	<b>Related FW</b>	2.1.0
<b>Units</b>	[-]		
<b>Comm object</b>	14571	<b>Related applications</b>	MINT
<b>Description</b>			
State of binary outputs of PLC.			

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## PLC-BOUT 19

<b>Value group</b>	PLC	<b>Related FW</b>	2.1.0
<b>Units</b>	[-]		
<b>Comm object</b>	14572	<b>Related applications</b>	MINT
<b>Description</b>			
State of binary outputs of PLC.			

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## PLC-BOUT 20

<b>Value group</b>	PLC	<b>Related FW</b>	2.1.0
<b>Units</b>	[-]		
<b>Comm object</b>	14573	<b>Related applications</b>	MINT
<b>Description</b>			
State of binary outputs of PLC.			

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## PLC-BOUT 21

<b>Value group</b>	PLC	<b>Related FW</b>	2.1.0
<b>Units</b>	[-]		
<b>Comm object</b>	14574	<b>Related applications</b>	MINT
<b>Description</b>			
State of binary outputs of PLC.			

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## PLC-BOUT 22

<b>Value group</b>	PLC	<b>Related FW</b>	2.1.0
<b>Units</b>	[-]		
<b>Comm object</b>	14575	<b>Related applications</b>	MINT
<b>Description</b>			
State of binary outputs of PLC.			

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## PLC-BOUT 23

<b>Value group</b>	PLC	<b>Related FW</b>	2.1.0
<b>Units</b>	[-]		
<b>Comm object</b>	14576	<b>Related applications</b>	MINT
<b>Description</b>			
State of binary outputs of PLC.			

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## PLC-BOUT 24

<b>Value group</b>	PLC	<b>Related FW</b>	2.1.0
<b>Units</b>	[-]		
<b>Comm object</b>	14577	<b>Related applications</b>	MINT
<b>Description</b>			
State of binary outputs of PLC.			

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## PLC-BOUT 25

<b>Value group</b>	PLC	<b>Related FW</b>	2.1.0
<b>Units</b>	[-]		
<b>Comm object</b>	14578	<b>Related applications</b>	MINT
<b>Description</b>			
State of binary outputs of PLC.			

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## PLC-BOUT 26

<b>Value group</b>	PLC	<b>Related FW</b>	2.1.0
<b>Units</b>	[-]		
<b>Comm object</b>	14579	<b>Related applications</b>	MINT
<b>Description</b>			
State of binary outputs of PLC.			

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## PLC-BOUT 27

<b>Value group</b>	PLC	<b>Related FW</b>	2.1.0
<b>Units</b>	[-]		
<b>Comm object</b>	14580	<b>Related applications</b>	MINT
<b>Description</b>			
State of binary outputs of PLC.			

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## PLC-BOUT 28

<b>Value group</b>	PLC	<b>Related FW</b>	2.1.0
<b>Units</b>	[-]		
<b>Comm object</b>	14581	<b>Related applications</b>	MINT
<b>Description</b>			
State of binary outputs of PLC.			

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## PLC-BOUT 29

<b>Value group</b>	PLC	<b>Related FW</b>	2.1.0
<b>Units</b>	[-]		
<b>Comm object</b>	14582	<b>Related applications</b>	MINT
<b>Description</b>			
State of binary outputs of PLC.			

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## PLC-BOUT 30

<b>Value group</b>	PLC	<b>Related FW</b>	2.1.0
<b>Units</b>	[-]		
<b>Comm object</b>	14583	<b>Related applications</b>	MINT
<b>Description</b>			
State of binary outputs of PLC.			

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### PLC-BOUT 31

<b>Value group</b>	PLC	<b>Related FW</b>	2.1.0
<b>Units</b>	[-]		
<b>Comm object</b>	14584	<b>Related applications</b>	MINT
<b>Description</b>			
State of binary outputs of PLC.			

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### PLC-BOUT 32

<b>Value group</b>	PLC	<b>Related FW</b>	2.1.0
<b>Units</b>	[-]		
<b>Comm object</b>	14585	<b>Related applications</b>	MINT
<b>Description</b>			
State of binary outputs of PLC.			

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### PLC Resource 1

<b>Value group</b>	PLC	<b>Related FW</b>	2.1.0
<b>Units</b>	[-]		
<b>Comm object</b>	21216	<b>Related applications</b>	MINT
<b>Description</b>			
Internal value of PLC block.			

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### PLC Resource 2

<b>Value group</b>	PLC	<b>Related FW</b>	2.1.0
<b>Units</b>	[-]		
<b>Comm object</b>	21217	<b>Related applications</b>	MINT
<b>Description</b>			
Internal value of PLC block.			

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### PLC Resource 3

<b>Value group</b>	PLC	<b>Related FW</b>	2.1.0
<b>Units</b>	[-]		
<b>Comm object</b>	21218	<b>Related applications</b>	MINT
<b>Description</b>			
Internal value of PLC block.			

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#### PLC Resource 4

<b>Value group</b>	PLC	<b>Related FW</b>	2.1.0
<b>Units</b>	[-]		
<b>Comm object</b>	21219	<b>Related applications</b>	MINT
<b>Description</b>			
Internal value of PLC block.			

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#### PLC Resource 5

<b>Value group</b>	PLC	<b>Related FW</b>	2.1.0
<b>Units</b>	[-]		
<b>Comm object</b>	21220	<b>Related applications</b>	MINT
<b>Description</b>			
Internal value of PLC block.			

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#### PLC Resource 6

<b>Value group</b>	PLC	<b>Related FW</b>	2.1.0
<b>Units</b>	[-]		
<b>Comm object</b>	21221	<b>Related applications</b>	MINT
<b>Description</b>			
Internal value of PLC block.			

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#### PLC Resource 7

<b>Value group</b>	PLC	<b>Related FW</b>	2.1.0
<b>Units</b>	[-]		
<b>Comm object</b>	21222	<b>Related applications</b>	MINT
<b>Description</b>			
Internal value of PLC block.			

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#### PLC Resource 8

<b>Value group</b>	PLC	<b>Related FW</b>	2.1.0
<b>Units</b>	[-]		
<b>Comm object</b>	21223	<b>Related applications</b>	MINT
<b>Description</b>			
Internal value of PLC block.			

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### PLC Resource 9

<b>Value group</b>	PLC	<b>Related FW</b>	2.1.0
<b>Units</b>	[-]		
<b>Comm object</b>	21224	<b>Related applications</b>	MINT
<b>Description</b>			
Internal value of PLC block.			

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### PLC Resource 10

<b>Value group</b>	PLC	<b>Related FW</b>	2.1.0
<b>Units</b>	[-]		
<b>Comm object</b>	21225	<b>Related applications</b>	MINT
<b>Description</b>			
Internal value of PLC block.			

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### PLC Resource 11

<b>Value group</b>	PLC	<b>Related FW</b>	2.1.0
<b>Units</b>	[-]		
<b>Comm object</b>	21226	<b>Related applications</b>	MINT
<b>Description</b>			
Internal value of PLC block.			

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### PLC Resource 12

<b>Value group</b>	PLC	<b>Related FW</b>	2.1.0
<b>Units</b>	[-]		
<b>Comm object</b>	21227	<b>Related applications</b>	MINT
<b>Description</b>			
Internal value of PLC block.			

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### PLC Resource 13

<b>Value group</b>	PLC	<b>Related FW</b>	2.1.0
<b>Units</b>	[-]		
<b>Comm object</b>	21228	<b>Related applications</b>	MINT
<b>Description</b>			
Internal value of PLC block.			

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## PLC Resource 14

Value group	PLC	Related FW	2.1.0
Units	[-]		
Comm object	21229	Related applications	MINT
Description			
Internal value of PLC block.			

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## PLC Resource 15

Value group	PLC	Related FW	2.1.0
Units	[-]		
Comm object	21230	Related applications	MINT
Description			
Internal value of PLC block.			

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## PLC Resource 16

Value group	PLC	Related FW	2.1.0
Units	[-]		
Comm object	21231	Related applications	MINT
Description			
Internal value of PLC block.			

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## Group: Remote Control

### RemoteControl2B 1

Value group	Remote Control	Related FW	2.1.0
Units	-		
Comm object	16671	Related applications	MINT
Description			
This value contains user data written over <b>Modbus-RTU, Modbus/TCP</b> . Data type of this value is Int16.			

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### RemoteControl2B 2

Value group	Remote Control	Related FW	2.1.0
Units	-		
Comm object	16672	Related applications	MINT
Description			
This value contains user data written over <b>Modbus-RTU, Modbus/TCP</b> . Data type of this value is Int16.			

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### RemoteControl2B 3

<b>Value group</b>	Remote Control	<b>Related FW</b>	2.1.0
<b>Units</b>	-		
<b>Comm object</b>	16673	<b>Related applications</b>	MINT
<b>Description</b>			
This value contains user data written over <b>Modbus-RTU, Modbus/TCP</b> . Data type of this value is Int16.			

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### RemoteControl2B 4

<b>Value group</b>	Remote Control	<b>Related FW</b>	2.1.0
<b>Units</b>	-		
<b>Comm object</b>	16674	<b>Related applications</b>	MINT
<b>Description</b>			
This value contains user data written over <b>Modbus-RTU, Modbus/TCP</b> . Data type of this value is Int16.			

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### RemoteControl2B 5

<b>Value group</b>	Remote Control	<b>Related FW</b>	2.1.0
<b>Units</b>	-		
<b>Comm object</b>	16675	<b>Related applications</b>	MINT
<b>Description</b>			
This value contains user data written over <b>Modbus-RTU, Modbus/TCP</b> . Data type of this value is Int16.			

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### RemoteControl2B 6

<b>Value group</b>	Remote Control	<b>Related FW</b>	2.1.0
<b>Units</b>	-		
<b>Comm object</b>	16676	<b>Related applications</b>	MINT
<b>Description</b>			
This value contains user data written over <b>Modbus-RTU, Modbus/TCP</b> . Data type of this value is Int16.			

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### RemoteControl2B 7

<b>Value group</b>	Remote Control	<b>Related FW</b>	2.1.0
<b>Units</b>	-		
<b>Comm object</b>	16677	<b>Related applications</b>	MINT
<b>Description</b>			
This value contains user data written over <b>Modbus-RTU, Modbus/TCP</b> . Data type of this value is Int16.			

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### RemoteControl2B 8

Value group	Remote Control	Related FW	2.1.0
Units	-		
Comm object	16678	Related applications	MINT
Description			
This value contains user data written over <b>Modbus-RTU, Modbus/TCP</b> . Data type of this value is Int16.			

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### RemoteControl4B 1

Value group	Remote Control	Related FW	2.1.0
Units	-		
Comm object	16679	Related applications	MINT
Description			
This value contains user data written over <b>Modbus-RTU, Modbus/TCP</b> . Data type of this value is Int32.			

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### RemoteControl4B 2

Value group	Remote Control	Related FW	2.1.0
Units	-		
Comm object	16680	Related applications	MINT
Description			
This value contains user data written over <b>Modbus-RTU, Modbus/TCP</b> . Data type of this value is Int32.			

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### RemoteControl4B 3

Value group	Remote Control	Related FW	2.1.0
Units	-		
Comm object	16681	Related applications	MINT
Description			
This value contains user data written over <b>Modbus-RTU, Modbus/TCP</b> . Data type of this value is Int32.			

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### RemoteControl4B 4

Value group	Remote Control	Related FW	2.1.0
Units	-		
Comm object	16682	Related applications	MINT
Description			
This value contains user data written over <b>Modbus-RTU, Modbus/TCP</b> . Data type of this value is Int32.			

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## RemoteControlBin

<b>Value group</b>	Remote Control	<b>Related FW</b>	2.1.0
<b>Units</b>	-		
<b>Comm object</b>	16683	<b>Related applications</b>	MINT
<b>Description</b>			
This value contains user data written over <b>Modbus-RTU, Modbus/TCP</b> . Data type of this value is Binary16.			

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Group: Plug-in

## EM BIO A

<b>Value group</b>	CM-Ethernet	<b>Related FW</b>	2.1.0
<b>Units</b>			
<b>Comm object</b>	14291	<b>Related applications</b>	MINT
<b>Description</b>			
XYZ.			

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## EM BIO B

<b>Value group</b>	CM-Ethernet	<b>Related FW</b>	2.1.0
<b>Units</b>			
<b>Comm object</b>	14292	<b>Related applications</b>	MINT
<b>Description</b>			
XYZ.			

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## Group: SH Modules

### SHBIN-1

<b>Value group</b>	SH Modules	<b>Related FW</b>	2.1.0
<b>Units</b>	[-]		
<b>Comm object</b>	10572	<b>Related applications</b>	MINT
<b>Description</b>			
This value contains Binary Inputs of shared binary inputs from SHBIN module 1. <ol style="list-style-type: none"><li>1. SHBIN-1 1</li><li>2. SHBIN-1 2</li><li>3. SHBIN-1 3</li><li>4. SHBIN-1 4</li><li>5. SHBIN-1 5</li><li>6. SHBIN-1 6</li><li>7. SHBIN-1 7</li><li>8. SHBIN-1 8</li></ol>			

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### SHBIN-2

<b>Value group</b>	SH Modules	<b>Related FW</b>	2.1.0
<b>Units</b>	[-]		
<b>Comm object</b>	10573	<b>Related applications</b>	MINT
<b>Description</b>			
This value contains Binary Inputs of shared binary inputs from SHBIN module 2. <ol style="list-style-type: none"><li>1. SHBIN-2 1</li><li>2. SHBIN-2 2</li><li>3. SHBIN-2 3</li><li>4. SHBIN-2 4</li><li>5. SHBIN-2 5</li><li>6. SHBIN-2 6</li><li>7. SHBIN-2 7</li><li>8. SHBIN-2 8</li></ol>			

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### SHBIN-3

<b>Value group</b>	SH Modules	<b>Related FW</b>	2.1.0
<b>Units</b>	[-]		
<b>Comm object</b>	10574	<b>Related applications</b>	MINT
<b>Description</b>			
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

<b>Value group</b>	SH Modules	<b>Related FW</b>	2.1.0
<b>Units</b>	[-]		
<b>Comm object</b>	10575	<b>Related applications</b>	MINT
<b>Description</b>			
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

<b>Value group</b>	SH Modules	<b>Related FW</b>	2.1.0
<b>Units</b>	[-]		
<b>Comm object</b>	11341	<b>Related applications</b>	MINT
<b>Description</b>			
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

<b>Value group</b>	SH Modules	<b>Related FW</b>	2.1.0
<b>Units</b>	[-]		
<b>Comm object</b>	11342	<b>Related applications</b>	MINT
<b>Description</b>			
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

<b>Value group</b>	SH Modules	<b>Related FW</b>	2.1.0
<b>Units</b>	[-]		
<b>Comm object</b>	10576	<b>Related applications</b>	MINT
<b>Description</b>			
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

<b>Value group</b>	SH Modules	<b>Related FW</b>	2.1.0
<b>Units</b>	[-]		
<b>Comm object</b>	10577	<b>Related applications</b>	MINT
<b>Description</b>			
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

<b>Value group</b>	SH Modules	<b>Related FW</b>	2.1.0
<b>Units</b>	[-]		
<b>Comm object</b>	10578	<b>Related applications</b>	MINT
<b>Description</b>			
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

<b>Value group</b>	SH Modules	<b>Related FW</b>	2.1.0
<b>Units</b>	[-]		
<b>Comm object</b>	10579	<b>Related applications</b>	MINT
<b>Description</b>			
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

<b>Value group</b>	SH Modules	<b>Related FW</b>	2.1.0
<b>Units</b>	[-]		
<b>Comm object</b>	11343	<b>Related applications</b>	MINT
<b>Description</b>			
This value contains Binary Inputs of shared binary outputs from SHBOUT module 5. <ol style="list-style-type: none"><li>1. SHBOUT-5 1</li><li>2. SHBOUT-5 2</li><li>3. SHBOUT-5 3</li><li>4. SHBOUT-5 4</li><li>5. SHBOUT-5 5</li><li>6. SHBOUT-5 6</li><li>7. SHBOUT-5 7</li><li>8. SHBOUT-5 8</li></ol>			

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## SHBOUT-6

<b>Value group</b>	SH Modules	<b>Related FW</b>	2.1.0
<b>Units</b>	[-]		
<b>Comm object</b>	11344	<b>Related applications</b>	MINT
<b>Description</b>			
This value contains Binary Inputs of shared binary outputs from SHBOUT module 6. <ol style="list-style-type: none"><li>1. SHBOUT-6 1</li><li>2. SHBOUT-6 2</li><li>3. SHBOUT-6 3</li><li>4. SHBOUT-6 4</li><li>5. SHBOUT-6 5</li><li>6. SHBOUT-6 6</li><li>7. SHBOUT-6 7</li><li>8. SHBOUT-6 8</li></ol>			

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### SHAIN-1 1

Value group	SH Modules	Related FW	2.1.0
Units	[-]		
Comm object	10584	Related applications	MINT
<b>Description</b>			
This value contains data of first shared analog input from SHAOUT module 1.			
<b>IMPORTANT: This value is received (and visible) only when it is configured with sensor type "Electronic".</b>			

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### SHAIN-1 2

Value group	SH Modules	Related FW	2.1.0
Units	[-]		
Comm object	10585	Related applications	MINT
<b>Description</b>			
This value contains data of second shared analog input from SHAOUT module 1.			
<b>IMPORTANT: This value is received (and visible) only when it is configured with sensor type "Electronic".</b>			

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### SHAIN-1 3

Value group	SH Modules	Related FW	2.1.0
Units	[-]		
Comm object	10586	Related applications	MINT
<b>Description</b>			
This value contains data of third shared analog input from SHAOUT module 1.			
<b>IMPORTANT: This value is received (and visible) only when it is configured with sensor type "Electronic".</b>			

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### SHAIN-1 4

Value group	SH Modules	Related FW	2.1.0
Units	[-]		
Comm object	10587	Related applications	MINT
<b>Description</b>			
This value contains data of fourth shared analog input from SHAOUT module 1.			
<b>IMPORTANT: This value is received (and visible) only when it is configured with sensor type "Electronic".</b>			

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## SHAIN-2 1

Value group	SH Modules	Related FW	2.1.0
Units	[-]		
Comm object	11390	Related applications	MINT
<b>Description</b>			
This value contains data of first shared analog input from SHAOUT module 2.			
<b>IMPORTANT: This value is received (and visible) only when it is configured with sensor type "Electronic".</b>			

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## SHAIN-2 2

Value group	SH Modules	Related FW	2.1.0
Units	[-]		
Comm object	11391	Related applications	MINT
<b>Description</b>			
This value contains data of second shared analog input from SHAOUT module 2.			
<b>IMPORTANT: This value is received (and visible) only when it is configured with sensor type "Electronic".</b>			

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## SHAIN-2 3

Value group	SH Modules	Related FW	2.1.0
Units	[-]		
Comm object	11392	Related applications	MINT
<b>Description</b>			
This value contains data of third shared analog input from SHAOUT module 2.			
<b>IMPORTANT: This value is received (and visible) only when it is configured with sensor type "Electronic".</b>			

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## SHAIN-2 4

Value group	SH Modules	Related FW	2.1.0
Units	[-]		
Comm object	11393	Related applications	MINT
<b>Description</b>			
This value contains data of fourth shared analog input from SHAOUT module 2.			
<b>IMPORTANT: This value is received (and visible) only when it is configured with sensor type "Electronic".</b>			

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# 9.1.5 Application Curves

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## Capability L

Related FW	2.1.0	Related applications	MINT
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-axis is relative value of **BESS P** to **BESS Nominal power**.

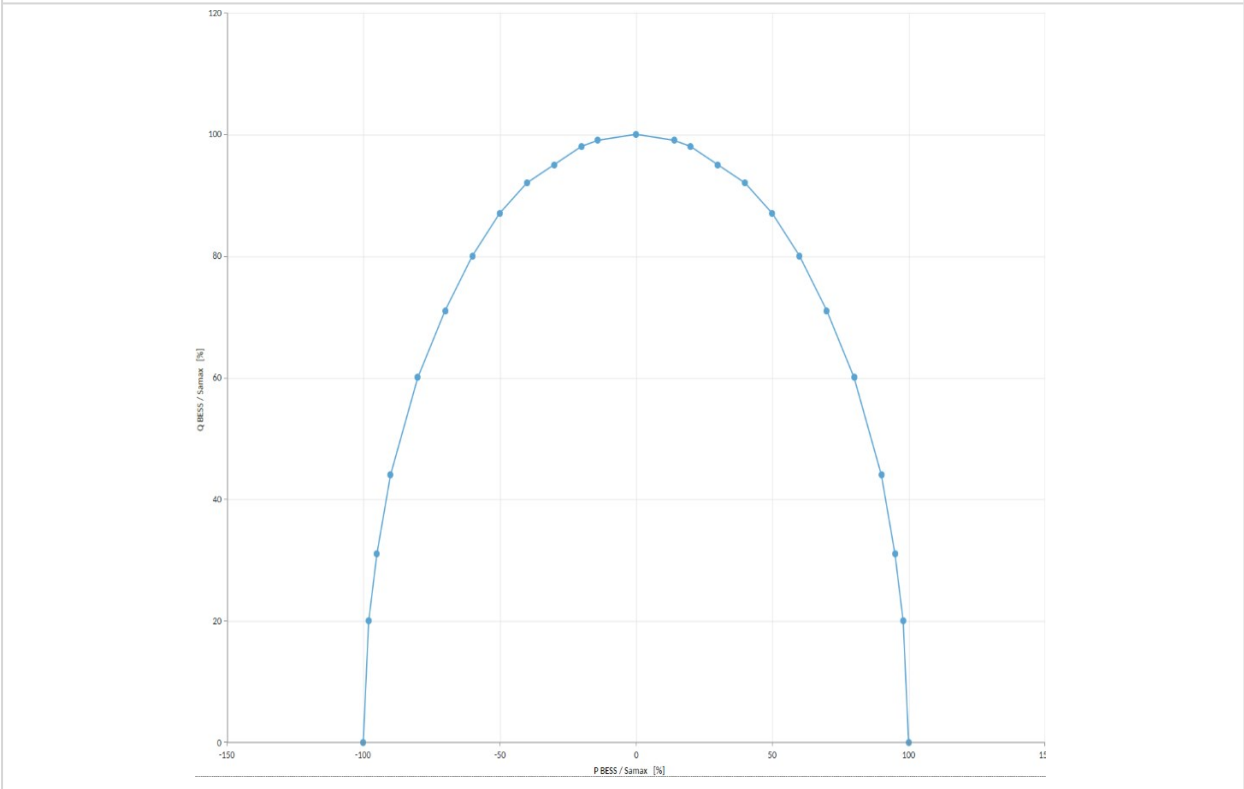
Y-axis is relative value of **BESS Q** to **Samax**.

**Note:** The samax value is counted from **BESS Nominal Current** and **BESS Nominal Voltage Ph-N** (or **BESS Nominal Voltage Ph-Ph**) in case that **Samax** = OFF.

### Default values

X-axis [%]	Y-axis [%]
-10	0
0	0
100	106
102	106

### Default appearance



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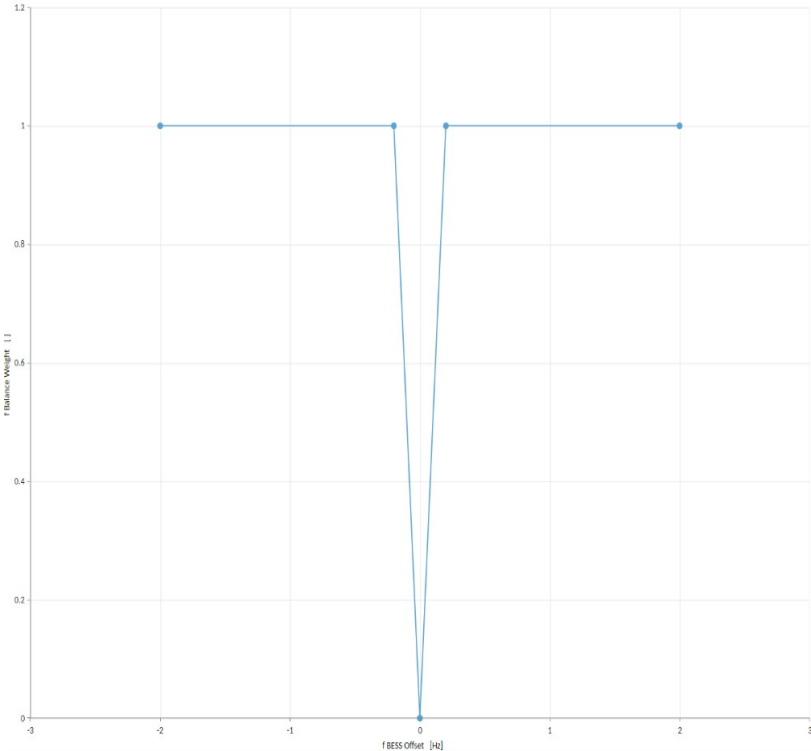
## Capability C

Related FW	2.1.0	Related applications	MINT																																												
App Curve ID	5																																														
Description																																															
<p>This curve defines <b>BESS Operation Area</b> within which it can deliver reactive power continuously without overheating while <b>BESS Load Character</b> = C.</p> <p>X-axis is relative value of <b>BESS P</b> to <b>BESS Nominal power</b>.</p> <p>Y-axis is relative value of <b>BESS Q</b> to <b>Samax</b>.</p> <div><p><b>IMPORTANT:</b> 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.</p></div> <div><p><b>Note:</b> The samax value is counted from <b>BESS Nominal Current</b> and <b>BESS Nominal Voltage Ph-N</b> (or <b>BESS Nominal Voltage Ph-Ph</b>) in case that <b>Samax</b> = OFF.</p></div>																																															
Default values																																															
X-axis [%]		Y-axis [%]																																													
-10		0																																													
0		0																																													
100		-60																																													
102		-60																																													
Default appearance																																															
<table border="1"><caption>Data points for the Capability C curve</caption><thead><tr><th>P BESS / Samax [%]</th><th>Q BESS / Samax [%]</th></tr></thead><tbody><tr><td>-100</td><td>0</td></tr><tr><td>-90</td><td>-20</td></tr><tr><td>-80</td><td>-30</td></tr><tr><td>-70</td><td>-45</td></tr><tr><td>-60</td><td>-60</td></tr><tr><td>-50</td><td>-72</td></tr><tr><td>-40</td><td>-82</td></tr><tr><td>-30</td><td>-90</td></tr><tr><td>-20</td><td>-95</td></tr><tr><td>-10</td><td>-98</td></tr><tr><td>0</td><td>-100</td></tr><tr><td>10</td><td>-98</td></tr><tr><td>20</td><td>-95</td></tr><tr><td>30</td><td>-90</td></tr><tr><td>40</td><td>-82</td></tr><tr><td>50</td><td>-72</td></tr><tr><td>60</td><td>-60</td></tr><tr><td>70</td><td>-45</td></tr><tr><td>80</td><td>-30</td></tr><tr><td>90</td><td>-20</td></tr><tr><td>100</td><td>0</td></tr></tbody></table>				P BESS / Samax [%]	Q BESS / Samax [%]	-100	0	-90	-20	-80	-30	-70	-45	-60	-60	-50	-72	-40	-82	-30	-90	-20	-95	-10	-98	0	-100	10	-98	20	-95	30	-90	40	-82	50	-72	60	-60	70	-45	80	-30	90	-20	100	0
P BESS / Samax [%]	Q BESS / Samax [%]																																														
-100	0																																														
-90	-20																																														
-80	-30																																														
-70	-45																																														
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-50	-72																																														
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90	-20																																														
100	0																																														

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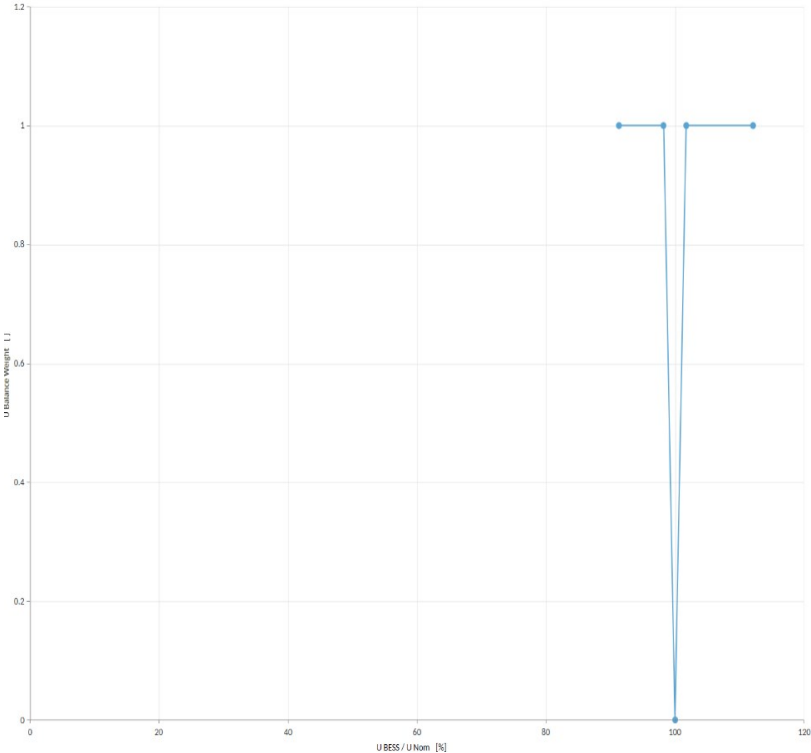
Dynamic f Balance Weight - f

Related FW	2.1.0	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 <b>Frequency Balancing Weight</b> .			
Default appearance			
			

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Dynamic U Balance Weight - U

Related FW	2.1.0	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 <b>Voltage Balancing Weight</b> .			
Default appearance			
			

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Dynamic f Balance Weight - P

Related FW	2.1.0	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 <b>Frequency Balancing Weight</b> .															
Default appearance															
<p>The graph shows a trapezoidal relationship between the relative power of the BESS (P BESS / Smax [%]) on the x-axis and the dynamic weight of isochronous frequency regulation (f Balance Weight []) on the y-axis. The x-axis ranges from -150 to 150 with major grid lines every 50 units. The y-axis ranges from 0 to 1.2 with major grid lines every 0.2 units. The curve is defined by the following points: (-100, 0), (-90, 1), (0, 1), (90, 1), (100, 0). The weight is 1.0 for power values between -90% and 90%, and drops linearly to 0 at -100% and 100%.</p> <table><tr><th>P BESS / Smax [%]</th><th>f Balance Weight []</th></tr><tr><td>-100</td><td>0</td></tr><tr><td>-90</td><td>1</td></tr><tr><td>0</td><td>1</td></tr><tr><td>90</td><td>1</td></tr><tr><td>100</td><td>0</td></tr></table>				P BESS / Smax [%]	f Balance Weight []	-100	0	-90	1	0	1	90	1	100	0
P BESS / Smax [%]	f Balance Weight []														
-100	0														
-90	1														
0	1														
90	1														
100	0														

[⬅ back to Application Curves](#)



Dynamic U Balance Weight - Q

Related FW	2.1.0	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 <b>Voltage Balancing Weight</b> .															
Default appearance															
<div><p>The graph shows a trapezoidal curve representing the dynamic weight of isochronous voltage regulation. The x-axis is labeled 'Q BESS / Smax (kV)' and ranges from -150 to 150. The y-axis is labeled 'Q balance weight (1)' and ranges from 0 to 1.2. The curve starts at (-100, 0), rises linearly to (-90, 1), remains constant at 1 until 90, and then falls linearly to (100, 0). There are blue dots at the points (-100, 0), (-90, 1), (0, 1), (90, 1), and (100, 0).</p><table><tr><th>Q BESS / Smax (kV)</th><th>Q balance weight (1)</th></tr><tr><td>-100</td><td>0</td></tr><tr><td>-90</td><td>1</td></tr><tr><td>0</td><td>1</td></tr><tr><td>90</td><td>1</td></tr><tr><td>100</td><td>0</td></tr></table></div>				Q BESS / Smax (kV)	Q balance weight (1)	-100	0	-90	1	0	1	90	1	100	0
Q BESS / Smax (kV)	Q balance weight (1)														
-100	0														
-90	1														
0	1														
90	1														
100	0														

[⬅ back to Application Curves](#)



# 9.1.6 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 .....	809
LBI: B .....	811
LBI: E .....	816
LBI: F .....	821
LBI: G .....	826
LBI: H .....	827
LBI: I .....	829
LBI: L .....	831
LBI: M .....	833
LBI: N .....	839
LBI: P .....	839
LBI: R .....	847
LBI: S .....	849
LBI: T .....	860

For full list of Logical binary inputs go to the chapter **Logical binary inputs alphabetically**.



## Logical binary inputs alphabetically

LB1: A .....	809	ES Charging .....	817	Forced Value Input 22 .....	826
Access Lock .....	809	ES Discharge Enable .....	818	Forced Value Input 23 .....	826
All ES Connection OK .....	809	ES Discharging .....	818	Forced Value Input 24 .....	826
Any BMS HW Fault .....	809	ES Ready To Load .....	818	LB1: G .....	826
Any ES Charge Over		ES Ready To Start .....	818	Geo Home Position .....	826
Current .....	809	ESCB Feedback .....	819	Geo-Fencing Enable .....	826
Any ES Connection Not		ESCB Feedback Negative	820	Group link .....	827
OK .....	809	Ext Supply Fail .....	820	LB1: H .....	827
Any ES Current Diff Too		Ext Supply OK .....	820	Horn Reset Button .....	827
High .....	810	LB1: F .....	821	HVAC Alarm Level 1 .....	827
Any ES Discharge Over		Fault Reset Button .....	821	HVAC Alarm Level 2 .....	827
Current .....	810	Fire Suppression Activated	821	HVAC Communication	
Any ES High Temperature	810	Fire Suppression Alarm		Failure .....	828
Any ES Low Temperature	810	Level 1 .....	821	HVAC High External	
Any ES Over Voltage .....	810	Fire Suppression Alarm		Temperature .....	828
Any ES Under Voltage .....	810	Level 2 .....	821	HVAC High Internal	
Any ES Voltage Diff Too		Forced Value Input 01 .....	821	Temperature .....	828
High .....	811	Forced Value Input 02 .....	822	HVAC Low External	
ARMED - Fire suppression		Forced Value Input 03 .....	822	Temperature .....	828
is ready .....	811	Forced Value Input 04 .....	822	HVAC Low Internal	
LB1: B .....	811	Forced Value Input 05 .....	822	Temperature .....	828
BCB Button .....	811	Forced Value Input 06 .....	822	HVAC Running .....	828
BCB Disable .....	811	Forced Value Input 07 .....	823	LB1: I .....	829
BCB Feedback .....	812	Forced Value Input 08 .....	823	Ignore High SOC .....	829
BCB Feedback Negative .....	813	Forced Value Input 09 .....	823	Ignore Low SOC .....	829
BCB Secondary Feedback	814	Forced Value Input 10 .....	823	Ignore High V Rel .....	829
BCB Secondary Feedback		Forced Value Input 11 .....	823	Ignore Low V Rel .....	830
Negative .....	815	Forced Value Input 12 .....	824	Insulation Resistance	
BESS Door Opened .....	815	Forced Value Input 13 .....	824	Critical Low .....	830
BMS Alarm Level 1 .....	815	Forced Value Input 14 .....	824	Insulation Resistance Low	830
BMS Alarm Level 2 .....	816	Forced Value Input 15 .....	824	LB1: L .....	831
Start Blocking .....	816	Forced Value Input 16 .....	824	Load Res 2 Active .....	831
BCB Open .....	816	Forced Value Input 17 .....	825	Load Res 3 Active .....	832
LB1: E .....	816	Forced Value Input 18 .....	825	Load Res 4 Active .....	833
ECU Key Switch .....	816	Forced Value Input 19 .....	825	LB1: M .....	833
Emergency MAN .....	817	Forced Value Input 20 .....	825	Manual Load	
Emergency Stop .....	817	Forced Value Input 21 .....	825	Reconnection .....	833
ES Charge Enable .....	817			MCB Feedback .....	834



MCB Feedback Negative	836	Protection Force Disable		SBMB Feedback 8	860
Min Run Power Act 1	837	Block 3	846	LBi: T	860
Min Run Power Act 2	838	PSU Alarm Level 1	846	TEST ROCOF	860
Min Run Power Act 3	838	PSU Alarm Level 2	846	Test Vector Shift	861
LBi: N	839	PSU Critical Temperature	846	Top Priority	861
NCB Feedback	839	PSU High Temperature	847	TX Critical Temperature	861
LBi: P	839	PSU Over/Under Voltage	847	TX High Temperature	861
PCS AC Over Frequency	839	PSU Overload	847		
PCS AC Over Voltage	839	LBi: R	847		
PCS AC Overload	839	Remote AUTO	847		
PCS AC Under Frequency	839	Remote Ctrl Lock	848		
PCS AC Under Voltage	840	Remote MAN MODE	848		
PCS Alarm Level 1	840	Remote OFF MODE	848		
PCS Alarm Level 2	840	Remote Start/Stop	849		
PCS Communication		LBi: S	849		
Failure	840	Sd Override	849		
PCS Critical Temperature	840	Soft Unload Enable	849		
PCS DC Over Voltage	840	SOH Critical Low	850		
PCS DC Overload	841	SOH Low	850		
PCS DC Under Voltage	841	Source Not Operable	850		
PCS Derating	841	Start Button	850		
PCS High Temperature	841	Stop Button	850		
PCS Output Control Mode		Sunrise/Sunset Home			
U-f/P-Q	842	Position	851		
PCS PQ Mode	842	Synchronization Disabled	851		
PCS Ready To Load	842	String Healthy 1	851		
PCS Ready To Start	843	String Healthy 2	851		
PCS Running	843	String Healthy 3	851		
PCS Saturated	843	String Healthy 4	852		
PCS Start Disabled	843	String Healthy 5	852		
PCS Starting	843	String Healthy 6	852		
PCS Stopped	844	String Healthy 7	852		
PCS Stopping	844	String Healthy 8	852		
PCS VF Const Freq	844	SBMB Feedback 1	853		
PCS VF Droop	844	SBMB Feedback 2	854		
Precharge Finished	844	SBMB Feedback 3	855		
Protection Force Disable		SBMB Feedback 4	856		
Block 1	845	SBMB Feedback 5	857		
Protection Force Disable		SBMB Feedback 6	858		
Block 2	845	SBMB Feedback 7	859		

 **back to Controller objects**



## LBI: A

### Access Lock

Related FW	2.1.0	Related applications	MINT
LBI ID	1		
Description			
When this input is closed, no setpoints can be adjusted from controller's front panel and Microgrid mode (OFF / MAN / AUTO / TEST) cannot be changed.			
<i><b>Note:</b> Access Lock does not protect setpoints and mode changing from IntelliConfig. To avoid unqualified changes the selected setpoints have to be password protected. Also the buttons Fault Reset and Horn Reset are not blocked at all and buttons Start and Stop in MAN mode are not blocked.</i>			

⬅ back to Logical binary inputs alphabetically

### All ES Connection OK

Related FW	2.1.0	Related applications	MINT
LBI ID	1257		
Description			
The status of this LBI is mirrored in group <b>BMS Info</b>			

⬅ back to Logical binary inputs alphabetically

### Any BMS HW Fault

Related FW	2.1.0	Related applications	MINT
LBI ID	1256		
Description			
The status of this LBI is mirrored in group <b>BMS Info</b>			

⬅ back to Logical binary inputs alphabetically

### Any ES Charge Over Current

Related FW	2.1.0	Related applications	MINT
LBI ID	1269		
Description			
The status of this LBI is mirrored in group <b>BMS Info</b>			

⬅ back to Logical binary inputs alphabetically

### Any ES Connection Not OK

Related FW	2.1.0	Related applications	MINT
LBI ID	1264		
Description			
The status of this LBI is mirrored in group <b>BMS Info</b>			

⬅ back to Logical binary inputs alphabetically



### Any ES Current Diff Too High

Related FW	2.1.0	Related applications	MINT
LBI ID	1266		
Description			
The status of this LBI is mirrored in group <b>BMS Info</b>			

⬅ back to Logical binary inputs alphabetically

### Any ES Discharge Over Current

Related FW	2.1.0	Related applications	MINT
LBI ID	1270		
Description			
The status of this LBI is mirrored in group <b>BMS Info</b>			

⬅ back to Logical binary inputs alphabetically

### Any ES High Temperature

Related FW	2.1.0	Related applications	MINT
LBI ID	1271		
Description			
The status of this LBI is mirrored in group <b>BMS Info</b>			

⬅ back to Logical binary inputs alphabetically

### Any ES Low Temperature

Related FW	2.1.0	Related applications	MINT
LBI ID	1272		
Description			
The status of this LBI is mirrored in group <b>BMS Info</b>			

⬅ back to Logical binary inputs alphabetically

### Any ES Over Voltage

Related FW	2.1.0	Related applications	MINT
LBI ID	1267		
Description			
The status of this LBI is mirrored in group <b>BMS Info</b>			

⬅ back to Logical binary inputs alphabetically

### Any ES Under Voltage

Related FW	2.1.0	Related applications	MINT
LBI ID	1268		
Description			
The status of this LBI is mirrored in group <b>BMS Info</b>			

⬅ back to Logical binary inputs alphabetically



### Any ES Voltage Diff Too High

Related FW	2.1.0	Related applications	MINT
LBI ID	1265		
Description			
The status of this LBI is mirrored in group <b>BMS Info</b>			

⬅ back to Logical binary inputs alphabetically

### ARMED - Fire suppression is ready

Related FW	2.1.0	Related applications	MINT
LBI ID	1285		
Description			
The status of this LBI is mirrored in group <b>AUX Info</b>			

⬅ back to Logical binary inputs alphabetically

### LBI: B

#### BCB Button

Related FW	2.1.0	Related applications	MINT
LBI ID	193		
Description			
Binary input has the same function as BCB button <input type="checkbox"/> on an <b>External display</b> Internal display.			

⬅ back to Logical binary inputs alphabetically

#### BCB Disable

Related FW	2.1.0	Related applications	MINT
LBI ID	62		
Description			
<p>This function is used to prevent BCB closing and opening.</p> <ul style="list-style-type: none"> <li>➤ 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.</li> <li>➤ 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.</li> <li>➤ 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.</li> <li>➤ If the input is active and the BCB is already closed, the breaker will not open automatically. BCB can be opened with GCB Button (or the corresponding command).</li> </ul>			

⬅ back to Logical binary inputs alphabetically



BCB Feedback

Related FW	2.1.0	Related applications	MINT
LBI ID	63		

**Description**

Use this input to indicate whether the master generator BESSAC bus DC bus circuit breaker is opened or closed.

Image 7.7 BCB Feedback 1

Image 7.8 BCB Feedback 2

This input is used for connection of the normally open feedback contact from the BESS 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** within time adjusted in Setpoint **Waiting For Breaker Feedback**, 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	2.1.0	Related applications	MINT
LBI ID	64		

Description

Use this input to indicate whether the master generator BESS circuit breaker is opened or closed.

This input is used for connection of the normally closed feedback contact from the BESS 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.

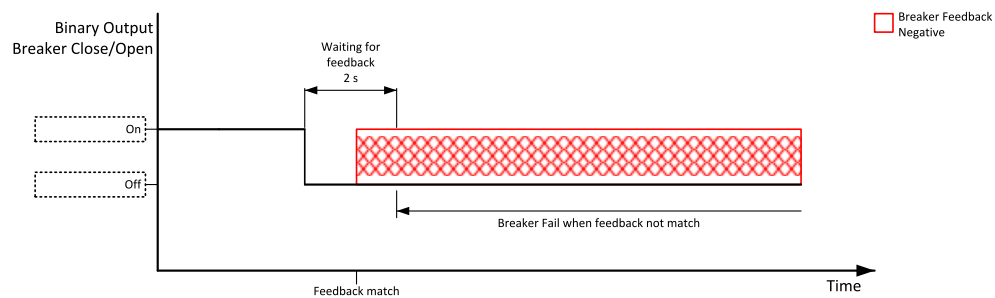


Image 7.9 BCB Feedback Negative 1

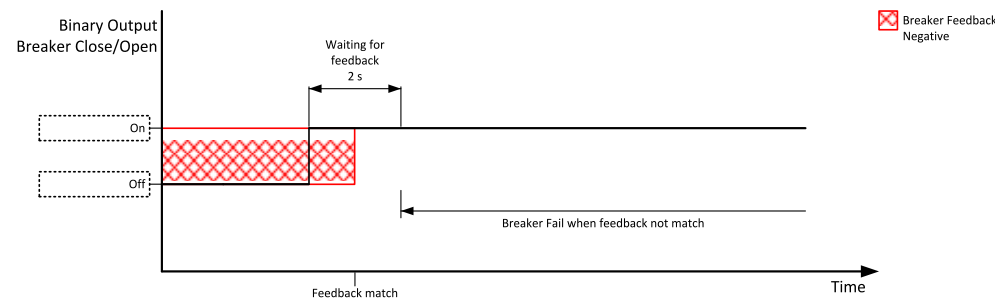


Image 7.10 BCB Feedback Negative 2

[back to Logical binary inputs alphabetically](#)



BCB Secondary Feedback

Related FW	2.1.0	Related applications	MINT
LBI ID	548		

Description

Use this input to indicate whether the master generator BESS circuit breaker is opened or closed.

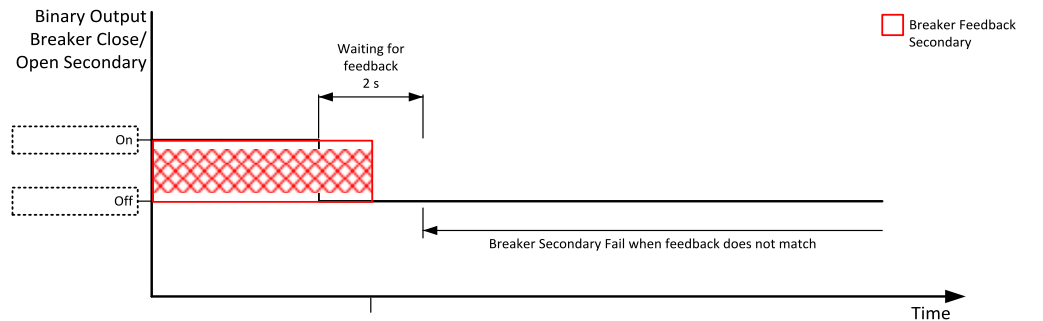


Image 7.11 BCB Feedback 1

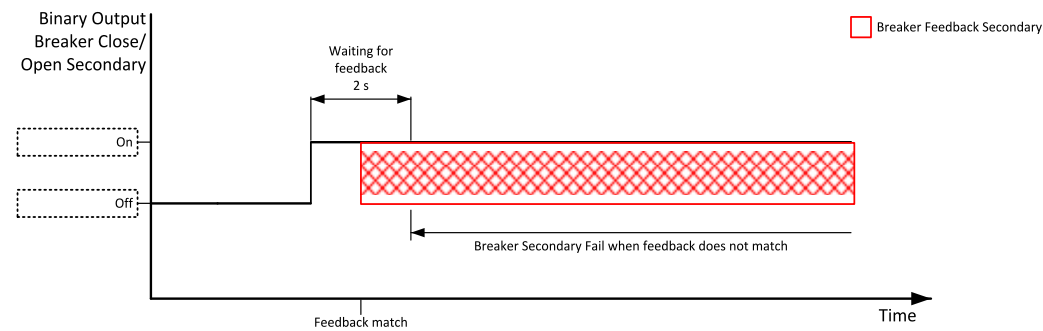
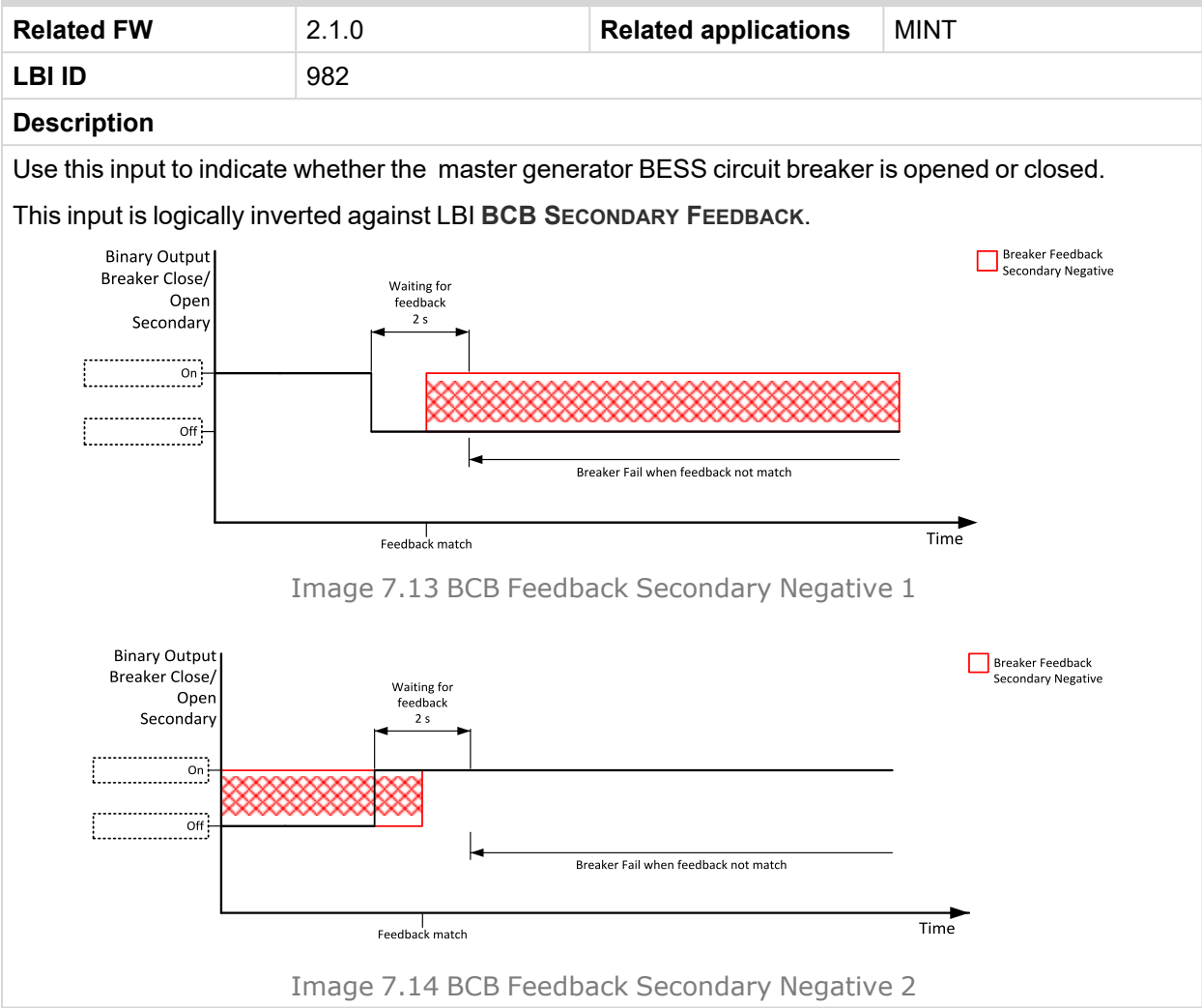


Image 7.12 BCB Feedback 2

⬅ back to Logical binary inputs alphabetically



BCB Secondary Feedback Negative



⬅ back to Logical binary inputs alphabetically

BESS Door Opened

Related FW	2.1.0	Related applications	MINT
LBI ID	1299		
Description			
The status of this LBI is mirrored in group <b>AUX Info</b>			

⬅ back to Logical binary inputs alphabetically

BMS Alarm Level 1

Related FW	2.1.0	Related applications	MINT
LBI ID	1254		
Description			
The status of this LBI is mirrored in group <b>BMS Info</b>			

⬅ back to Logical binary inputs alphabetically



## BMS Alarm Level 2

Related FW	2.1.0	Related applications	MINT
LBI ID	1255		
Description			
The status of this LBI is mirrored in group <b>BMS Info</b>			

⬅ back to Logical binary inputs alphabetically

## Start Blocking

Related FW	2.1.0	Related applications	MINT
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 <b>ALI Start Blocking</b> is active.			
<b>Note:</b> Activation of this LBI while BESS is already running (or is about to be started) has no effect.			

⬅ back to Logical binary inputs alphabetically

## BCB Open

Related FW	2.1.0	Related applications	MINT
LBI ID	274		
Description			
This LBI serves for demanding BCB to open and preventing its closing If the BCB breaker is closed (LBI <b>BCB FEEDBACK</b> = 1) and a pulse comes to the LBI BCB Open, the unloading sequence is initiated in <b>Controller Mode</b> =AUTO.			
<b>Note:</b> Having the setup of no BCB control ( <b>BCB Type</b> = Fuse/Disc.) or external BCB control set up ( <b>BCB Control Mode</b> = External) will the LBI BCB Open not do any of its function.			
When Value <b>BESS P</b> gets below the Setpoint <b>BESS Unload Level BCB Open</b> (page 591). In case there is no other source that can take the load, BCB is opened immediately. If the breaker is opened and this LBI is active, breaker closing is not accepted. When this LBI is received by the controller, history record "BCB Open Requested, Close Blocked" is written to the history. If this LBI is deactivated or controller mode is changed to one that does not support this LBI, history record "BCB Close Unblocked" is written to the history.			

⬅ back to Logical binary inputs alphabetically

## LBI: E

## ECU Key Switch

Related FW	2.1.0	Related applications	MINT
LBI ID	951		
Description			
Activation of this binary input activates LBO <b>ECU POWER RELAY</b> 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



## Emergency MAN

Related FW	2.1.0	Related applications	MINT
LBI ID	45		
<b>Description</b>			
<p>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.</p> <p>The controller behaves in the following way:</p> <ul style="list-style-type: none"><li>➤ Stops all functions regarding the BESS and breaker control, deactivates all outputs related to it.</li><li>➤ 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.</li></ul>			

⬅ back to Logical binary inputs alphabetically

## Emergency Stop

Related FW	2.1.0	Related applications	MINT
LBI ID	40		
<b>Description</b>			
<p>When this binary input is activated, BESS is immediately stopped, binary outputs are disconnected and alarm <b>Emergency Stop</b> is activated.</p>			

⬅ back to Logical binary inputs alphabetically

## ES Charge Enable

Related FW	2.1.0	Related applications	MINT
LBI ID	1105		
<b>Description</b>			
<p>This logical input enables charging process of the battery.</p>			

⬅ back to Logical binary inputs alphabetically

## ES Charging

Related FW	2.1.0	Related applications	MINT
LBI ID	1263		
<b>Description</b>			
<p>The status of this LBI is mirrored in group <b>BMS Info</b></p>			

⬅ back to Logical binary inputs alphabetically



## ES Discharge Enable

Related FW	2.1.0	Related applications	MINT
LBI ID	1106		
Description			
This logical input enables discharging process of the battery.			

⬅ back to Logical binary inputs alphabetically

## ES Discharging

Related FW	2.1.0	Related applications	MINT
LBI ID	1262		
Description			
The status of this LBI is mirrored in group <b>BMS Info</b>			

⬅ back to Logical binary inputs alphabetically

## ES Ready To Load

Related FW	2.1.0	Related applications	MINT
LBI ID	1165		
Description			
Logical binary input signaling that the Energy Storage is ready to be connected to the DC Bus. For the core application to function properly, this function must be configured. Deactivation of this LBI after certain starting sequence or already loaded state will activate alarm <b>SD Unexpected Source State</b> .			

⬅ back to Logical binary inputs alphabetically

## ES Ready To Start

Related FW	2.1.0	Related applications	MINT
LBI ID	1164		
Description			
Logical binary input for Energy Storage readiness to start. For the core application to function properly, this function must be configured. Deactivation of this LBI after certain starting sequence or already loaded state will activate alarm <b>SD Unexpected Source State</b> .			

⬅ back to Logical binary inputs alphabetically



ESCB Feedback

Related FW	2.1.0	Related applications	MINT
LBI ID	1169		

Description

Use this input to indicate whether the Energy Storage circuit breaker is opened or closed.

Binary Output Breaker Close/Open

On

Off

Waiting for feedback 2 s

Feedback match

Time

Breaker Feedback

Breaker Fail when feedback does not match

Image 7.15 BCB Feedback 1

Binary Output Breaker Close/Open

On

Off

Waiting for feedback 2 s

Feedback match

Time

Breaker Feedback

Breaker Fail when feedback does not match

Image 7.16 BCB Feedback 2

This input is used for connection of the normally open feedback contact from the Energy Storage circuit breaker or contactor. If the input is active, the controller will consider the ESCB as closed.

- > If the feedback does not respond to a change of the control output LBO **ESCB CLOSE/OPEN** within time adjusted in Setpoint **Waiting For Breaker Feedback**, 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 **Sd ESCB Fail** will be issued immediately.

⬅ back to Logical binary inputs alphabetically



ESCB Feedback Negative

Related FW	2.1.0	Related applications	MINT
LBI ID	1170		
<b>Description</b>			
<p>Use this input to indicate whether the Energy Storage circuit breaker is opened or closed. This input is used for connection of the normally closed feedback contact from the ES 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 <b>ESCB FEEDBACK</b>. Maximal allowed time the both inputs are in the same position is 500ms, after this time the Alarm <b>Sd ESCB Fail</b> is issued.</p>			

Image 7.17 BCB Feedback Negative 1

Image 7.18 BCB Feedback Negative 2

⬅ back to Logical binary inputs alphabetically

Ext Supply Fail

Related FW	2.1.0	Related applications	MINT
LBI ID	1294		
Description			
The status of this LBI is mirrored in group <b>AUX Info</b>			

⬅ back to Logical binary inputs alphabetically

Ext Supply OK


Related FW	2.1.0	Related applications	MINT
LBI ID	1293		
Description			
The status of this LBI is mirrored in group <b>AUX Info</b>			

⬅ back to Logical binary inputs alphabetically



## LBI: F

### Fault Reset Button

Related FW	2.1.0	Related applications	MINT
LBI ID	191		
Description			
Binary input has the same function as Fault Reset button  on an <b>External display</b> Internal display.			

⬆ back to Logical binary inputs alphabetically

### Fire Suppression Activated

Related FW	2.1.0	Related applications	MINT
LBI ID	1286		
Description			
The status of this LBI is mirrored in group <b>AUX Info</b>			

⬆ back to Logical binary inputs alphabetically

### Fire Suppression Alarm Level 1

Related FW	2.1.0	Related applications	MINT
LBI ID	1283		
Description			
The status of this LBI is mirrored in group <b>AUX Info</b>			

⬆ back to Logical binary inputs alphabetically

### Fire Suppression Alarm Level 2

Related FW	2.1.0	Related applications	MINT
LBI ID	1284		
Description			
The status of this LBI is mirrored in group <b>AUX Info</b>			

⬆ back to Logical binary inputs alphabetically

### Forced Value Input 01

Related FW	2.1.0	Related applications	MINT
LBI ID	19		
Description			
This LBI is used for activation of preconfigured <b>Forced Value</b> to setpoint.			
<b>Note:</b> This LBI can be renamed during configuration.			

⬆ back to Logical binary inputs alphabetically



### Forced Value Input 02

Related FW	2.1.0	Related applications	MINT
LBI ID	20		
Description			
This LBI is used for activation of preconfigured <b>Forced Value</b> to setpoint.			
<b>Note:</b> This LBI can be renamed during configuration.			

⬅ back to Logical binary inputs alphabetically

### Forced Value Input 03

Related FW	2.1.0	Related applications	MINT
LBI ID	21		
Description			
This LBI is used for activation of preconfigured <b>Forced Value</b> to setpoint.			
<b>Note:</b> This LBI can be renamed during configuration.			

⬅ back to Logical binary inputs alphabetically

### Forced Value Input 04

Related FW	2.1.0	Related applications	MINT
LBI ID	22		
Description			
This LBI is used for activation of preconfigured <b>Forced Value</b> to setpoint.			
<b>Note:</b> This LBI can be renamed during configuration.			

⬅ back to Logical binary inputs alphabetically

### Forced Value Input 05

Related FW	2.1.0	Related applications	MINT
LBI ID	23		
Description			
This LBI is used for activation of preconfigured <b>Forced Value</b> to setpoint.			
<b>Note:</b> This LBI can be renamed during configuration.			

⬅ back to Logical binary inputs alphabetically

### Forced Value Input 06

Related FW	2.1.0	Related applications	MINT
LBI ID	24		
Description			
This LBI is used for activation of preconfigured <b>Forced Value</b> to setpoint.			
<b>Note:</b> This LBI can be renamed during configuration.			

⬅ back to Logical binary inputs alphabetically



### Forced Value Input 07

Related FW	2.1.0	Related applications	MINT
LBI ID	25		
Description			
This LBI is used for activation of preconfigured <b>Forced Value</b> to setpoint.			
<b>Note:</b> This LBI can be renamed during configuration.			

⬅ back to Logical binary inputs alphabetically

### Forced Value Input 08

Related FW	2.1.0	Related applications	MINT
LBI ID	26		
Description			
This LBI is used for activation of preconfigured <b>Forced Value</b> to setpoint.			
<b>Note:</b> This LBI can be renamed during configuration.			

⬅ back to Logical binary inputs alphabetically

### Forced Value Input 09

Related FW	2.1.0	Related applications	MINT
LBI ID	27		
Description			
This LBI is used for activation of preconfigured <b>Forced Value</b> to setpoint.			
<b>Note:</b> This LBI can be renamed during configuration.			

⬅ back to Logical binary inputs alphabetically

### Forced Value Input 10

Related FW	2.1.0	Related applications	MINT
LBI ID	28		
Description			
This LBI is used for activation of preconfigured <b>Forced Value</b> to setpoint.			
<b>Note:</b> This LBI can be renamed during configuration.			

⬅ back to Logical binary inputs alphabetically

### Forced Value Input 11

Related FW	2.1.0	Related applications	MINT
LBI ID	29		
Description			
This LBI is used for activation of preconfigured <b>Forced Value</b> to setpoint.			
<b>Note:</b> This LBI can be renamed during configuration.			

⬅ back to Logical binary inputs alphabetically



### Forced Value Input 12

Related FW	2.1.0	Related applications	MINT
LBI ID	30		
Description			
This LBI is used for activation of preconfigured <b>Forced Value</b> to setpoint.			
<i>Note: This LBI can be renamed during configuration.</i>			

⬅ back to Logical binary inputs alphabetically

### Forced Value Input 13

Related FW	2.1.0	Related applications	MINT
LBI ID	31		
Description			
This LBI is used for activation of preconfigured <b>Forced Value</b> to setpoint.			
<i>Note: This LBI can be renamed during configuration.</i>			

⬅ back to Logical binary inputs alphabetically

### Forced Value Input 14

Related FW	2.1.0	Related applications	MINT
LBI ID	32		
Description			
This LBI is used for activation of preconfigured <b>Forced Value</b> to setpoint.			
<i>Note: This LBI can be renamed during configuration.</i>			

⬅ back to Logical binary inputs alphabetically

### Forced Value Input 15

Related FW	2.1.0	Related applications	MINT
LBI ID	33		
Description			
This LBI is used for activation of preconfigured <b>Forced Value</b> to setpoint.			
<i>Note: This LBI can be renamed during configuration.</i>			

⬅ back to Logical binary inputs alphabetically

### Forced Value Input 16

Related FW	2.1.0	Related applications	MINT
LBI ID	34		
Description			
This LBI is used for activation of preconfigured <b>Forced Value</b> to setpoint.			
<i>Note: This LBI can be renamed during configuration.</i>			

⬅ back to Logical binary inputs alphabetically



### Forced Value Input 17

Related FW	2.1.0	Related applications	MINT
LBI ID	839		
Description			
This LBI is used for activation of preconfigured <b>Forced Value</b> to setpoint.			
<b>Note:</b> This LBI can be renamed during configuration.			

⬅ back to Logical binary inputs alphabetically

### Forced Value Input 18

Related FW	2.1.0	Related applications	MINT
LBI ID	840		
Description			
This LBI is used for activation of preconfigured <b>Forced Value</b> to setpoint.			
<b>Note:</b> This LBI can be renamed during configuration.			

⬅ back to Logical binary inputs alphabetically

### Forced Value Input 19

Related FW	2.1.0	Related applications	MINT
LBI ID	841		
Description			
This LBI is used for activation of preconfigured <b>Forced Value</b> to setpoint.			
<b>Note:</b> This LBI can be renamed during configuration.			

⬅ back to Logical binary inputs alphabetically

### Forced Value Input 20

Related FW	2.1.0	Related applications	MINT
LBI ID	842		
Description			
This LBI is used for activation of preconfigured <b>Forced Value</b> to setpoint.			
<b>Note:</b> This LBI can be renamed during configuration.			

⬅ back to Logical binary inputs alphabetically

### Forced Value Input 21

Related FW	2.1.0	Related applications	MINT
LBI ID	843		
Description			
This LBI is used for activation of preconfigured <b>Forced Value</b> to setpoint.			
<b>Note:</b> This LBI can be renamed during configuration.			

⬅ back to Logical binary inputs alphabetically



### Forced Value Input 22

Related FW	2.1.0	Related applications	MINT
LBI ID	844		
Description			
This LBI is used for activation of preconfigured <b>Forced Value</b> to setpoint.			
<b>Note:</b> This LBI can be renamed during configuration.			

⬅ back to Logical binary inputs alphabetically

### Forced Value Input 23

Related FW	2.1.0	Related applications	MINT
LBI ID	845		
Description			
This LBI is used for activation of preconfigured <b>Forced Value</b> to setpoint.			
<b>Note:</b> This LBI can be renamed during configuration.			

⬅ back to Logical binary inputs alphabetically

### Forced Value Input 24

Related FW	2.1.0	Related applications	MINT
LBI ID	846		
Description			
This LBI is used for activation of preconfigured <b>Forced Value</b> to setpoint.			
<b>Note:</b> This LBI can be renamed during configuration.			

⬅ back to Logical binary inputs alphabetically

## LBI: G

### Geo Home Position

Related FW	2.1.0	Related applications	MINT
Comm object	219		
Description			
This binary input can be used to adjust home position of BESS. In case that binary input is active, setpoints <b>Home Latitude</b> and <b>Home Longitude</b> are adjusted automatically from actual coordinates from GPS signal.			
<b>Note:</b> Input has to be activated for at least 2 seconds.			

⬅ back to Logical binary inputs alphabetically

### Geo-Fencing Enable

Related FW	2.1.0	Related applications	MINT
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".

⬅ back to Logical binary inputs alphabetically


### Group link

Related FW	2.1.0	Related applications	MINT
LBI ID	59		
<b>Description</b>			
This input is used for logical connection and disconnection of two BESS groups selected with setpoints <b>Group Link L</b> and <b>Group Link R</b> . If the input is active, then the two selected groups will perform <b>Power Management</b> , load sharing and Var sharing together as one large group.			
<i><b>Note:</b> 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.</i>			
<p><b>IMPORTANT:</b> In case the LBI is not configured, BTB controller makes automatically Group link function through closing the BTB breaker.</p> <p>In case the LBI is configured, the group link is provided first when LBI MCB FEEDBACK and LBI GROUP LINK is closed.</p>			

⬅ back to Logical binary inputs alphabetically

### LBI: H

#### Horn Reset Button

Related FW	2.1.0	Related applications	MINT
LBI ID	192		
<b>Description</b>			
Binary input has the same function as Horn reset  button on an <b>External display</b> Internal display.			

⬅ back to Logical binary inputs alphabetically

#### HVAC Alarm Level 1

Related FW	2.1.0	Related applications	MINT
LBI ID	1275		
<b>Description</b>			
The status of this LBI is mirrored in group <b>AUX Info</b>			

⬅ back to Logical binary inputs alphabetically

#### HVAC Alarm Level 2

Related FW	2.1.0	Related applications	MINT
LBI ID	1276		
<b>Description</b>			
The status of this LBI is mirrored in group <b>AUX Info</b>			

⬅ back to Logical binary inputs alphabetically



## HVAC Communication Failure

Related FW	2.1.0	Related applications	MINT
LBI ID	1277		
Description			
The status of this LBI is mirrored in group <b>AUX Info</b>			

⬅ back to Logical binary inputs alphabetically

## HVAC High External Temperature

Related FW	2.1.0	Related applications	MINT
LBI ID	1281		
Description			
The status of this LBI is mirrored in group <b>AUX Info</b>			

⬅ back to Logical binary inputs alphabetically

## HVAC High Internal Temperature

Related FW	2.1.0	Related applications	MINT
LBI ID	1279		
Description			
The status of this LBI is mirrored in group <b>AUX Info</b>			

⬅ back to Logical binary inputs alphabetically

## HVAC Low External Temperature

Related FW	2.1.0	Related applications	MINT
LBI ID	1282		
Description			
The status of this LBI is mirrored in group <b>AUX Info</b>			

⬅ back to Logical binary inputs alphabetically

## HVAC Low Internal Temperature

Related FW	2.1.0	Related applications	MINT
LBI ID	1280		
Description			
The status of this LBI is mirrored in group <b>AUX Info</b>			

⬅ back to Logical binary inputs alphabetically

## HVAC Running

Related FW	2.1.0	Related applications	MINT
LBI ID	1278		
Description			
The status of this LBI is mirrored in group <b>AUX Info</b>			

⬅ back to Logical binary inputs alphabetically



## LBID: I

### Ignore High SOC

Related FW	2.1.0	Related applications	MINT
LBID ID	1518		
Description			
<p>This LBI allows for charging of the energy storage even when value <b>ES SOC</b> is below set control target <b>SOC Low Target</b>. The activation of this LBI a protection AHI Ignore Low Target Activated appears in the alarm list and a history record is written. When the LBI is deactivated a history record Ignore High Target Deactivated is written in the history.</p> <p>For more information see <b>Ignore Target Control</b>.</p> <p><b>Note:</b> For safety it is recommended to have the protections for SOC enabled since the ignoring is not limited.</p>			

⬅ back to Logical binary inputs alphabetically

### Ignore Low SOC

Related FW	2.1.0	Related applications	MINT
LBID ID	1186		
Description			
<p>This LBI allows for charging of the energy storage even when value <b>ES SOC</b> is above set control target <b>SOC High Target</b>. The activation of this LBI a protection AHI Ignore High Target Activated appears in the alarm list and a history record is written. When the LBI is deactivated a history record Ignore High Target Deactivated is written in the history.</p> <p>For more information see <b>Ignore Target Control</b>.</p> <p><b>Note:</b> For safety it is recommended to have the protections for SOC enabled since the ignoring is not limited.</p>			

⬅ back to Logical binary inputs alphabetically

### Ignore High V Rel

Related FW	2.1.0	Related applications	MINT
LBID ID	1522		
Description			
<p>This LBI allows for charging of the energy storage even when value <b>ES Voltage Rel</b> is above set control target <b>V Rel High Target</b>. The activation of this LBI a protection AHI Ignore High Target Activated appears in the alarm list and a history record is written. When the LBI is deactivated a history record Ignore High Target Deactivated is written in the history.</p> <p>For more information see <b>Ignore Target Control</b>.</p> <p><b>Note:</b> For safety it is recommended to have the protections for ES Voltage enabled since the ignoring is not limited.</p>			

⬅ back to Logical binary inputs alphabetically



## Ignore Low V Rel

Related FW	2.1.0	Related applications	MINT
LBI ID	1521		
Description			
<p>This LBI allows for charging of the energy storage even when value <b>ES SOC</b> is below set control target <b>SOC High Target</b>. The activation of this LBI a protection AHI Ignore High Target Activated appears in the alarm list and a history record is written. When the LBI is deactivated a history record Ignore High Target Deactivated is written in the history.</p> <p>For more information see <b>Ignore Target Control</b>.</p> <p><b>Note:</b> For safety it is recommended to have the protections for ES Voltage enabled since the ignoring is not limited.</p>			

⬆ back to Logical binary inputs alphabetically

## Insulation Resistance Critical Low

Related FW	2.1.0	Related applications	MINT
LBI ID	1298		
Description			
The status of this LBI is mirrored in group <b>AUX Info</b>			

⬆ back to Logical binary inputs alphabetically

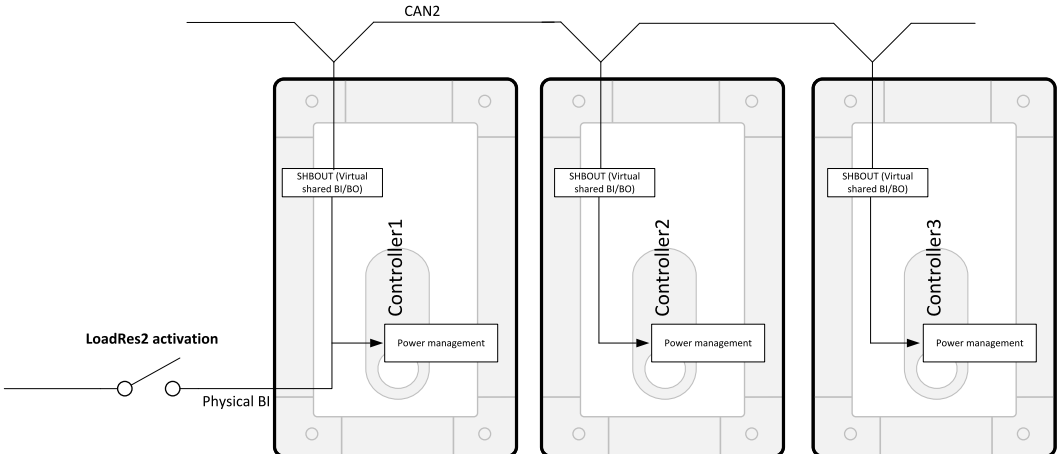
## Insulation Resistance Low

Related FW	2.1.0	Related applications	MINT
LBI ID	1297		
Description			
The status of this LBI is mirrored in group <b>AUX Info</b>			

⬆ back to Logical binary inputs alphabetically



Load Res 2 Active

Related FW	2.1.0	Related applications	MINT
LBI ID	49		
Description			
<p>This input is used to activate the load reserve set #2 (learn more about load reserve in the chapter <b>Power Management</b>) instead of the set #1, which is active by default. The set #2 is adjusted by setpoints:</p> <ul style="list-style-type: none"><li>&gt; <b>#Starting Load Reserve 2</b> and <b>#Stopping Load Reserve 2</b> if the power management is switched to absolute mode</li><li>&gt; <b>#Starting Rel Load Reserve 2</b> and <b>#Stopping Rel Load Reserve 2</b> if the power management is switched to relative mode.</li></ul> <p><b>IMPORTANT: All controllers cooperating together in Power management must have the same load reserve set selected.</b></p> <p><i>Note: It is possible to use virtual peripherals for distribution of the binary signal from one physical switch connected to one controller to all other controllers over the CAN bus.</i></p>			
			

◀ back to Logical binary inputs alphabetically



Load Res 3 Active

Related FW	2.1.0	Related applications	MINT
LBI ID	50		

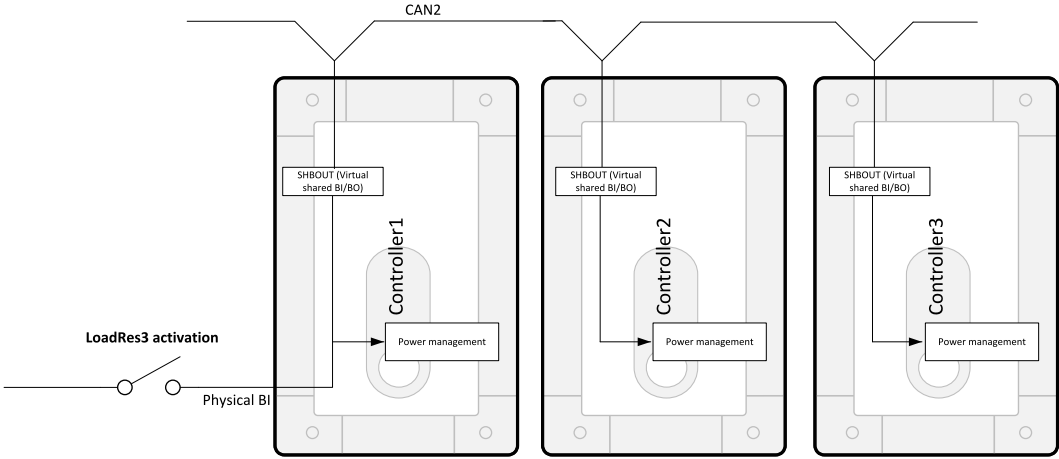
**Description**

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 peripherals for distribution of the binary signal from one physical switch connected to one controller to all other controllers over the CAN bus.*

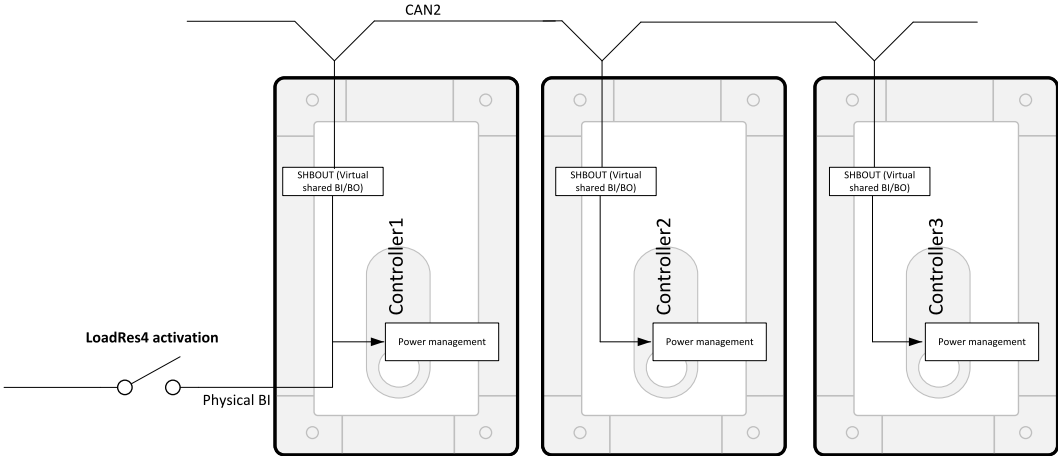


⬅ back to Logical binary inputs alphabetically



Load Res 4 Active

Related FW	2.1.0	Related applications	MINT
LBI ID	51		
Description			
<p>This input is used to activate the load reserve set #4 (learn more about load reserve in the chapter <b>Power Management</b>) instead of the set #1, which is active by default. The set #4 is adjusted by setpoints:</p> <ul style="list-style-type: none"><li>&gt; <b>#Starting Load Reserve 4</b> and <b>#Stopping Load Reserve 4</b> if the power management is switched to absolute mode</li><li>&gt; <b>#Starting Rel Load Reserve 4</b> and <b>#Stopping Rel Load Reserve 4</b> if the power management is switched to relative mode.</li></ul>			
<b>IMPORTANT: All controllers cooperating together in Power management must have the same load reserve set selected.</b>			
<p><i><b>Note:</b> It is possible to use virtual peripherals for distribution of the binary signal from one physical switch connected to one controller to all other controllers over the CAN bus.</i></p>			



The diagram illustrates a CAN bus network labeled CAN2 at the top. Three controllers, Controller1, Controller2, and Controller3, are connected to this bus. Each controller contains a 'Power management' block and a 'SHBOUT (Virtual shared BI/BO)' block. A 'Physical BI' (Binary Input) is connected to the 'SHBOUT' block of Controller1. This 'Physical BI' is also connected to a switch labeled 'LoadRes4 activation'. The 'SHBOUT' block of Controller1 is connected to the 'SHBOUT' blocks of Controller2 and Controller3, which in turn are connected to their respective 'Power management' blocks. This setup allows a single physical switch to activate the load reserve set #4 across all three controllers via the CAN bus.

⬅ back to Logical binary inputs alphabetically

LBI: M

Manual Load Reconnection

Related FW	2.1.0	Related applications	MINT
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 <b>Power P Load Reconnection Level</b> . This works only if automatic reconnection is disabled, i.e. the setpoint <b>Auto Load Reconnection</b> = Disabled.			

⬅ back to Logical binary inputs alphabetically



MCB Feedback

Related FW	2.1.0	Related applications	MINT
LBI ID	65		

**Description**

Use this input to indicate whether the Mainsmains circuitbus tie breaker is opened or closed.

Binary Output  
MCB Close/Open

On

Off

Waiting for  
feedback  
2 s

Feedback match

MCB Fail when feedback not match

Time

Binary Output  
BTB Close/Open

On

Off

Waiting for  
feedback  
2 s

Feedback match

BTB Fail when feedback not match

Time

Image 7.19 MCB Feedback 1

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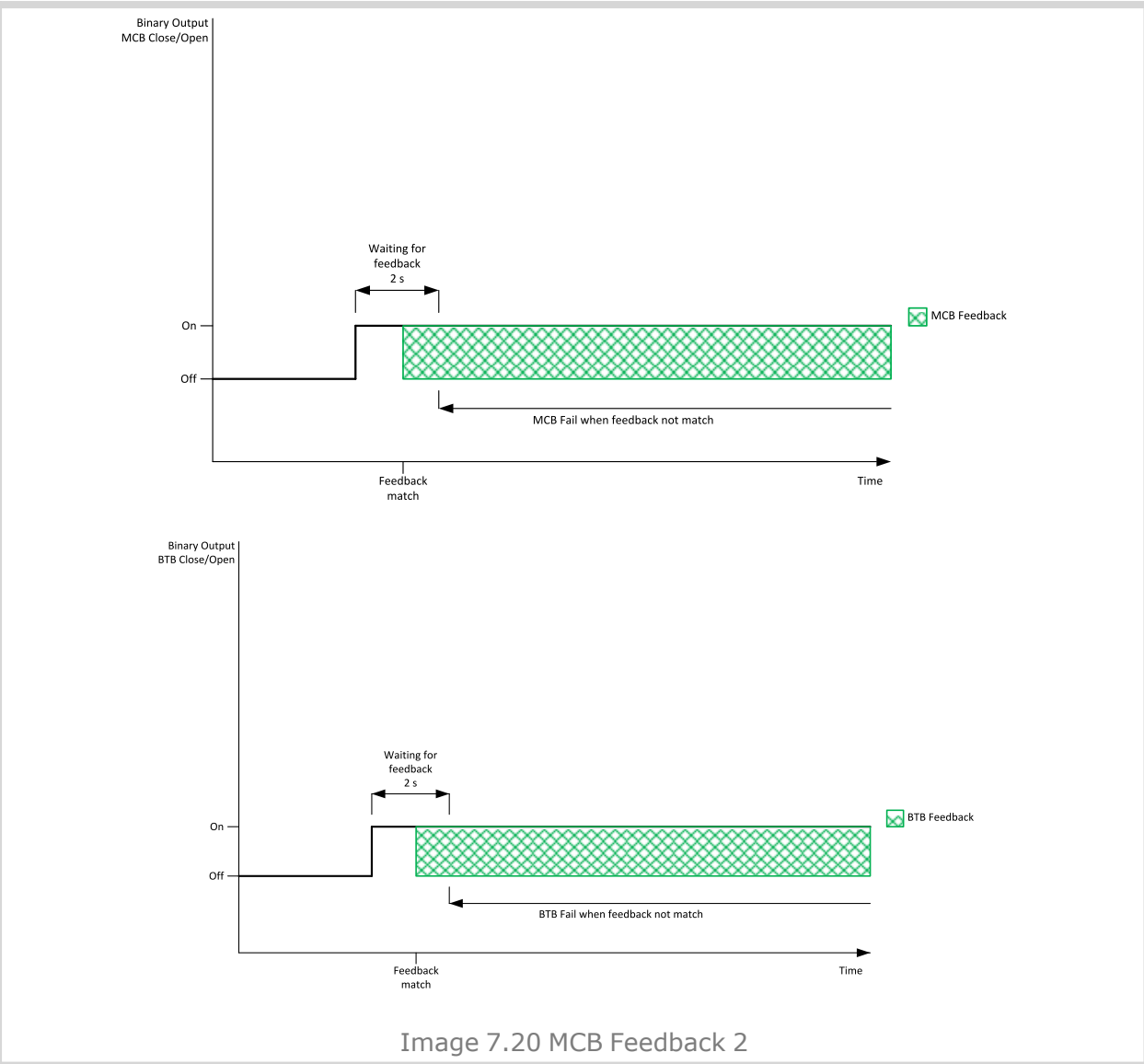


Image 7.20 MCB Feedback 2

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MCB Feedback Negative

Related FW	2.1.0	Related applications	MINT
LBI ID	66		

Description

Use this input to indicate whether the Mainsmains circuitbus tie breaker is opened or closed.  
This input is logically inverted against LBI **MCB FEEDBACK**.

The diagram illustrates the timing for MCB Feedback Negative. It features two vertical axes on the left: 'Binary Output MCB Close/Open' and 'Binary Output BTB Close/Open'. Each axis has 'On' and 'Off' states indicated by dashed boxes. The horizontal axis represents 'Time'. A solid line shows the output transitioning from 'On' to 'Off'. Following the transition, a horizontal double-headed arrow indicates a 'Waiting for feedback 2 s' period. A green hatched area represents the 'MCB Feedback Negative' signal, which is active (high) during this waiting period. A legend on the right shows a green square next to the text 'MCB Feedback Negative'. A vertical line marks the 'Feedback match' point. A horizontal arrow labeled 'MCB Fail when feedback not match' spans the duration from the output transition to the feedback match.

Binary Output MCB Close/Open

On

Off

Waiting for feedback 2 s

MCB Feedback Negative

MCB Fail when feedback not match

Feedback match

Time

The diagram illustrates the timing for BTB Feedback Negative. It features two vertical axes on the left: 'Binary Output MCB Close/Open' and 'Binary Output BTB Close/Open'. Each axis has 'On' and 'Off' states indicated by dashed boxes. The horizontal axis represents 'Time'. A solid line shows the output transitioning from 'On' to 'Off'. Following the transition, a horizontal double-headed arrow indicates a 'Waiting for feedback 2 s' period. A green hatched area represents the 'BTB Feedback Negative' signal, which is active (high) during this waiting period. A legend on the right shows a green square next to the text 'BTB Feedback Negative'. A vertical line marks the 'Feedback match' point. A horizontal arrow labeled 'BTB Fail when feedback not match' spans the duration from the output transition to the feedback match.

Binary Output BTB Close/Open

On

Off

Waiting for feedback 2 s

BTB Feedback Negative

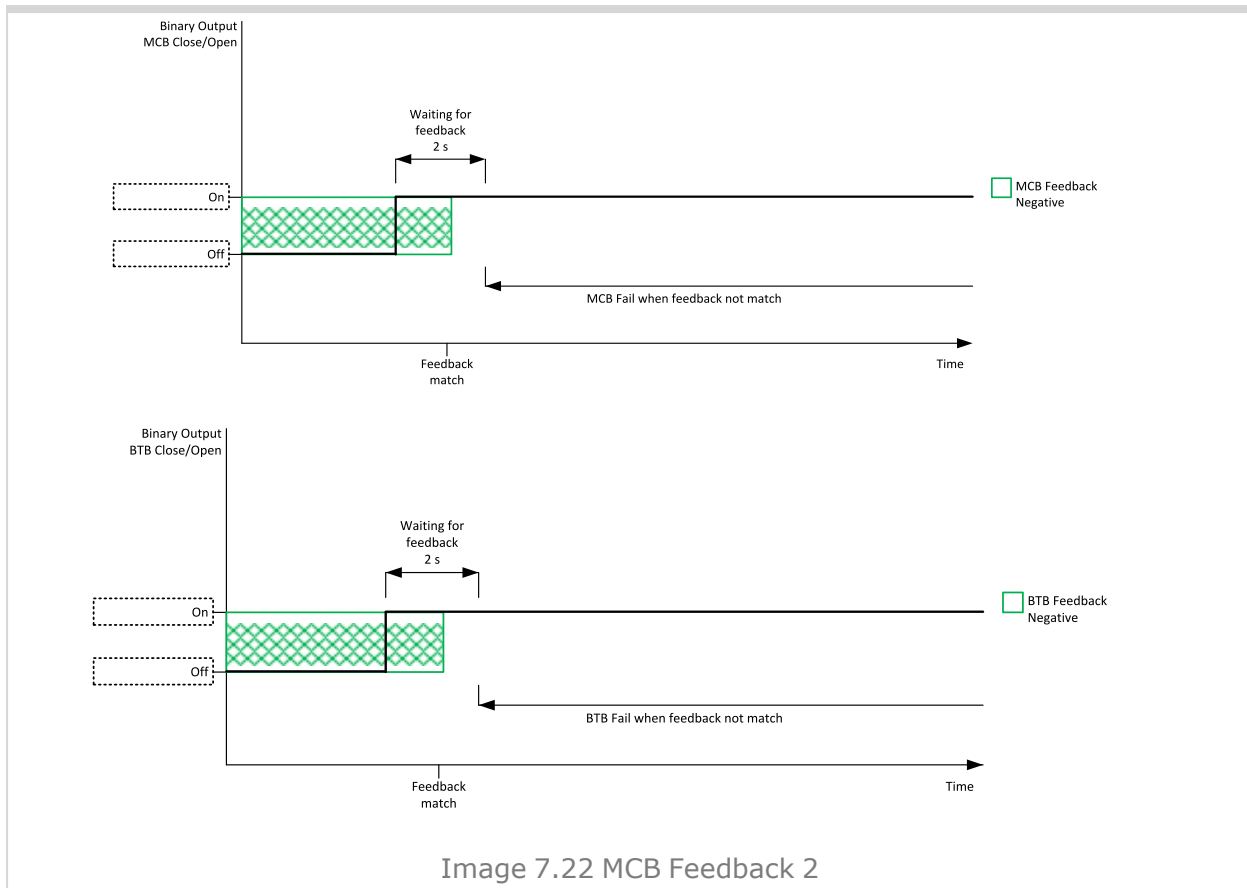
BTB Fail when feedback not match

Feedback match

Time

Image 7.21 MCB Feedback 1





⬅ back to Logical binary inputs alphabetically

### Min Run Power Act 1

Related FW	2.1.0	Related applications	MINT
LBI ID	52		
<b>Description</b>			
This input is used to activate the function Minimal running power #1, which is adjusted by setpoint #Min Run Power 1.			
<b>Note:</b> The default value of minimal running power, which takes place while none of the inputs Min Run Power x Act, is 0 kW.			
<b>Note:</b> 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.			
<b>IMPORTANT:</b> All controllers cooperating together in Power management must have the same minimal running power selected.			
<b>Note:</b> It is possible to use virtual peripherals 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 <b>LOAD RES 2 ACTIVE</b> .			

⬅ back to Logical binary inputs alphabetically



## Min Run Power Act 2

Related FW	2.1.0	Related applications	MINT
LBI ID	53		
<b>Description</b>			
This input is used to activate the function Minimal running power #2, which is adjusted by setpoint #Min Run Power 2.			
<i><b>Note:</b> The default value of minimal running power, which takes place while none of the inputs Min Run Power x Act, is 0 kW.</i>			
<i><b>Note:</b> 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.</i>			
<b>IMPORTANT: All controllers cooperating together in Power management must have the same minimal running power selected.</b>			
<i><b>Note:</b> 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 <b>LOAD RES 2 ACTIVE</b>.</i>			

⬅ back to Logical binary inputs alphabetically

## Min Run Power Act 3

Related FW	2.1.0	Related applications	MINT
LBI ID	54		
<b>Description</b>			
This input is used to activate the function Minimal running power #3, which is adjusted by setpoint #Min Run Power 3.			
<i><b>Note:</b> The default value of minimal running power, which takes place while none of the inputs Min Run Power x Act, is 0 kW.</i>			
<i><b>Note:</b> 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.</i>			
<b>IMPORTANT: All controllers cooperating together in Power management must have the same minimal running power selected.</b>			
<i><b>Note:</b> It is possible to use virtual peripherals 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 <b>LOAD RES 2 ACTIVE</b>.</i>			

⬅ back to Logical binary inputs alphabetically



LBI: N

### NCB Feedback

Related FW	2.1.0	Related applications	MINT
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 <b>#Neutral Contactor Control</b> which is used for selecting of the NCB mode (Each / Common).			

⬅ back to Logical binary inputs alphabetically

LBI: P

### PCS AC Over Frequency

Related FW	2.1.0	Related applications	MINT
LBI ID	1244		
Description			
The status of this LBI is mirrored in group <b>PCS Info</b>			

⬅ back to Logical binary inputs alphabetically

### PCS AC Over Voltage

Related FW	2.1.0	Related applications	MINT
LBI ID	1242		
Description			
The status of this LBI is mirrored in group <b>PCS Info</b>			

⬅ back to Logical binary inputs alphabetically

### PCS AC Overload

Related FW	2.1.0	Related applications	MINT
LBI ID	1246		
Description			
The status of this LBI is mirrored in group <b>PCS Info</b>			

⬅ back to Logical binary inputs alphabetically

### PCS AC Under Frequency

Related FW	2.1.0	Related applications	MINT
LBI ID	1245		
Description			
The status of this LBI is mirrored in group <b>PCS Info</b>			

⬅ back to Logical binary inputs alphabetically



### PCS AC Under Voltage

Related FW	2.1.0	Related applications	MINT
LBI ID	1243		
Description			
The status of this LBI is mirrored in group <b>PCS Info</b>			

⬅ back to Logical binary inputs alphabetically

### PCS Alarm Level 1

Related FW	2.1.0	Related applications	MINT
LBI ID	1232		
Description			
The status of this LBI is mirrored in group <b>PCS Info</b>			

⬅ back to Logical binary inputs alphabetically

### PCS Alarm Level 2

Related FW	2.1.0	Related applications	MINT
LBI ID	1233		
Description			
The status of this LBI is mirrored in group <b>PCS Info</b>			

⬅ back to Logical binary inputs alphabetically

### PCS Communication Failure

Related FW	2.1.0	Related applications	MINT
LBI ID	1234		
Description			
The status of this LBI is mirrored in group <b>PCS Info</b>			

⬅ back to Logical binary inputs alphabetically

### PCS Critical Temperature

Related FW	2.1.0	Related applications	MINT
LBI ID	1250		
Description			
The status of this LBI is mirrored in group <b>PCS Info</b>			

⬅ back to Logical binary inputs alphabetically

### PCS DC Over Voltage

Related FW	2.1.0	Related applications	MINT
LBI ID	1239		
Description			
The status of this LBI is mirrored in group <b>PCS Info</b>			

⬅ back to Logical binary inputs alphabetically



### PCS DC Overload

Related FW	2.1.0	Related applications	MINT
LBI ID	1241		
Description			
The status of this LBI is mirrored in group <b>PCS Info</b>			

⬆️ back to Logical binary inputs alphabetically

### PCS DC Under Voltage

Related FW	2.1.0	Related applications	MINT
LBI ID	1240		
Description			
The status of this LBI is mirrored in group <b>PCS Info</b>			

⬆️ back to Logical binary inputs alphabetically

### PCS Derating

Related FW	2.1.0	Related applications	MINT
LBI ID	1248		
Description			
The status of this LBI is mirrored in group <b>PCS Info</b>			

⬆️ back to Logical binary inputs alphabetically

### PCS High Temperature

Related FW	2.1.0	Related applications	MINT
LBI ID	1249		
Description			
The status of this LBI is mirrored in group <b>PCS Info</b>			

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## PCS Output Control Mode U-f/P-Q

Related FW	2.1.0	Related applications	MINT
LBI ID	1109		
<b>Description</b>			
<p>This logical input provides information to the controller 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 <b>HLC Control mode</b> making so that the control of PQ takes place. More info can be read <b>see BESS output control methods P-Q / U-f on page 251</b></p> <p><b>Note:</b> Having this LBI configured and active while the setpoint Start Sequence BCB Control = Start with Opened BCB the alarm <b>SD Wrong P-Q Control Settings</b> 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 <b>SD Wrong P-Q Control Settings</b> will appear and stay active until the LBI is deactivated.</p> <p><b>Note:</b> 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 <b>BESS Anti Islanding</b> protection is tripped, BCB is opened, the BESS goes to Stop and Ready state while the DC circuit is to be yet opened.</p>			

⬅ back to Logical binary inputs alphabetically

## PCS PQ Mode

Related FW	2.1.0	Related applications	MINT
LBI ID	1251		
<b>Description</b>			
The status of this LBI is mirrored in group <b>PCS Info</b>			

⬅ back to Logical binary inputs alphabetically

## PCS Ready To Load

Related FW	2.1.0	Related applications	MINT
LBI ID	121		
<b>Description</b>			
<p>Activation of this LBI signalizes that BESS is ready to be loaded. Once this LBI gets active and the BESS finished the stabilization phase, <b>BESS state</b> goes to Energized. Deactivation of this LBI after certain starting sequence or already loaded state will activate alarm <b>SD Unexpected PCS State</b>. Having this LBI active during Ready state will the controller block the start of the BESS and keep the controller in Ready state. The activation of this LBI is advised to be done only when the LBO <b>PCS RUN REQUEST</b> is active and value <b>BESS state</b> is visualizing Ready To Start. Important that this LBI receives information that the PCS is no longer considered loaded in order to start the system again.</p> <p>➤ If this LBI is configured and it is not activated before <b>PCS Ready To Load TOPCS Ready To Load TO</b> elapsed the alarm <b>Start Fail</b> is activated.</p>			

⬅ back to Logical binary inputs alphabetically



## PCS Ready To Start

Related FW	2.1.0	Related applications	MINT
LBI ID	1163		
<b>Description</b>			
Logical binary input for PCS readiness. This LBI is important for the controller system to be able to get in to Loaded state. Not having this LBI active during the countdown of setpoint <b>PCS Ready To Start TO</b> will not allow the <b>BESS state</b> to continue. Deactivation of this LBI after certain starting sequence or already loaded state will activate alarm <b>SD Unexpected PCS State</b>			

⬅ back to Logical binary inputs alphabetically

## PCS Running

Related FW	2.1.0	Related applications	MINT
LBI ID	1236		
<b>Description</b>			
The status of this LBI is mirrored in group <b>PCS Info</b>			

⬅ back to Logical binary inputs alphabetically

## PCS Saturated

Related FW	2.1.0	Related applications	MINT
LBI ID	1247		
<b>Description</b>			
The status of this LBI is mirrored in group <b>PCS Info</b>			

⬅ back to Logical binary inputs alphabetically

## PCS Start Disabled

Related FW	2.1.0	Related applications	MINT
LBI ID	1185		
<b>Description</b>			
This LBI can be used to keep the BESS in idle operation. The controller will stay in BESS State = Ready To Start when the LBI is active before the controller gets into Energized state. Once the LBI deactivates the controller continues in the next states.			
<i>Note: The LBI function does not disable the PCS once it has already started.</i>			

⬅ back to Logical binary inputs alphabetically

## PCS Starting

Related FW	2.1.0	Related applications	MINT
LBI ID	1235		
<b>Description</b>			
The status of this LBI is mirrored in group <b>PCS Info</b>			

⬅ back to Logical binary inputs alphabetically



### PCS Stopped

Related FW	2.1.0	Related applications	MINT
LBI ID	1238		
Description			
The status of this LBI is mirrored in group <b>PCS Info</b>			

⬅ back to Logical binary inputs alphabetically

### PCS Stopping

Related FW	2.1.0	Related applications	MINT
LBI ID	1237		
Description			
The status of this LBI is mirrored in group <b>PCS Info</b>			

⬅ back to Logical binary inputs alphabetically

### PCS VF Const Freq

Related FW	2.1.0	Related applications	MINT
LBI ID	1252		
Description			
The status of this LBI is mirrored in group <b>PCS Info</b>			

⬅ back to Logical binary inputs alphabetically

### PCS VF Droop

Related FW	2.1.0	Related applications	MINT
LBI ID	1253		
Description			
The status of this LBI is mirrored in group <b>PCS Info</b>			

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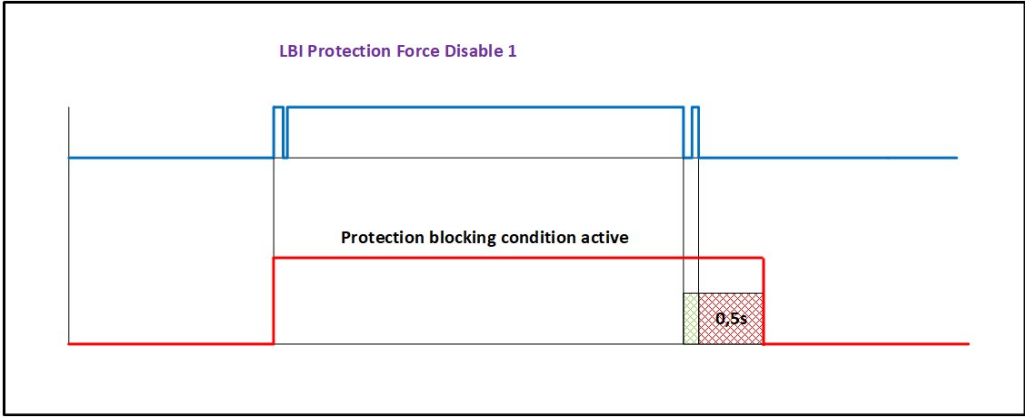
### Precharge Finished

Related FW	2.1.0	Related applications	MINT
LBI ID	1171		
Description			
<p>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).</p> <p>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.</p> <p>This LBI relates to the BESS Precharge Types decrcribed in <b>BESS Precharge Types</b>.</p>			

⬅ back to Logical binary inputs alphabetically

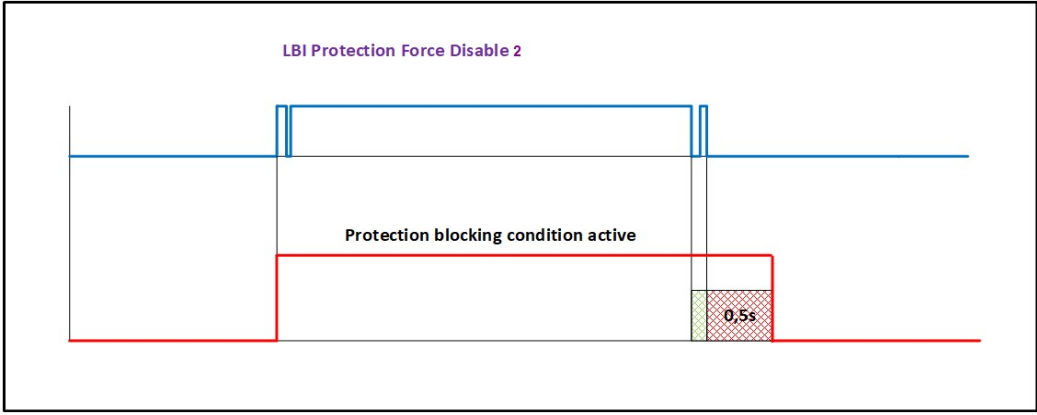


## Protection Force Disable Block 1

Related FW	2.1.0	Related applications	MINT
LBI ID	16		
<b>Description</b>			
<p>Activation of this LBI disables blocks selected protections.</p> <p>Proper history record is written to the history log.</p> <ul style="list-style-type: none"> <li>➤ Protection Force Disable Block 1 active</li> <li>➤ Protection Force Disable Block 1 inactive</li> </ul>			
			

⬅ back to Logical binary inputs alphabetically

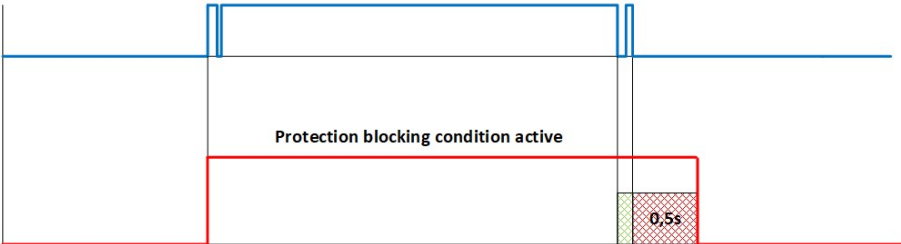
## Protection Force Disable Block 2

Related FW	2.1.0	Related applications	MINT
LBI ID	17		
<b>Description</b>			
<p>Activation of this LBI disables blocks selected protections.</p> <p>Proper history record is written to the history log.</p> <ul style="list-style-type: none"> <li>➤ Protection Force Disable Block 2 active</li> <li>➤ Protection Force Disable Block 2 inactive</li> </ul>			
			

⬅ back to Logical binary inputs alphabetically



### Protection Force Disable Block 3

Related FW	2.1.0	Related applications	MINT
LBI ID	18		
<b>Description</b>			
Activation of this LBI disables blocks selected protections.			
Proper history record is written to the history log.			
<div>➤ Protection Force Disable Block 3 active</div> <div>➤ Protection Force Disable Block 3 inactive</div>			
<div><div>LBI Protection Force Disable 3</div></div>			

⬅ back to Logical binary inputs alphabetically

### PSU Alarm Level 1

Related FW	2.1.0	Related applications	MINT
LBI ID	1287		
Description			
The status of this LBI is mirrored in group <b>AUX Info</b>			

⬅ back to Logical binary inputs alphabetically

### PSU Alarm Level 2

Related FW	2.1.0	Related applications	MINT
LBI ID	1288		
Description			
The status of this LBI is mirrored in group <b>AUX Info</b>			

⬅ back to Logical binary inputs alphabetically

### PSU Critical Temperature

Related FW	2.1.0	Related applications	MINT
LBI ID	1292		
Description			
The status of this LBI is mirrored in group <b>AUX Info</b>			

⬅ back to Logical binary inputs alphabetically



## PSU High Temperature

Related FW	2.1.0	Related applications	MINT
LBI ID	1291		
Description			
The status of this LBI is mirrored in group <b>AUX Info</b>			

⬅ back to Logical binary inputs alphabetically

## PSU Over/Under Voltage

Related FW	2.1.0	Related applications	MINT
LBI ID	1289		
Description			
The status of this LBI is mirrored in group <b>AUX Info</b>			

⬅ back to Logical binary inputs alphabetically

## PSU Overload

Related FW	2.1.0	Related applications	MINT
LBI ID	1290		
Description			
The status of this LBI is mirrored in group <b>AUX Info</b>			

⬅ back to Logical binary inputs alphabetically

## LBI: R

### Remote AUTO

Related FW	2.1.0	Related applications	MINT
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 // TESTSWB binary inputs			
Remote control priority:			
➤ Remote OFF (Highest priority)			
➤ Remote MAN			
➤ Remote AUTO (Lowest Priority)			

⬅ back to Logical binary inputs alphabetically



## Remote Ctrl Lock

Related FW	2.1.0	Related applications	MINT
LBI ID	4		
Description			
If the input is active, the controller will not accept any actions regarding the system control - e. g. writing of commands and setpoints change via remote communication interfaces.			

⬅ back to Logical binary inputs alphabetically

## Remote MAN MODE

Related FW	2.1.0	Related applications	MINT
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	2.1.0	Related applications	MINT
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 Start/Stop

Related FW	2.1.0	Related applications	MINT
LBI ID	38		
Description			
Use this input to start and stop the BESS in AUTO and TEST and SWB mode. This information is shared to all controllers in the same group connected to the master controller via CAN.			
Taken action in MINT application (AUTO Mode)			
Active	Starts the BESS after #System Start Delay if Power Management (page 1)Power Management = Enabled, otherwise it is started immediately.		
Inactive	Stops the BESS after #System Start Delay if Power Management (page 1)Power Management = Enabled, otherwise it is stopped immediately.		

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LBI: S

## Sd Override

Related FW	2.1.0	Related applications	MINT
LBI ID	44		
Description			
If this input is active, all alarms except <b>Emergency Stop</b> , and <b>E-STOP</b> are suppressed. The suppressed alarms will be displayed in the alarm list, but they will not take effect regarding the BESS control.			
<b>Note:</b> <i>Wrn Override All Sd</i> is indicated in the alarm list if Sd Override mode is active to inform the operator that the BESS is not protected.			
<b>Note:</b> <i>User protections with protection type Shutdown Override are also NOT suppressed.</i>			
<b>IMPORTANT: MISUSE OF THIS INPUT CAN CAUSE DAMAGE TO THE BESS!</b>			

⬆ back to Logical binary inputs alphabetically

## Soft Unload Enable

Related FW	2.1.0	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.			
<b>Note:</b> <i>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.</i>			

⬆ back to Logical binary inputs alphabetically



### SOH Critical Low

Related FW	2.1.0	Related applications	MINT
LBI ID	1274		
Description			
The status of this LBI is mirrored in group <b>BMS Info</b>			

⬅ back to Logical binary inputs alphabetically

### SOH Low

Related FW	2.1.0	Related applications	MINT
LBI ID	1273		
Description			
The status of this LBI is mirrored in group <b>BMS Info</b>			


⬅ back to Logical binary inputs alphabetically

### Source Not Operable

Related FW	2.1.0	Related applications	MINT
LBI ID	985		
Description			
This binary input signalizes not operable BESS. While it is activated the BESS can not be started ( <b>BESS state</b> = NotReady) and alarm <b>Source Not Ready</b> is active.			


⬅ back to Logical binary inputs alphabetically

### Start Button

Related FW	2.1.0	Related applications	MINT
LBI ID	189		
Description			
Binary input has the same function as Start Button  on an <b>External display</b> Internal display.			

⬅ back to Logical binary inputs alphabetically

### Stop Button

Related FW	2.1.0	Related applications	MINT
LBI ID	190		
Description			
Binary input has the same function as Stop Button  on an <b>External display</b> Internal display.			

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### Sunrise/Sunset Home Position

Related FW	2.1.0	Related applications	MINT
LBI ID	1120		
<b>Description</b>			
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).			

⬅ back to Logical binary inputs alphabetically

### Synchronization Disabled

Related FW	2.1.0	Related applications	MINT
LBI ID	277		
<b>Description</b>			
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.			

⬅ back to Logical binary inputs alphabetically

### String Healthy 1

Related FW	2.1.0	Related applications	MINT
LBI ID	1465		
<b>Description</b>			
Logical binary input for receiving from one of the BMS in the Multi BMS system that it is healthy. This logical binary input is mandatory for <b>Energy storage with Multiple BMS control</b> function.			

⬅ back to Logical binary inputs alphabetically

### String Healthy 2

Related FW	2.1.0	Related applications	MINT
LBI ID	1466		
<b>Description</b>			
Logical binary input for receiving from one of the BMS in the Multi BMS system that it is healthy. This logical binary input is mandatory for <b>Energy storage with Multiple BMS control</b> function.			

⬅ back to Logical binary inputs alphabetically

### String Healthy 3

Related FW	2.1.0	Related applications	MINT
LBI ID	1467		
<b>Description</b>			
Logical binary input for receiving from one of the BMS in the Multi BMS system that it is healthy. This logical binary input is mandatory for <b>Energy storage with Multiple BMS control</b> function.			

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### String Healthy 4

Related FW	2.1.0	Related applications	MINT
LBI ID	1468		
Description			
Logical binary input for receiving from one of the BMS in the Multi BMS system that it is healthy. This logical binary input is mandatory for <b>Energy storage with Multiple BMS control</b> function.			

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### String Healthy 5

Related FW	2.1.0	Related applications	MINT
LBI ID	1469		
Description			
Logical binary input for receiving from one of the BMS in the Multi BMS system that it is healthy. This logical binary input is mandatory for <b>Energy storage with Multiple BMS control</b> function.			

⬅ back to Logical binary inputs alphabetically

### String Healthy 6

Related FW	2.1.0	Related applications	MINT
LBI ID	1470		
Description			
Logical binary input for receiving from one of the BMS in the Multi BMS system that it is healthy. This logical binary input is mandatory for <b>Energy storage with Multiple BMS control</b> function.			

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### String Healthy 7

Related FW	2.1.0	Related applications	MINT
LBI ID	1471		
Description			
Logical binary input for receiving from one of the BMS in the Multi BMS system that it is healthy. This logical binary input is mandatory for <b>Energy storage with Multiple BMS control</b> function.			

⬅ back to Logical binary inputs alphabetically

### String Healthy 8

Related FW	2.1.0	Related applications	MINT
LBI ID	1472		
Description			
Logical binary input for receiving from one of the BMS in the Multi BMS system that it is healthy. This logical binary input is mandatory for <b>Energy storage with Multiple BMS control</b> function.			

⬅ back to Logical binary inputs alphabetically



SBMB Feedback 1

Related FW	2.1.0	Related applications	MINT
LBI ID	1457		

**Description**

Use this input to indicate whether the string battery module breaker is opened or closed.

Image 7.23 SBMB Feedback 1 closing

Image 7.24 SBMB Feedback 1 opening

This input is used for connection of the normally open feedback contact from the string battery module breaker or contactor. If the input is active, the controller will consider the Battery String as closed to the DC bus and vice versa.

- > If the feedback does not respond to a change of the control output **SBMB CLOSE/OPEN 1** within time adjusted in setpoint **SBMB Breaker Feedback TO**, otherwise specific alarm (fill in SBMB x Fail) 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 (fill in SBMB x Fail) will be issued immediately.

🔍 back to Logical binary inputs alphabetically



SBMB Feedback 2

Related FW	2.1.0	Related applications	MINT
LBI ID	1458		

**Description**

Use this input to indicate whether the string battery module breaker is opened or closed.

Binary Output Breaker Close/Open

On

Off

Waiting for feedback 2 s

Feedback match

Breaker Feedback

Breaker Fail when feedback does not match

Time

Image 7.25 SBMB Feedback 2 closing

Binary Output Breaker Close/Open

On

Off

Waiting for feedback 2 s

Feedback match

Breaker Feedback

Breaker Fail when feedback does not match

Time

Image 7.26 SBMB Feedback 2 opening

This input is used for connection of the normally open feedback contact from the string battery module breaker or contactor. If the input is active, the controller will consider the Battery String as closed to the DC bus and vice versa.

- > If the feedback does not respond to a change of the control output (fill the LBO SBMB Close/Open x) within time adjusted in Setpoint (fill in setpoint SBMB Breaker Feedback TO), otherwise specific alarm (fill in SBMB x Fail) 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 (fill in SBMB x Fail) will be issued immediately.

🔍 back to Logical binary inputs alphabetically



SBMB Feedback 3

Related FW	2.1.0	Related applications	MINT
LBI ID	1459		

**Description**

Use this input to indicate whether the string battery module breaker is opened or closed.

Binary Output Breaker Close/Open

On

Off

Waiting for feedback 2 s

Feedback match

Breaker Feedback

Breaker Fail when feedback does not match

Time

Image 7.27 SBMB Feedback 3 closing

Binary Output Breaker Close/Open

On

Off

Waiting for feedback 2 s

Feedback match

Breaker Feedback

Breaker Fail when feedback does not match

Time

Image 7.28 SBMB Feedback 3 opening

This input is used for connection of the normally open feedback contact from the string battery module breaker or contactor. If the input is active, the controller will consider the Battery String as closed to the DC bus and vice versa.

- > If the feedback does not respond to a change of the control output (fill the LBO SBMB Close/Open x) within time adjusted in Setpoint (fill in setpoint SBMB Breaker Feedback TO), otherwise specific alarm (fill in SBMB x Fail) 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 (fill in SBMB x Fail) will be issued immediately.

🔍 back to Logical binary inputs alphabetically



SBMB Feedback 4

Related FW	2.1.0	Related applications	MINT
LBI ID	1460		

**Description**

Use this input to indicate whether the string battery module breaker is opened or closed.

Image 7.29 SBMB Feedback 4 closing

Image 7.30 SBMB Feedback 4 opening

This input is used for connection of the normally open feedback contact from the string battery module breaker or contactor. If the input is active, the controller will consider the Battery String as closed to the DC bus and vice versa.

- > If the feedback does not respond to a change of the control output (fill the LBO SBMB Close/Open x) within time adjusted in Setpoint (fill in setpoint SBMB Breaker Feedback TO), otherwise specific alarm (fill in SBMB x Fail) 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 (fill in SBMB x Fail) will be issued immediately.

🔍 back to Logical binary inputs alphabetically



SBMB Feedback 5

Related FW	2.1.0	Related applications	MINT
LBI ID	1461		

**Description**

Use this input to indicate whether the string battery module breaker is opened or closed.

Binary Output Breaker Close/Open

On

Off

Waiting for feedback 2 s

Feedback match

Breaker Feedback

Breaker Fail when feedback does not match

Time

Image 7.31 SBMB Feedback 5 closing

Binary Output Breaker Close/Open

On

Off

Waiting for feedback 2 s

Feedback match

Breaker Feedback

Breaker Fail when feedback does not match

Time

Image 7.32 SBMB Feedback 5 opening

This input is used for connection of the normally open feedback contact from the string battery module breaker or contactor. If the input is active, the controller will consider the Battery String as closed to the DC bus and vice versa.

- > If the feedback does not respond to a change of the control output (fill the LBO SBMB Close/Open x) within time adjusted in Setpoint (fill in setpoint SBMB Breaker Feedback TO), otherwise specific alarm (fill in SBMB x Fail) 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 (fill in SBMB x Fail) will be issued immediately.

🔍 back to Logical binary inputs alphabetically



SBMB Feedback 6

Related FW	2.1.0	Related applications	MINT
LBI ID	1462		

Description

Use this input to indicate whether the string battery module breaker is opened or closed.

Binary Output Breaker Close/Open

On

Off

Waiting for feedback 2 s

Feedback match

Time

Breaker Feedback

Breaker Fail when feedback does not match

Image 7.33 SBMB Feedback 6 closing

Binary Output Breaker Close/Open

On

Off

Waiting for feedback 2 s

Feedback match

Time

Breaker Feedback

Breaker Fail when feedback does not match

Image 7.34 SBMB Feedback 6 opening

This input is used for connection of the normally open feedback contact from the string battery module breaker or contactor. If the input is active, the controller will consider the Battery String as closed to the DC bus and vice versa.

- > If the feedback does not respond to a change of the control output (fill the LBO SBMB Close/Open x) within time adjusted in Setpoint (fill in setpoint SBMB Breaker Feedback TO), otherwise specific alarm (fill in SBMB x Fail) 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 (fill in SBMB x Fail) will be issued immediately.

🔍 back to Logical binary inputs alphabetically



SBMB Feedback 7

Related FW	2.1.0	Related applications	MINT
LBI ID	1463		

Description

Use this input to indicate whether the string battery module breaker is opened or closed.

Binary Output Breaker Close/Open

On

Off

Waiting for feedback 2 s

Feedback match

Time

Breaker Feedback

Breaker Fail when feedback does not match

Image 7.35 SBMB Feedback 7 closing

Binary Output Breaker Close/Open

On

Off

Waiting for feedback 2 s

Feedback match

Time

Breaker Feedback

Breaker Fail when feedback does not match

Image 7.36 SBMB Feedback 7 opening

This input is used for connection of the normally open feedback contact from the string battery module breaker or contactor. If the input is active, the controller will consider the Battery String as closed to the DC bus and vice versa.

- > If the feedback does not respond to a change of the control output (fill the LBO SBMB Close/Open x) within time adjusted in Setpoint (fill in setpoint SBMB Breaker Feedback TO), otherwise specific alarm (fill in SBMB x Fail) 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 (fill in SBMB x Fail) will be issued immediately.

🔍 back to Logical binary inputs alphabetically



SBMB Feedback 8

Related FW	2.1.0	Related applications	MINT
LBI ID	1464		

**Description**

Use this input to indicate whether the string battery module breaker is opened or closed.

Image 7.37 SBMB Feedback 8 closing

Image 7.38 SBMB Feedback 8 opening

This input is used for connection of the normally open feedback contact from the string battery module breaker or contactor. If the input is active, the controller will consider the Battery String as closed to the DC bus and vice versa.

- If the feedback does not respond to a change of the control output (fill the LBO SBMB Close/Open x) within time adjusted in Setpoint (fill in setpoint SBMB Breaker Feedback TO), otherwise specific alarm (fill in SBMB x Fail) 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 (fill in SBMB x Fail) will be issued immediately.

⬅ back to Logical binary inputs alphabetically

LBI: T

TEST ROCOF

Related FW	2.1.0	Related applications	MINT
LBI ID	1116		
<b>Description</b>			
A rising edge on this LBI triggers the same event in the controller as the actual ROCOF 1 protection trip.			

⬅ back to Logical binary inputs alphabetically



### Test Vector Shift

Related FW	2.1.0	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.			

⬅ back to Logical binary inputs alphabetically

### Top Priority

Related FW	2.1.0	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 (page 1).			
<b>IMPORTANT: This binary input can be used only if setpoint #Priority Auto Swap = Disabled.</b>			

⬅ back to Logical binary inputs alphabetically

### TX Critical Temperature

Related FW	2.1.0	Related applications	MINT
LBI ID	1296		
Description			
The status of this LBI is mirrored in group <b>AUX Info</b>			

⬅ back to Logical binary inputs alphabetically

### TX High Temperature

Related FW	2.1.0	Related applications	MINT
LBI ID	1295		
Description			
The status of this LBI is mirrored in group <b>AUX Info</b>			

⬅ back to Logical binary inputs alphabetically



# 9.1.7 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 .....	865
LBO: B .....	870
LBO: C .....	887
LBO: D .....	890
LBO: E .....	891
LBO: F .....	905
LBO: G .....	906
LBO: H .....	906
LBO: I .....	907
LBO: K .....	908
LBO: L .....	908
LBO: M .....	910
LBO: N .....	911
LBO: O .....	912
LBO: P .....	912
LBO: R .....	913
LBO: S .....	914
LBO: V .....	921


For full list of Logical binary outputs go to the chapter **Logical binary outputs alphabetically**.



## Logical binary outputs alphabetically

LBO: A	865	BESS Active	886	ECU 2 Comm Fail	891
AIN Switch01	865	Generator BESS		ECU 3 Comm Fail	891
AIN Switch02	865	Capability C		ECU 4 Comm Fail	892
AIN Switch03	865	LimitGenerator Capability		ECU 5 Comm Fail	892
AIN Switch04	865	C Limit	886	ECU 6 Comm Fail	892
AIN Switch05	866	Generator BESS		ECU 7 Comm Fail	892
AIN Switch06	866	Capability L		ECU 8 Comm Fail	892
AIN Switch07	866	LimitGenerator Capability		ECU 9 Comm Fail	892
AIN Switch08	866	L Limit	886	ECU Comm OK	893
AIN Switch09	867	BESS Healthy	887	ECU Power Relay	893
AIN Switch10	867	Mains/Bus HealthyMains		ECU Run Stop	894
Alarm Flashing	867	Healthy	887	RunningEnergized	894
AL Maintenance 1	867	LBO: C	887	Engines Swapped	894
AL Maintenance 2	867	Common Alarm Active		ES Charge Disabled	895
AL Maintenance 3	868	Level 1	887	ES Discharge Disabled	895
AL Maintenance 4	868	Common Alarm Active		ES Run Request	895
Alarm	868	Level 2	887	ES SOC Charge Disabled	896
Alarm BESS Frequency	868	Common Alarm Level 1	888	ES SOC Discharge	
Alarm BESS Overcurrent	868	Common Alarm Level 2	888	Disabled	896
Alarm BESS Voltage	869	Common Alarm Only	888	ES Start Pulse	897
All Available Gen-sets Run	869	Common History Record	888	ES Stop Pulse	897
Any GCB Closed	869	Common Shutdown	888	ESCB Close/Open	898
Any Other GCB Closed	869	AL Common Shutdown		ESCB ON Coil	899
LBO: B	870	Override	889	ESCB OFF Coil	900
BCB Button Echo	870	Common Slow Stop		ESCB UV Coil	901
BCB Close/Open	870	Protection	889	ESCB Status	902
BCB Close/Open		Common Warning	889	Event Post VRT	902
Secondary	871	Controller HeartBeat Fail		Event Soft Unload	902
BCB OFF Coil	874	Detect	890	Exercise Timer 1	902
BCB OFF Coil Secondary	876	LBO: D	890	Exercise Timer 2	903
BCB ON Coil	878	Daily BESS Cycles		Exercise Timer 3	903
BCB ON Coil Secondary	880	Reached	890	Exercise Timer 4	903
BCB Status	881	Day/Night	890	Exercise Timer 5	903
BCB UV Coil	882	DC Circuit Closed	890	Exercise Timer 6	904
BCB UV Coil Secondary	884	DC Strings Coupled	890	ES V Rel Discharge	
BESS In Loadsharing	886	Display Fail	891	Disabled	904
BESS Parallel Oper	886	Deadbus	891	ES V Rel Charge Disabled	904
		LBO: E	891		
		ECU 1 Comm Fail	891		



LBO: F .....	905	LBO: P .....	912	Synchronizing .....	921
FltRes Button Echo .....	905	PCS Ready To Load .....	912	LBO: V .....	921
Forward Synchronization .....	905	PCS Run Request .....	912	Vector Shift Active .....	921
SpeedFrequencyFrequency		Peripheral Module Comm		Voltage Up .....	921
Down .....	905	Fail .....	912	Voltage Down .....	921
SpeedFrequency Up .....	905	Precharge Relay .....	913		
LBO: G .....	906	LBO: R .....	913	 <b>back to Controller objects</b>	
GPS Coordinates		Ready .....	913		
Detected .....	906	ROCOF 1 Active .....	913		
LBO: H .....	906	ROCOF 2 Active .....	913		
Heartbeat .....	906	ROCOF 3 Active .....	913		
Horn .....	906	ROCOF 4 Active .....	914		
Horn Flashing .....	906	LBO: S .....	914		
HornRes Button Echo .....	907	Sd Override .....	914		
HW AC Voltage		Soft Load .....	914		
Measurement Error .....	907	Soft Unload .....	914		
LBO: I .....	907	Start Blocked .....	914		
In Synchronism .....	907	Start Button Echo .....	915		
Initialized .....	907	Starting .....	915		
LBO: K .....	908	Stop Button Echo .....	915		
kWh Pulse .....	908	Stopping .....	915		
LBO: L .....	908	System Ready .....	915		
Load Shedding Stage 1 .....	908	System Reserve OK .....	916		
Load Shedding Stage 2 .....	908	Stop Bus Energize .....	916		
Load Shedding Stage 3 .....	909	SBMB Close/Open 1 .....	916		
Load Shedding Stage 5 .....	909	SBMB Close/Open 2 .....	916		
Loaded .....	910	SBMB Close/Open 3 .....	917		
LBO: M .....	910	SBMB Close/Open 4 .....	917		
Manual Ready .....	910	SBMB Close/Open 5 .....	917		
MCB Status .....	910	SBMB Close/Open 6 .....	918		
Mode AUTO .....	910	SBMB Close/Open 7 .....	918		
Mode MAN .....	911	SBMB Close/Open 8 .....	918		
Mode OFFPRG .....	911	String Voltage Healthy 1 .....	919		
LBO: N .....	911	String Voltage Healthy 2 .....	919		
NCB Close/Open .....	911	String Voltage Healthy 3 .....	919		
Not In Auto .....	911	String Voltage Healthy 4 .....	920		
Not Ready .....	911	String Voltage Healthy 5 .....	920		
Not Used .....	912	String Voltage Healthy 6 .....	920		
LBO: O .....	912	String Voltage Healthy 7 .....	920		
Operational .....	912	String Voltage Healthy 8 .....	921		



## LBO: A

### AIN Switch01

Related FW	2.1.0	Related applications	MINT
LBO ID	1400		
Description			
This is an output from the General Analog Input 01 switch function. The behavior of the switch depends on the adjustment of the setpoints <b>AIN Switch01 On</b> and <b>AIN Switch01 Off</b> . The value is measured from <b>AIN SWITCH01</b> analog input.			

⬅ back to Logical binary outputs alphabetically

### AIN Switch02

Related FW	2.1.0	Related applications	MINT
LBO ID	1401		
Description			
This is an output from the General Analog Input 02 switch function. The behavior of the switch depends on the adjustment of the setpoints <b>AIN Switch02 On</b> and <b>AIN Switch02 Off</b> . The value is measured from <b>AIN SWITCH02</b> analog input.			

⬅ back to Logical binary outputs alphabetically

### AIN Switch03

Related FW	2.1.0	Related applications	MINT
LBO ID	1402		
Description			
This is an output from the General Analog Input 03 switch function. The behavior of the switch depends on the adjustment of the setpoints <b>AIN Switch03 On</b> and <b>AIN Switch03 Off</b> . The value is measured from <b>AIN SWITCH03</b> analog input.			

⬅ back to Logical binary outputs alphabetically

### AIN Switch04

Related FW	2.1.0	Related applications	MINT
LBO ID	1403		
Description			
This is an output from the General Analog Input 01 switch function. The behavior of the switch depends on the adjustment of the setpoints <b>AIN Switch04 On</b> and <b>AIN Switch04 Off</b> . The value is measured from <b>AIN SWITCH04</b> analog input.			

⬅ back to Logical binary outputs alphabetically



### AIN Switch05

Related FW	2.1.0	Related applications	MINT
LBO ID	1787		
<b>Description</b>			
This is an output from the General Analog Input 01 switch function. The behavior of the switch depends on the adjustment of the setpoints <b>AIN Switch05 On</b> and <b>AIN Switch05 Off</b> . The value is measured from <b>AIN SWITCH05</b> analog input.			

⬅ back to Logical binary outputs alphabetically

### AIN Switch06

Related FW	2.1.0	Related applications	MINT
LBO ID	1788		
<b>Description</b>			
This is an output from the General Analog Input 01 switch function. The behavior of the switch depends on the adjustment of the setpoints <b>AIN Switch06 On</b> and <b>AIN Switch06 Off</b> . The value is measured from <b>AIN SWITCH06</b> analog input.			

⬅ back to Logical binary outputs alphabetically

### AIN Switch07

Related FW	2.1.0	Related applications	MINT
LBO ID	1789		
<b>Description</b>			
This is an output from the General Analog Input 01 switch function. The behavior of the switch depends on the adjustment of the setpoints <b>AIN Switch07 On</b> and <b>AIN Switch07 Off</b> . The value is measured from <b>AIN SWITCH07</b> analog input.			

⬅ back to Logical binary outputs alphabetically

### AIN Switch08

Related FW	2.1.0	Related applications	MINT
LBO ID	1790		
<b>Description</b>			
This is an output from the General Analog Input 02 switch function. The behavior of the switch depends on the adjustment of the setpoints <b>AIN Switch08 On</b> and <b>AIN Switch08 Off</b> . The value is measured from <b>AIN SWITCH08</b> analog input.			

⬅ back to Logical binary outputs alphabetically



### AIN Switch09

Related FW	2.1.0	Related applications	MINT
LBO ID	1791		
Description			
This is an output from the General Analog Input 02 switch function. The behavior of the switch depends on the adjustment of the setpoints <b>AIN Switch09 On</b> and <b>AIN Switch09 Off</b> . The value is measured from <b>AIN SWITCH09</b> analog input.			

⬅ back to Logical binary outputs alphabetically

### AIN Switch10

Related FW	2.1.0	Related applications	MINT
LBO ID	1792		
Description			
This is an output from the General Analog Input 02 switch function. The behavior of the switch depends on the adjustment of the setpoints <b>AIN Switch10 On</b> and <b>AIN Switch10 Off</b> . The value is measured from <b>AIN SWITCH10</b> analog input.			

⬅ back to Logical binary outputs alphabetically

### Alarm Flashing

Related FW	2.1.0	Related applications	MINT
LBO ID	28		
Description			
This is the flashing alternative of the output <b>ALARM</b> , i.e. the output flashes with 1 Hz period while the output Alarm is closed.			

⬅ back to Logical binary outputs alphabetically

### AL Maintenance 1

Related FW	2.1.0	Related applications	MINT
LBO ID	2211		
Description			
This output is active when alarm <b>Maintenance Timer 1 RunHours</b> or <b>Maintenance 1 Interval</b> is present in the alarm list.			

⬅ back to Logical binary outputs alphabetically

### AL Maintenance 2

Related FW	2.1.0	Related applications	MINT
LBO ID	2212		
Description			
This output is active when alarm <b>Maintenance 2 RunHours</b> or <b>Maintenance 2 Interval</b> is present in the alarm list.			

⬅ back to Logical binary outputs alphabetically



### AL Maintenance 3

Related FW	2.1.0	Related applications	MINT
LBO ID	2213		
Description			
This output is active when alarm <b>Maintenance 3 RunHours</b> or <b>Maintenance 3 Interval</b> is present in the alarm list.			

⬅ back to Logical binary outputs alphabetically

### AL Maintenance 4

Related FW	2.1.0	Related applications	MINT
LBO ID	2650		
Description			
This output is active when alarm <b>Maintenance 4 RunHours</b> or <b>Maintenance 4 Interval</b> is present in the alarm list.			

⬅ back to Logical binary outputs alphabetically

### Alarm

Related FW	2.1.0	Related applications	MINT
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.			

⬅ back to Logical binary outputs alphabetically

### Alarm BESS Frequency

Related FW	2.1.0	Related applications	MINT
LBO ID	1266		
Description			
This output is active when at least 1 protection caused by <b>BESS &gt;f Protection</b> or <b>BESS &lt;f Protection</b> is active.			

⬅ back to Logical binary outputs alphabetically

### Alarm BESS Overcurrent

Related FW	2.1.0	Related applications	MINT
LBO ID	109		
Description			
This output is active while at least one of the following overcurrent protection is active <b>Short Circuit Protection</b> or <b>BESS IDMT &gt;A Protection</b> .			

⬅ back to Logical binary outputs alphabetically



## Alarm BESS Voltage

Related FW	2.1.0	Related applications	MINT
LBO ID	1263		
Description			
This output is active when at least 1 alarm caused by <b>BESS &gt;&gt;V Protection</b> , <b>BESS &gt;V Protection</b> or <b>BESS &lt;&lt;V Protection</b> is present in the alarmlist.			

⬅ back to Logical binary outputs alphabetically

## All Available Gen-sets Run

Related FW	2.1.0	Related applications	MINT
LBO ID	122		
Description			
This output is closed when all available BESSs within the <b>Control Group</b> are loaded.			
<b>Note:</b> BESS is available if <b>Power Management (page 1) = Enabled</b> , <b>Controller Mode = AUTO</b> and there is not present <b>Alarms level 2</b> in the alarmlist.			

⬅ back to Logical binary outputs alphabetically

## Any GCB Closed

Related FW	2.1.0	Related applications	MINT
LBO ID	222		
Description			
This output is active when a GCB of any controller connected via CAN1 and/or CAN2 is closed.			
<b>Note:</b> This function works on <b>CAN ICC 16 - CAN ICC 32</b> values, therefore it ignores <b>Control Groups</b> .			

⬅ back to Logical binary outputs alphabetically

## Any Other GCB Closed

Related FW	2.1.0	Related applications	MINT
LBO ID	1827		
Description			
This output is active when a GCB of any other controller connected via CAN1 and/or CAN2 is closed.			
<b>Note:</b> This function works on <b>CAN ICC 16 - CAN ICC 32</b> values, therefore it ignores <b>Control Groups</b> .			

⬅ back to Logical binary outputs alphabetically



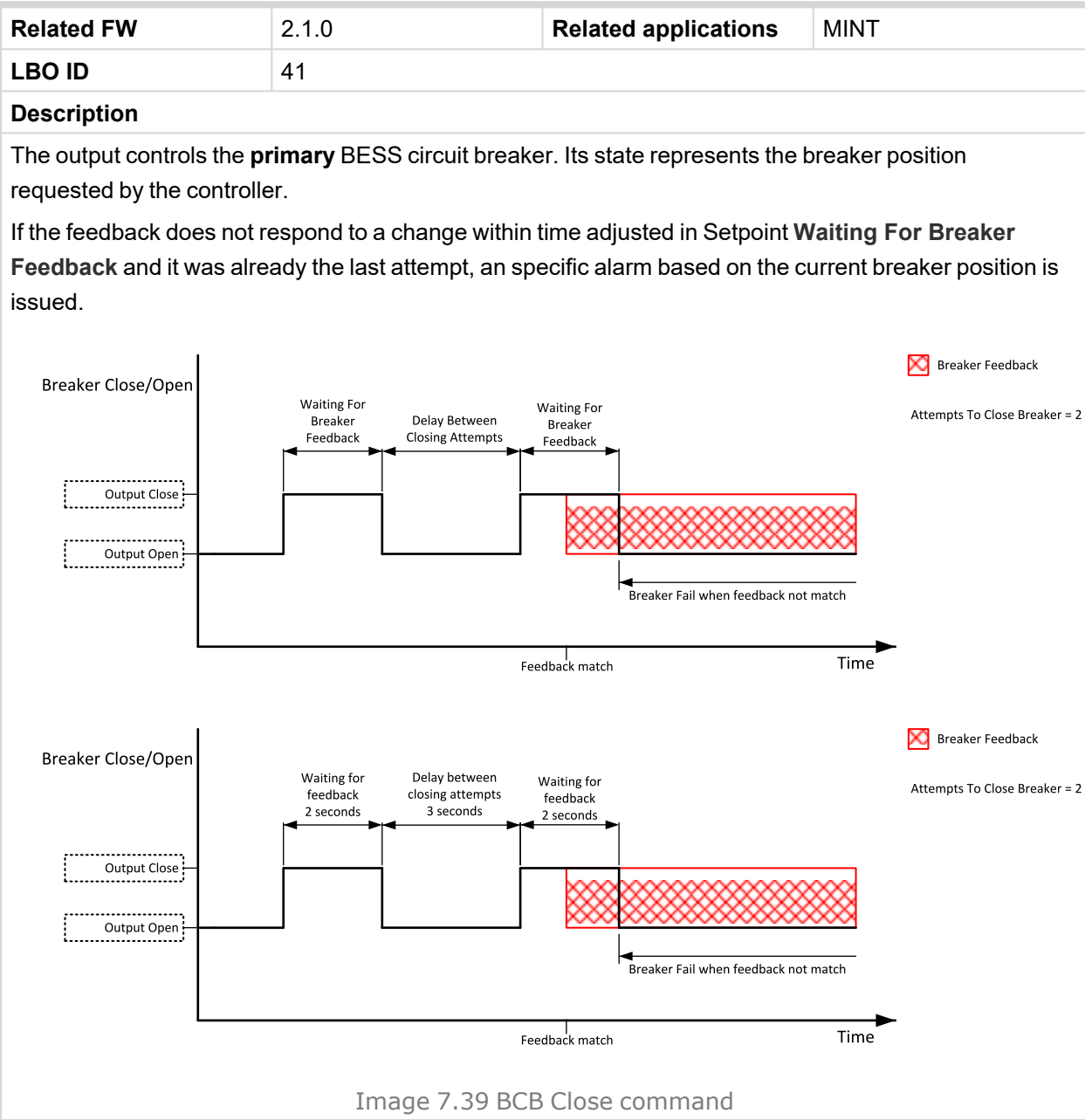
LBO: B

BCB Button Echo

Related FW	2.1.0	Related applications	MINT
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





The output controls the **primary** master generator BESS 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 **Stp BCB Fail** activated.

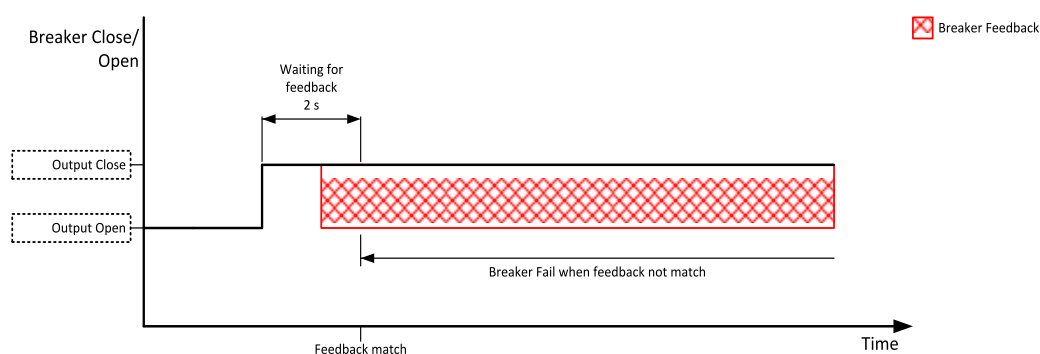


Image 7.40 BCB Close command

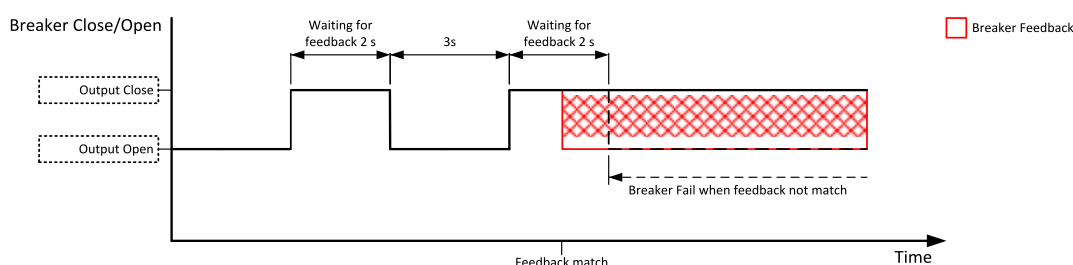


Image 7.41 Repeated BCB Close command

🔍 back to Logical binary outputs alphabetically

### BCB Close/Open Secondary

Related FW	2.1.0	Related applications	MINT
LBO ID	1058		
<b>Description</b>			
The output controls the <b>secondary</b> master generator 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 commandtime adjusted in Setpoint <b>Waiting For Breaker Feedback</b> and it was already the last attempt, an specific alarm based on the current breaker position is issued.			



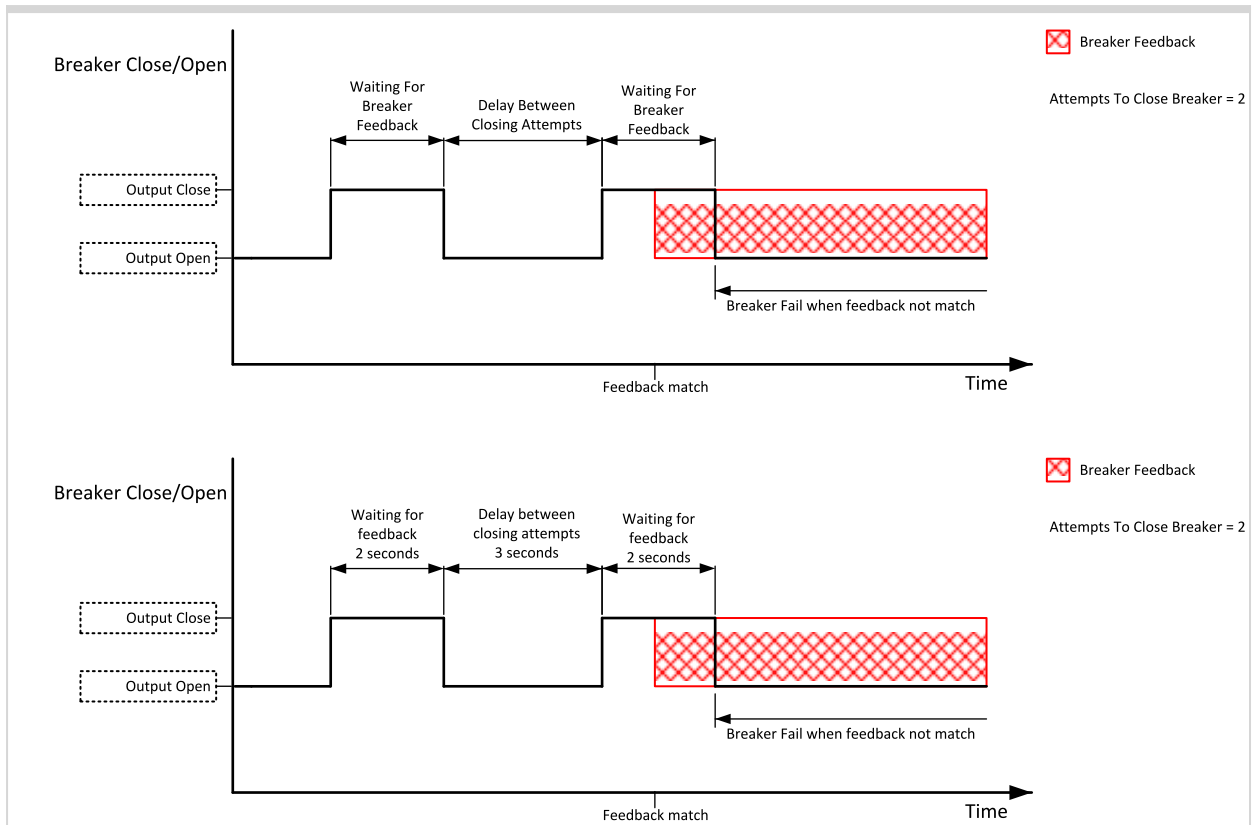


Image 7.42 BCB Close command

The output controls the **secondary** master generator BESS 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 **Stp BCB Secondary Fail** is activated.

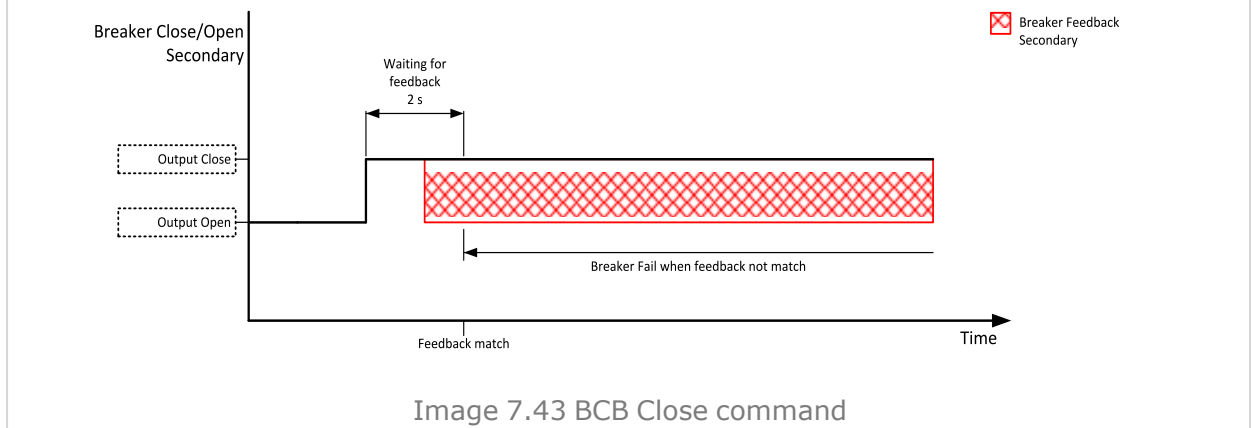
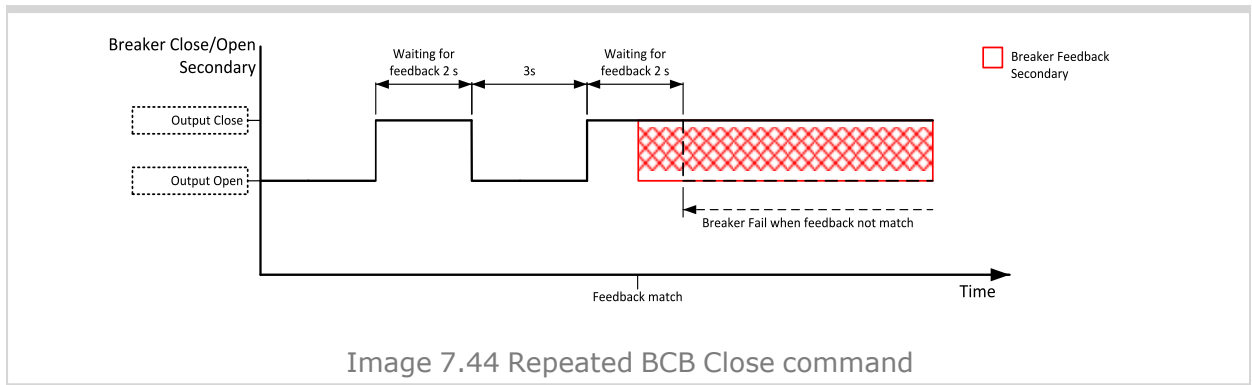


Image 7.43 BCB Close command





⬅ back to Logical binary outputs alphabetically



BCB OFF Coil

Related FW	2.1.0	Related applications	MINT
LBO ID	43		

Description

The output is intended for opening of **primary** master BESS circuit breaker.

The output provides pulses, which length is adjusted by Setpoint **Waiting For Breaker Feedback**, 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** is issued.

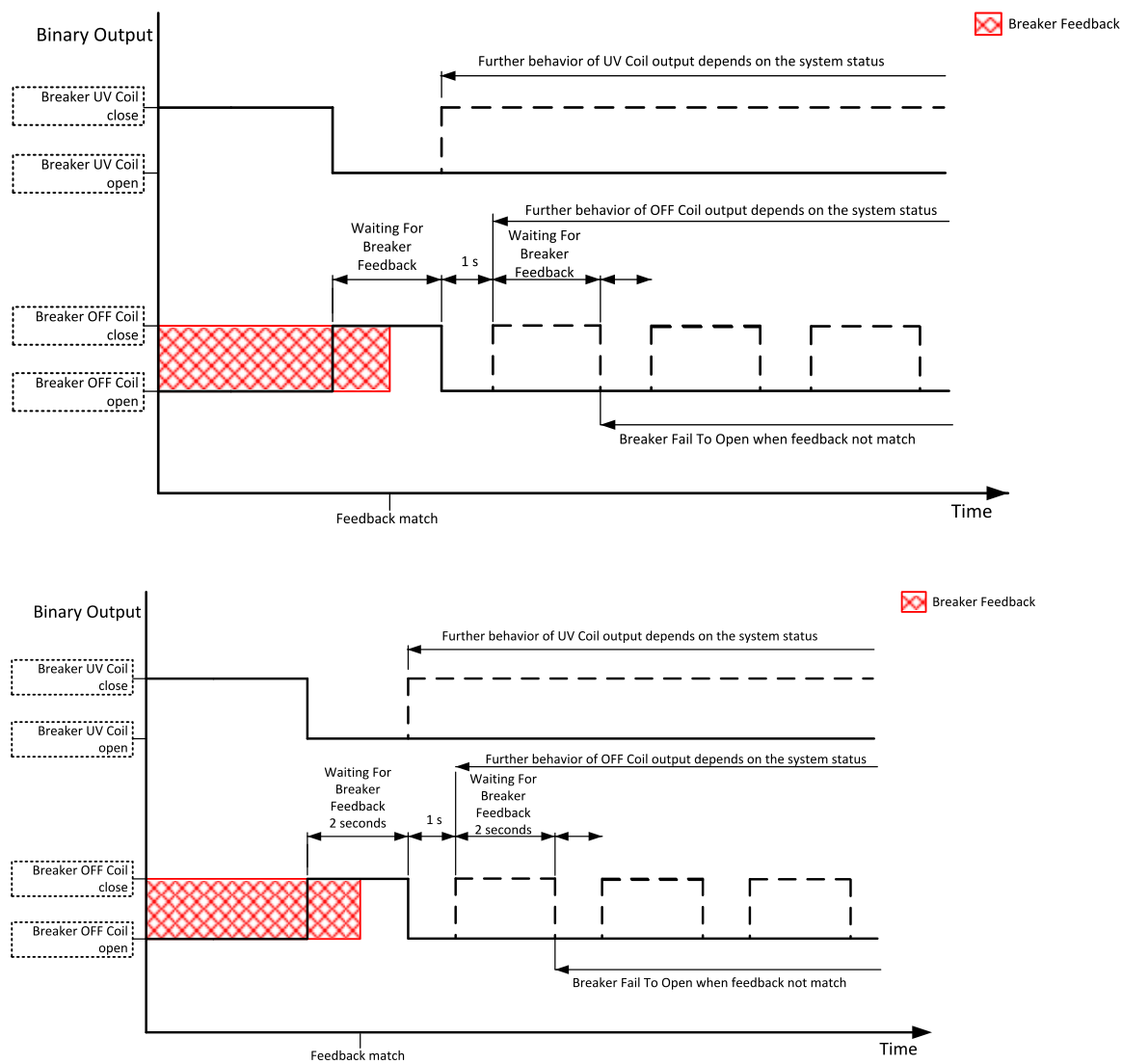
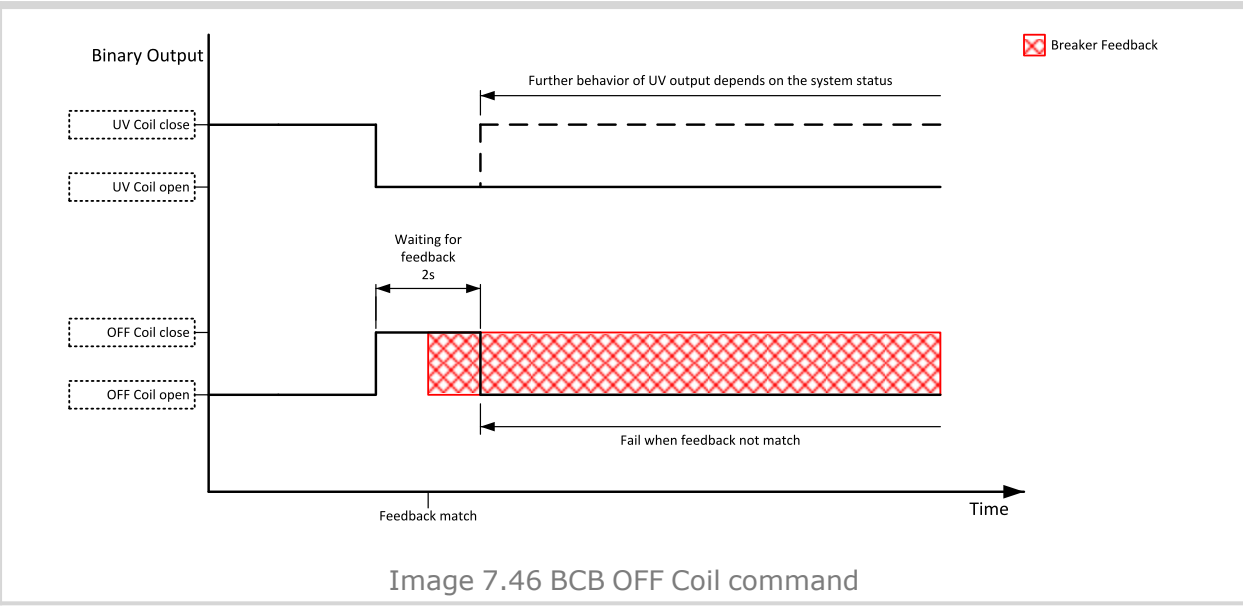


Image 7.45 BCB OFF Coil command

The output is intended for control of open coil of **primary** master generator 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.





[back to Logical binary outputs alphabetically](#)



BCB OFF Coil Secondary

Related FW	2.1.0	Related applications	MINT
LBO ID	1068		

Description

The output is intended for opening of **secondary** BESS circuit breaker.

The output provides pulses, which length is adjusted by Setpoint **Waiting For Breaker Feedback**, 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.

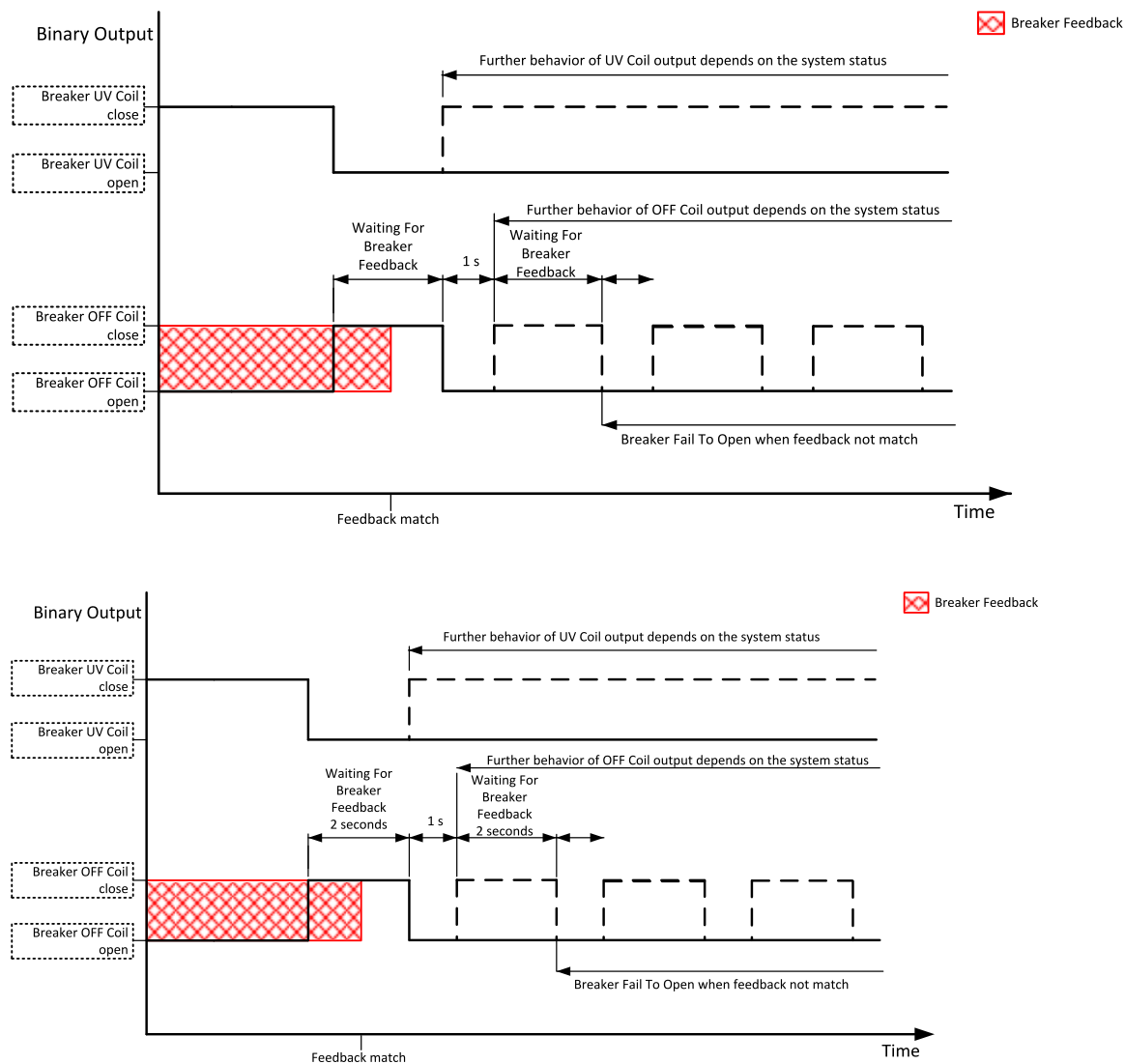


Image 7.47 BCB OFF Coil command

The output is intended for control of open coil of **secondary** master generator 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.







BCB ON Coil

Related FW	2.1.0	Related applications	MINT
LBO ID	42		

Description

The output is intended for control of close coil of **primary** BESS circuit breaker.

The output provides pulse, which length is adjusted by Setpoint **Waiting For Breaker Feedback**, when breaker has to close. The amount of pulses provided by the controller is based on Setpoint **Attempts To Close Breaker**. The pause between attempts is given by Setpoint **Delay Between Closing Attempts**.

When the last attempt elapses and LBI **BCB FEEDBACK** does not match Alarm **Sd BCB Fail To Close** is issued.

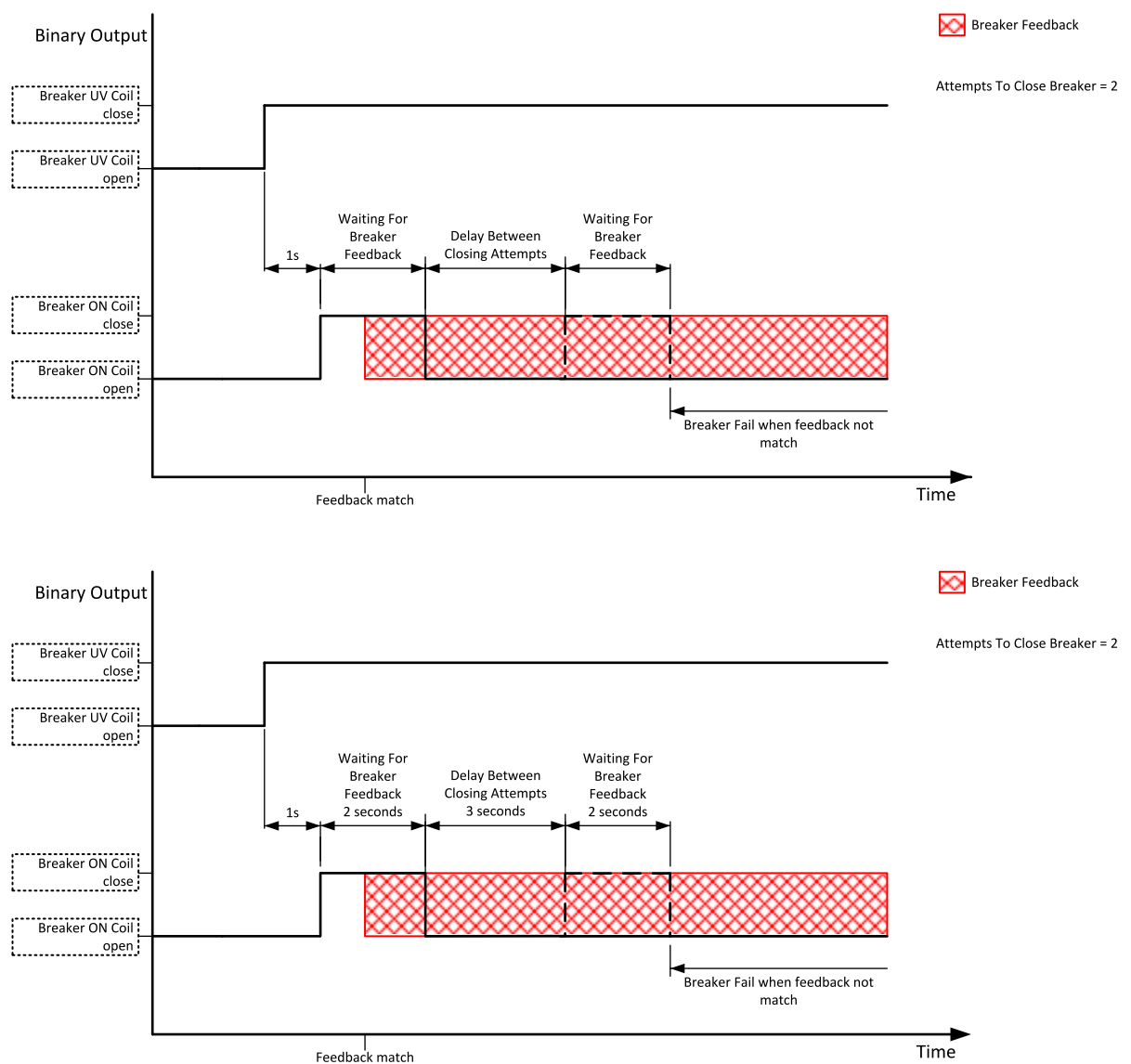


Image 7.49 BCB ON Coil close command

The output is intended for control of close coil of **primary** master generator BESS circuit breaker. The output gives at least 2 second pulse in the moment the breaker has to be closed.



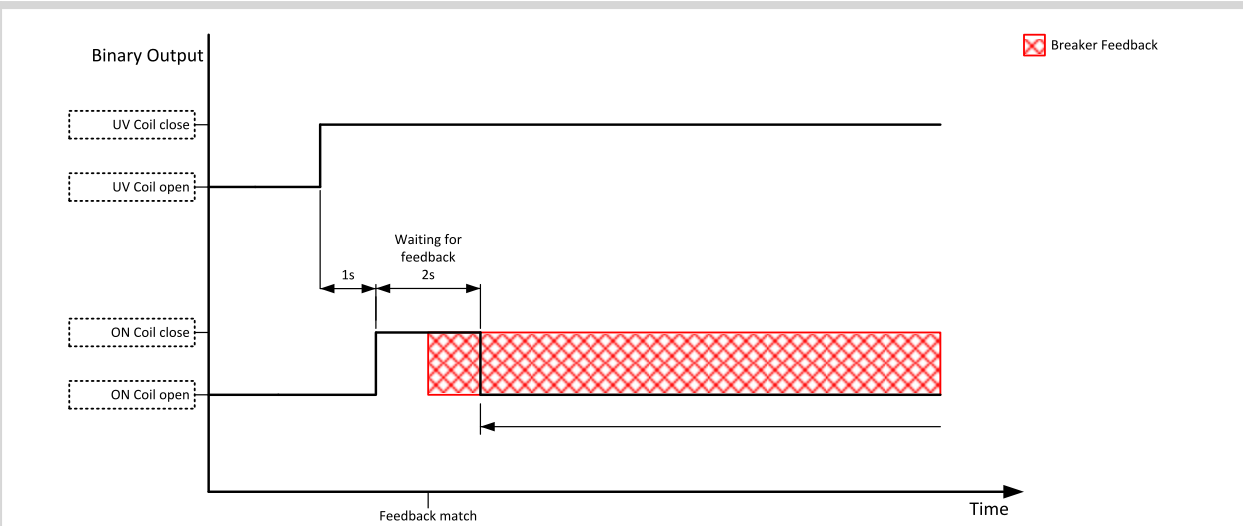


Image 7.50 BCB ON Coil close command

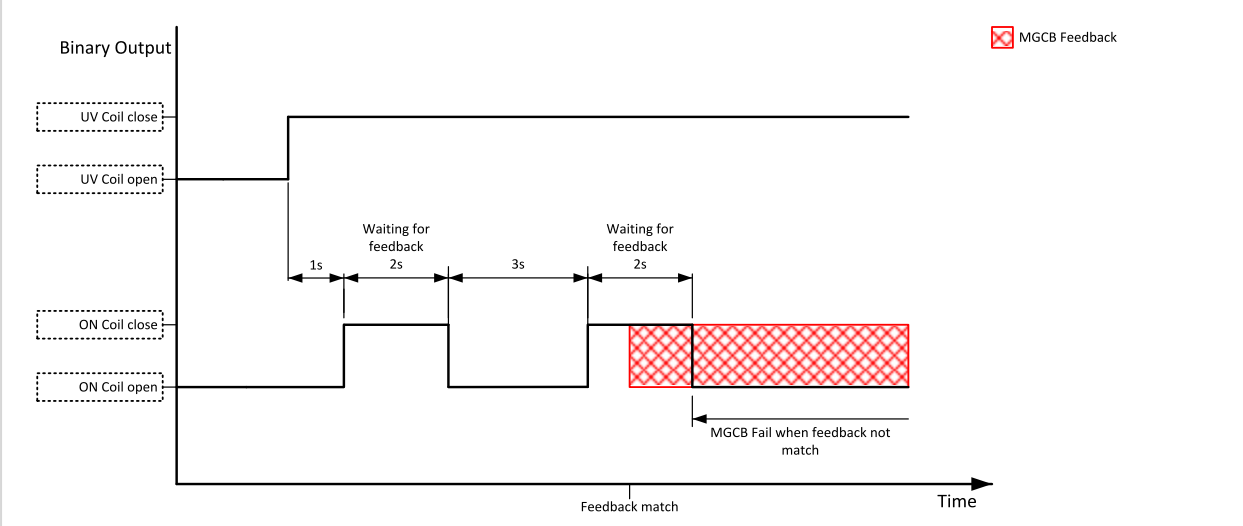


Image 7.51 Repeated BCB ON coil close command

⬅ back to Logical binary outputs alphabetically



BCB ON Coil Secondary

Related FW	2.1.0	Related applications	MINT
LBO ID	1067		

Description

The output is intended for control of close coil of **secondary** BESS circuit breaker.

The output provides pulse, which length is adjusted by Setpoint **Waiting For Breaker Feedback**, when breaker has to close. The amount of pulses provided by the controller is based on Setpoint **Attempts To Close Breaker**. The pause between attempts is given by Setpoint **Delay Between Closing Attempts**

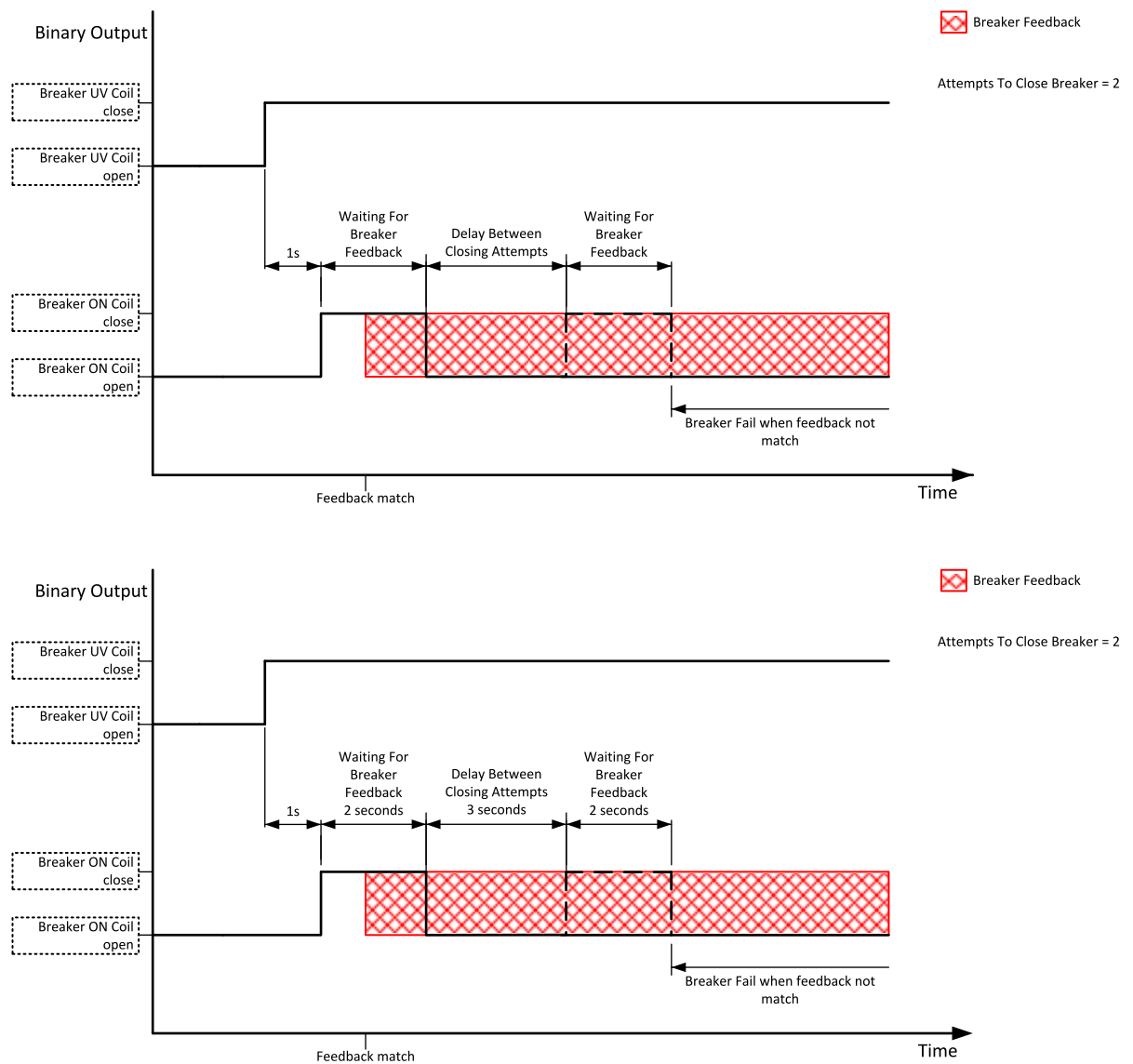


Image 7.52 BCB ON Coil close command

The output is intended for control of close coil of **secondary** master generator BESS circuit breaker. The output gives at least 2 second pulse in the moment the breaker has to be closed.



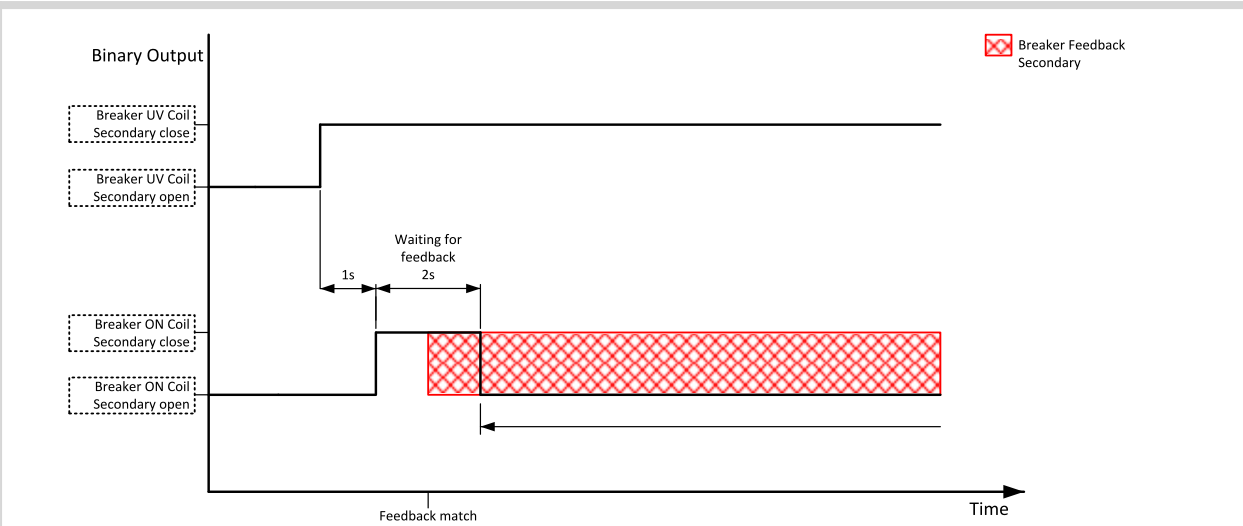


Image 7.53 BCB ON Coil close command

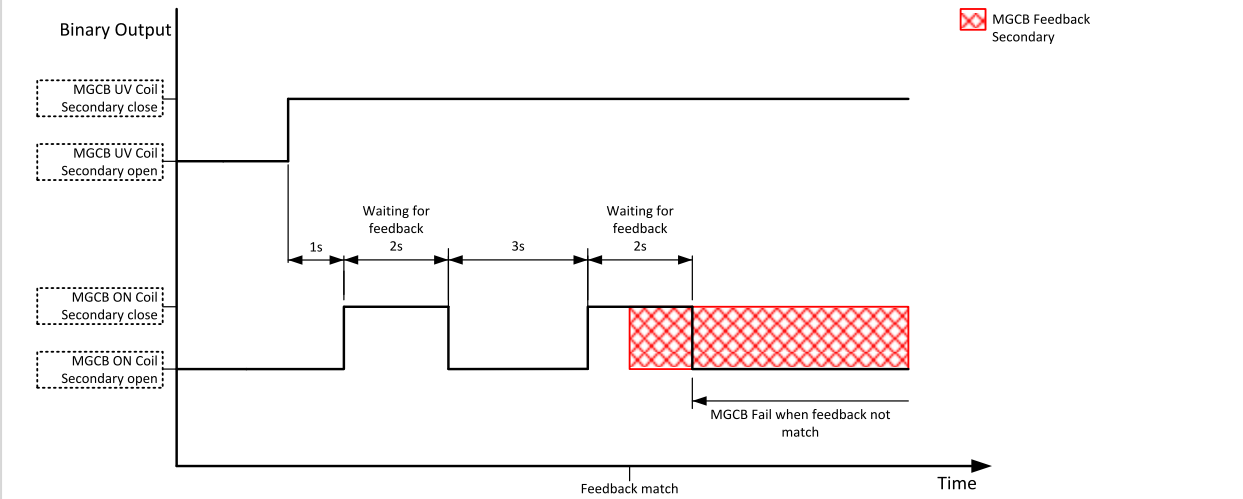


Image 7.54 Repeated BCB ON coil close command

⬅ back to Logical binary outputs alphabetically

**BCB Status**

Related FW	2.1.0	Related applications	MINT
LBO ID	84		
<b>Description</b>			
<p>This output indicates the BCB position as it is internally considered by the controller.</p> <p>The position is based on <b>BCB FEEDBACK</b> and <b>BCB FEEDBACK NEGATIVE</b>.</p> <ul style="list-style-type: none"> <li>➤ In case that only positive feedback is used, this output mirrors the feedback.</li> <li>➤ In case that both feedbacks are used and <ul style="list-style-type: none"> <li>➤➤ Feedbacks match each other - the output indicates BCB position according to feedbacks.</li> <li>➤➤ Feedbacks do not match each other - output indicates last position when feedbacks matched.</li> </ul> </li> </ul>			

⬅ back to Logical binary outputs alphabetically



## BCB UV Coil

Related FW	2.1.0	Related applications	MINT
LBO ID	44		

### Description

The output is intended for control of undervoltage coil of **primary** BESS circuit breaker.

The output is closed after the BESS has been started, min stab time has elapsed and the BESS voltage and frequency have got into limits. 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 the duration set by Setpoint **Waiting For Breaker Feedback** 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.

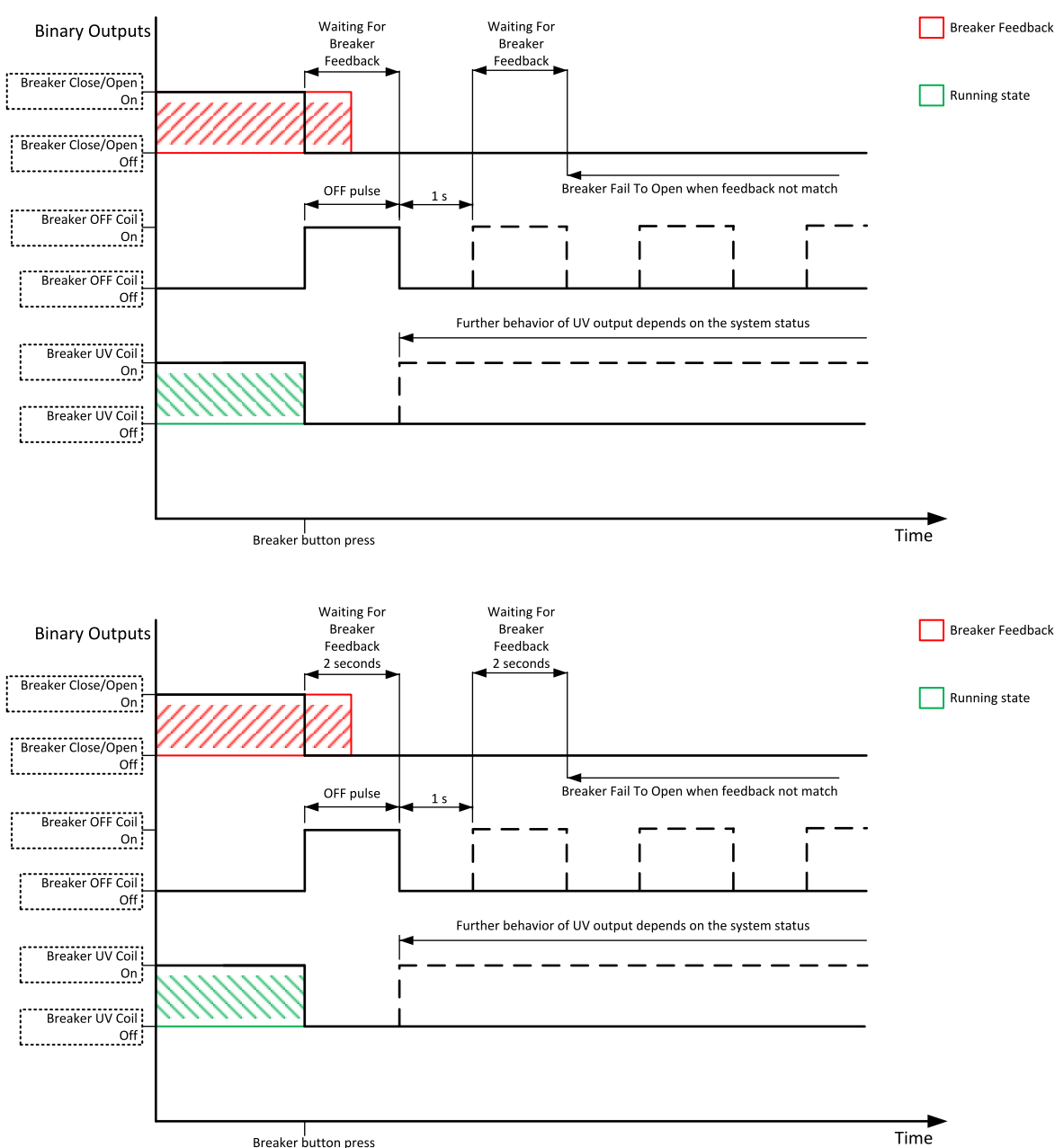


Image 7.55 BCB UV Coil close command



The output is intended for control of undervoltage coil of **primary** master generator BESS circuit breaker. The output is active the whole time when the BESS is running or in case the bus voltage is present. The output is deactivated for at least 2 seconds in the moment the breaker has to be switched off.

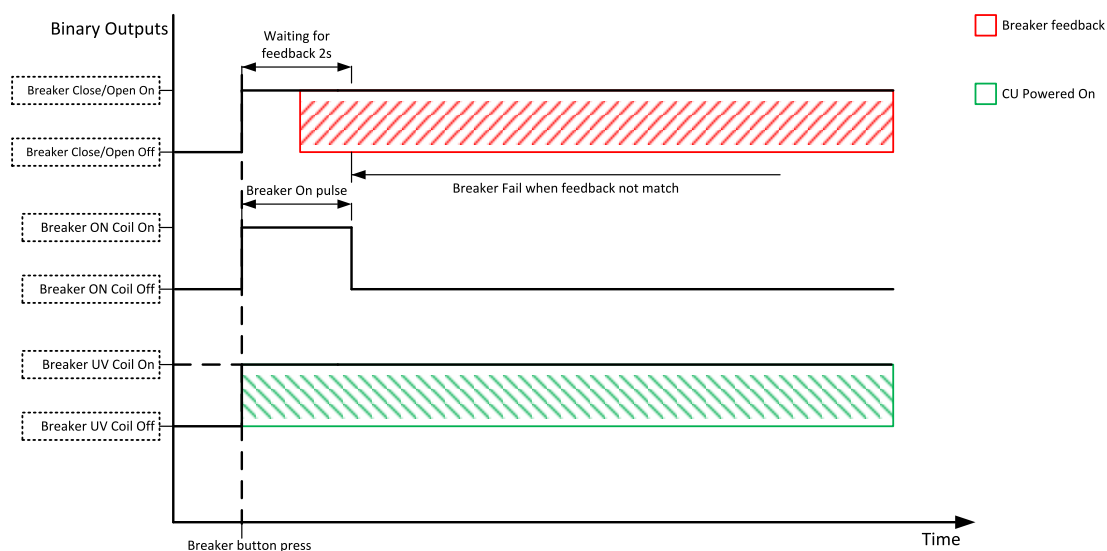


Image 7.56 BCB UV Coil close command

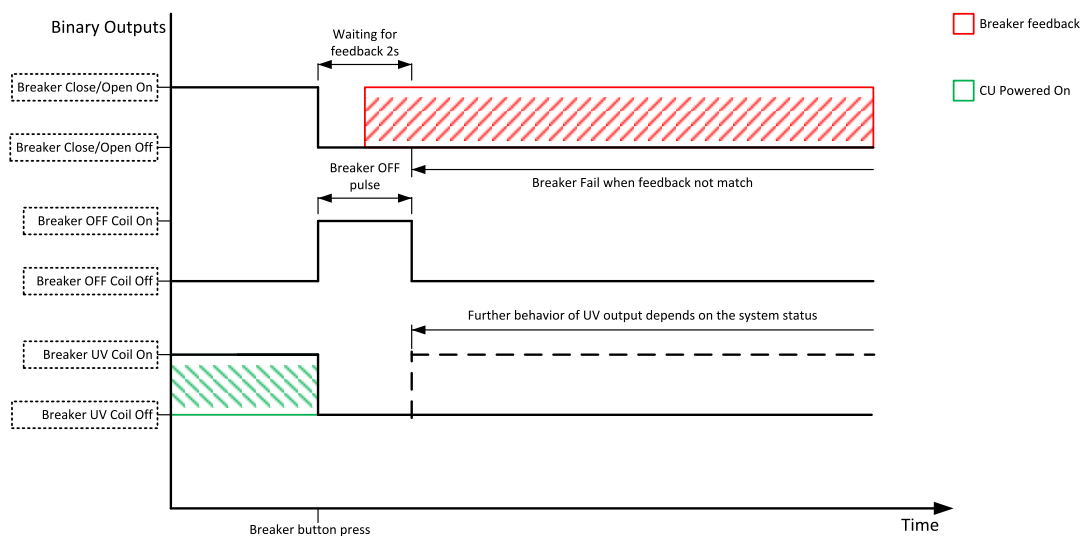


Image 7.57 BCB UV Coil open command

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BCB UV Coil Secondary

Related FW	2.1.0	Related applications	MINT
LBO ID	1069		

Description

The output is intended for control of undervoltage coil of **secondary** master generator BESS circuit breaker.

The output is closed after the BESS has been started, min stab time has elapsed and the BESS voltage and frequency have got into limits. 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 the duration set by Setpoint **Waiting For Breaker Feedback** when the BCB has to open.

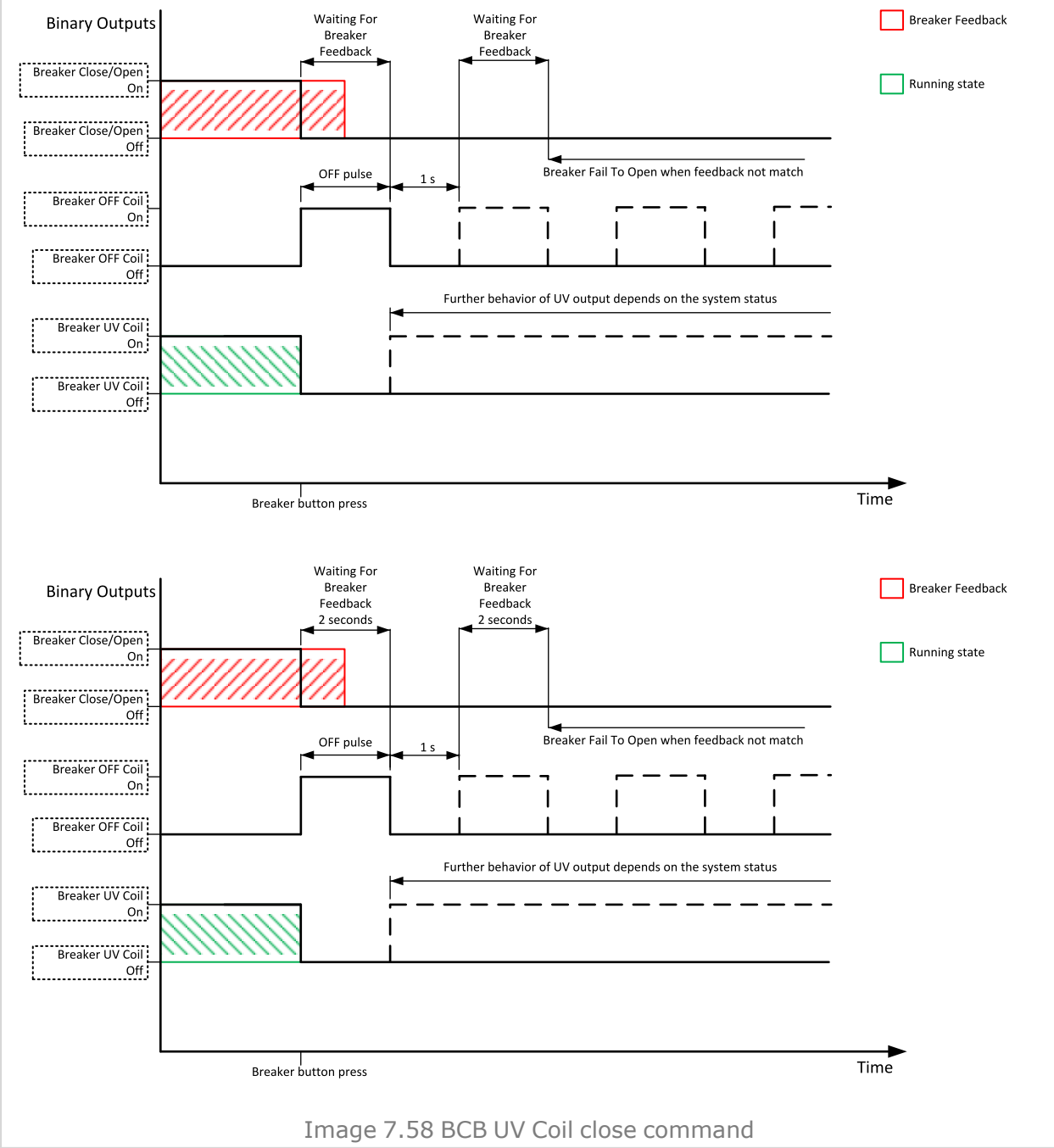


Image 7.58 BCB UV Coil close command



The output is intended for control of undervoltage coil of **secondary** master generator BESS circuit breaker. The output is active the whole time when the BESS is running or in case the bus voltage is present. 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.

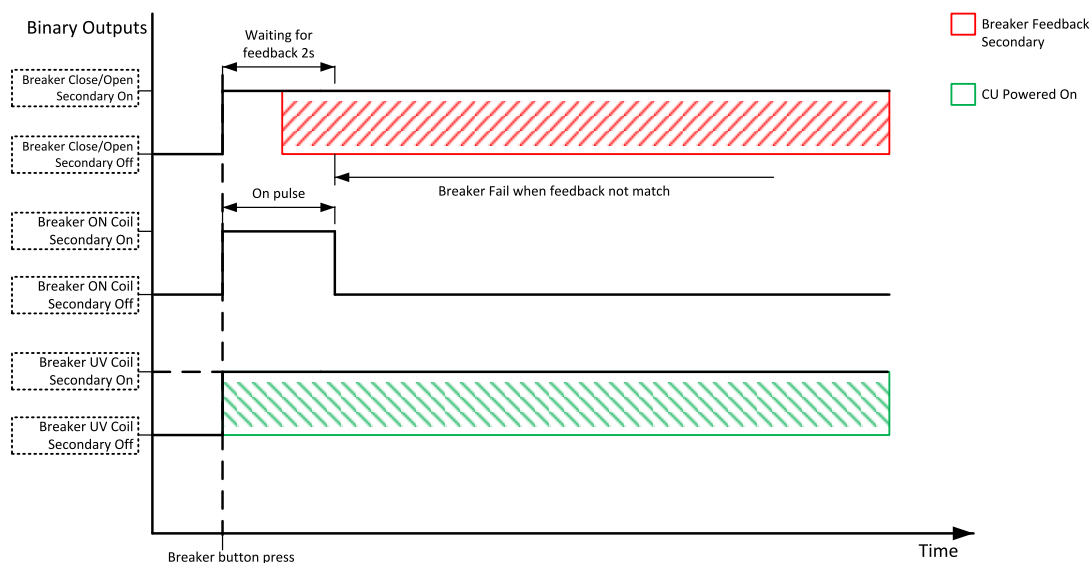


Image 7.59 BCB UV Coil close command

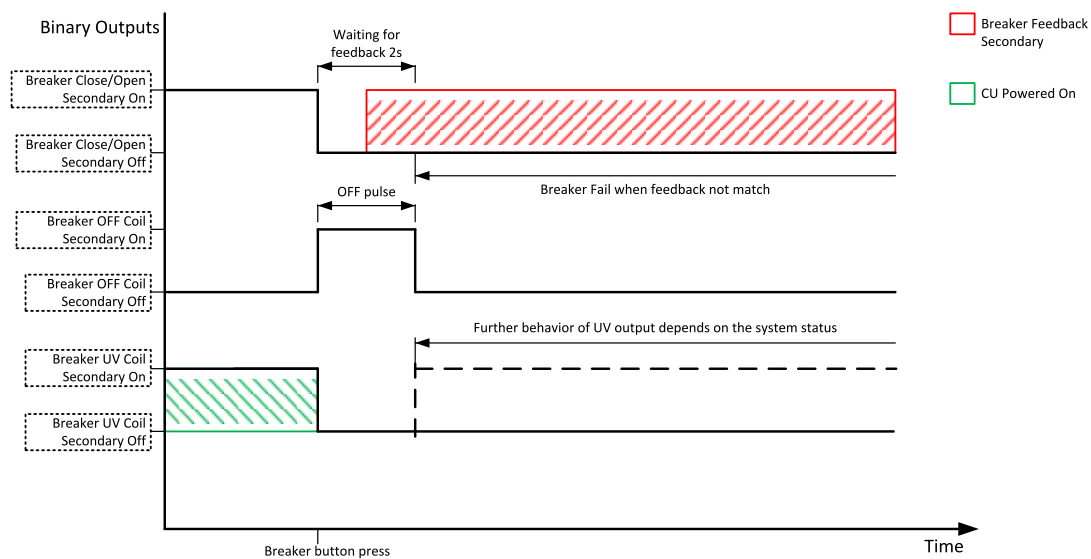


Image 7.60 BCB UV Coil open command

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## BESS In Loadsharing

Related FW	2.1.0	Related applications	MINT
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	2.1.0	Related applications	MINT
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).			

⬅ back to Logical binary outputs alphabetically

## BESS Active

Related FW	2.1.0	Related applications	MINT
LBO ID	60		
Description			
This output is closed after start command and opens when BESS is stopped.			
<b>Note:</b> This output also closes if the engine begins to rotate spontaneously.			

⬅ back to Logical binary outputs alphabetically

## Generator BESS Capability C LimitGenerator Capability C Limit

Related FW	2.1.0	Related applications	MINT
LBO ID	1427		
Description			
This output is closed when the <b>BESS Required PF</b> (while <b>BESS Required PF Character</b> = C) or <b>BESS Required Q</b> is out of capacitive limits in which is the BESSBESS allowed to run.			
Limits are given by adjusting the <b>CAPABILITY C</b> .			

⬅ back to Logical binary outputs alphabetically

## Generator BESS Capability L LimitGenerator Capability L Limit

Related FW	2.1.0	Related applications	MINT
LBO ID	1428		
Description			
This output is closed when the <b>BESS Required PF</b> (while <b>BESS Required PF Character</b> = L) or <b>BESS Required Q</b> is out of inductive limits in which is the BESSBESS allowed to run.			
Limits are given by adjusting the <b>CAPABILITY L</b> .			

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## BESS Healthy

Related FW	2.1.0	Related applications	MINT
LBO ID	77		
<b>Description</b>			
This output is closed while BESS is running and its parameters (voltage & frequency) are considered as healthy, i.e. within limits.			

🔍 back to Logical binary outputs alphabetically

## Mains/Bus HealthyMains Healthy

Related FW	2.1.0	Related applications	MINT
LBO ID	78		
<b>Description</b>			
This output is closed while Mains/Bus parameters (voltage & frequency) are considered as healthy, i. e. within limits.			
<b>Application Mode</b>		<b>Setting of Limits</b>	
MINT		BESS >>V	BESS >f
		BESS >V	BESS <f
		BESS <V	

🔍 back to Logical binary outputs alphabetically

## LBO: C

### Common Alarm Active Level 1

Related FW	2.1.0	Related applications	MINT
LBO ID	13		
<b>Description</b>			
This output is closed when there is at least one <b>Alarms level 1</b> in the alarmlist.			

🔍 back to Logical binary outputs alphabetically

### Common Alarm Active Level 2

Related FW	2.1.0	Related applications	MINT
LBO ID	15		
<b>Description</b>			
This output is closed when there is at least one <b>Alarms level 2</b> in the alarmlist.			

🔍 back to Logical binary outputs alphabetically



### Common Alarm Level 1

Related FW	2.1.0	Related applications	MINT
LBO ID	14		
Description			
This output is closed when there is at least one <b>unconfirmed Alarms level 1</b> in the alarmlist.			

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### Common Alarm Level 2

Related FW	2.1.0	Related applications	MINT
LBO ID	16		
Description			
This output is closed when there is at least one <b>unconfirmed Alarms level 2</b> in the alarmlist.			

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### Common Alarm Only

Related FW	2.1.0	Related applications	MINT
LBO ID	11		
Description			
This output is closed when there is at least one alarm of type <b>Alarm Only</b> present in the alarmlist.			

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### Common History Record

Related FW	2.1.0	Related applications	MINT
LBO ID	12		
Description			
This output is closed for 1 second every time alarm of type <b>History Record Only</b> occurs.			
<b>Note:</b> When any History Record alarm is activated the history record is logged into history.			

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### Common Shutdown

Related FW	2.1.0	Related applications	MINT
LBO ID	4		
Description			
This output is closed when there is at least one active alarm of type <b>ShutdownProtection typesProtection types</b> present in the alarmlist.			
<b>Note:</b> When any Mains Shutdown alarm is activated the BCB opens and BESS stops immediately.			

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## AL Common Shutdown Override

Related FW	2.1.0	Related applications	MINT
LBO ID	251		
Description			
This output is closed 2 seconds after there is at least one alarm of type <b>Shutdown Override</b> present in the alarmlist.			
<i><b>Note:</b> 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) <b>SD OVERRIDE</b>.</i>			

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## Common Slow Stop Protection

Related FW	2.1.0	Related applications	MINT
LBO ID	5		
Description			
This output is closed when there is at least one alarm of type <b>Slow Stop Offload System Protection</b> present in the alarmlist.			
<i><b>Note:</b> 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.</i>			
<i><b>Note:</b> When any Stp alarm is activated LBO System Start/Stop is immediately set to 0 and MGCB breaker is opened according to the Load Transfer settings.</i>			
<i><b>Note:</b> 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.</i>			
<i><b>Note:</b> 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.</i>			

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## Common Warning

Related FW	2.1.0	Related applications	MINT
LBO ID	3		
Description			
This output is closed when there is at least one alarm of type <b>Warning</b> present in the alarmlist.			

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### Controller HeartBeat Fail Detect

Related FW	2.1.0	Related applications	MINT
LBO ID	125		
Description			
XYZ.			

⬅ back to Logical binary outputs alphabetically

### LBO: D

### Daily BESS Cycles Reached

Related FW	2.1.0	Related applications	MINT
LBO ID	2704		
Description			
This output is active always when the number of daily battery cycles is reached.			

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### Day/Night

Related FW	2.1.0	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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### DC Circuit Closed

Related FW	2.1.0	Related applications	MINT
LBO ID	2784		
Description			
This LBO is a mirror of the LBI <b>PRECHARGE FINISHED</b> . It is active all the time when DC circuit of the BESS is closed.			

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### DC Strings Coupled

Related FW	2.1.0	Related applications	MINT
LBO ID	7369		
Description			
This logical output is active only when all of the operational battery strings have been coupled to each other to the dc bus. This LBO deactivates immediately when a 2nd level protection appears or a Stop command is activated.			

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## Display Fail

Related FW	2.1.0	Related applications	MINT
LBO ID	2223		
Description			
This output indicates controller display failure.			

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le

## Deadbus

Related FW	2.1.0	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 <b>Bus Dead Level</b> .			

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## LBO: E

### ECU 1 Comm Fail

Related FW	2.1.0	Related applications	MINT
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	2.1.0	Related applications	MINT
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	2.1.0	Related applications	MINT
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

<b>Related FW</b>	2.1.0	<b>Related applications</b>	MINT
<b>LBO ID</b>	2001		
<b>Description</b>			
This output is closed when there is no communication with ECU configured in ECU slot 4.			

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### ECU 5 Comm Fail

<b>Related FW</b>	2.1.0	<b>Related applications</b>	MINT
<b>LBO ID</b>	2002		
<b>Description</b>			
This output is closed when there is no communication with ECU configured in ECU slot 5.			

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### ECU 6 Comm Fail

<b>Related FW</b>	2.1.0	<b>Related applications</b>	MINT
<b>LBO ID</b>	2003		
<b>Description</b>			
This output is closed when there is no communication with ECU configured in ECU slot 6.			

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### ECU 7 Comm Fail

<b>Related FW</b>	2.1.0	<b>Related applications</b>	MINT
<b>LBO ID</b>	2004		
<b>Description</b>			
This output is closed when there is no communication with ECU configured in ECU slot 7.			

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### ECU 8 Comm Fail

<b>Related FW</b>	2.1.0	<b>Related applications</b>	MINT
<b>LBO ID</b>	2005		
<b>Description</b>			
This output is closed when there is no communication with ECU configured in ECU slot 8.			

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### ECU 9 Comm Fail

<b>Related FW</b>	2.1.0	<b>Related applications</b>	MINT
<b>LBO ID</b>	2006		
<b>Description</b>			
This output is closed when there is no communication with ECU configured in ECU slot 9.			

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ECU Comm OK

Related FW	2.1.0	Related applications	MINT
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	2.1.0	Related applications	MINT
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 (PAGE 1)** and remains closed for the entire duration that the BESS is running. It is opened at the moment that the BESS is stopped.

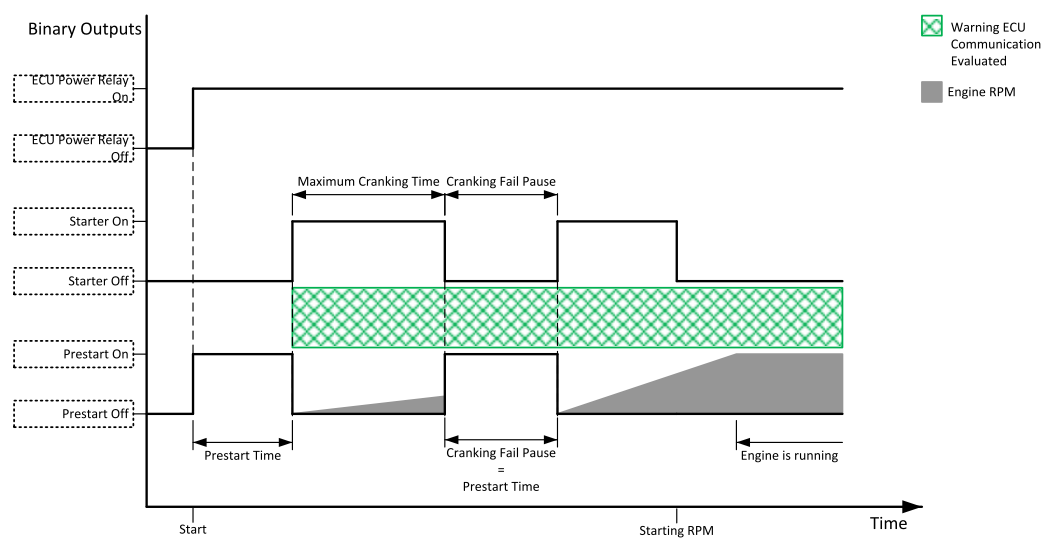


Image 7.61 ECU Power Relay

**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	2.1.0	Related applications	MINT
LBO ID	958		
Description			
Signal for starting and stopping of ECU.			

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RunningEnergized

Related FW	2.1.0	Related applications	MINT
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.			

The diagram illustrates the timing sequence for the RunningEnergized output. It shows a vertical timeline with several events: Starter On, Starter Off, Fuel Solenoid On, Fuel Solenoid Off, Running On, and Running Off. The Running On event is marked with a green shaded area, indicating the engine is running. The diagram also shows the Fuel Solenoid Lead, Cranking Time, and Prestart Time intervals. The Running Off event occurs after the engine is running, and the output remains closed until the BESS stop.

Image 7.62 Running

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Engines Swapped

Related FW	2.1.0	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 <b>#Priority Auto Swap</b> if it is setup to Run Hours Equal.			

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## ES Charge Disabled

Related FW	2.1.0	Related applications	MINT
LBO ID	5554		
<b>Description</b>			
<p>This logical output is activated if charging of the BESS be disabled.Reasons for activation and deactivation of this lbo are as follows:</p> <p>LBO ES Charge Disabled is activated based on the conditions below:</p> <p>&gt;</p> <p><b>LBI ES CHARGE ENABLE = 0 and/or LBO ES V REL CHARGE DISABLED = 1 and/or LBO ES SOC CHARGE DISABLED</b></p> <p>Energy Storage can no longer continue charging and blocks requests that would be below value Required P Target = 0 .</p> <p>Once LBO ES Charge Disabled is deactivated, the controller allows value Required P Target be below 0 and for the energy storage the charged power can be up to value ES Max Charging Power.</p>			

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## ES Discharge Disabled

Related FW	2.1.0	Related applications	MINT
LBO ID	5555		
<b>Description</b>			
<p>This logical output is activated if discharging of the BESS be disabled.Reasons for activation and deactivation of this lbo are as follows:</p> <p>LBO ES Discharge Disabled is activated based on the conditions below:</p> <p>&gt;</p> <p><b>LBI ES DISCHARGE ENABLE = 0 and/or LBO ES V REL DISCHARGE DISABLED = 1 and/or LBO ES SOC DISCHARGE DISABLED</b></p> <p>Energy Storage can no longer continue discharging and blocks requests that would be above value Required P Target = 0 .</p> <p>Once LBO ES Discharge Disabled is deactivated, the controller allows value Required P Target be above 0, and for the energy storage the discharged power can be up to value ES Max Discharging Power.</p>			

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## ES Run Request

Related FW	2.1.0	Related applications	MINT
LBO ID	2763		
<b>Description</b>			
<p>This output is used to send "start" request to the Energy Storage.</p>			

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## ES SOC Charge Disabled

Related FW	2.1.0	Related applications	MINT
LBO ID	2700		
<b>Description</b>			
<p>This output is active when state of charge of the BESS is too high and BESS cannot be charged anymore.</p> <p>ES V Rel Charge Disabled change from 0 to 1: Value <b>ES SOC</b> <math>\geq</math> <b>SOC High Target</b></p> <p>ES V Rel Charge Disabled change from 1 to 0: Value <b>ES SOC</b> <math>&lt;</math> <b>SOC Low Hysteresis</b></p> <p>The activation of this LBO does not occur when the LBI IGNORE HIGH SOC is active.</p>			

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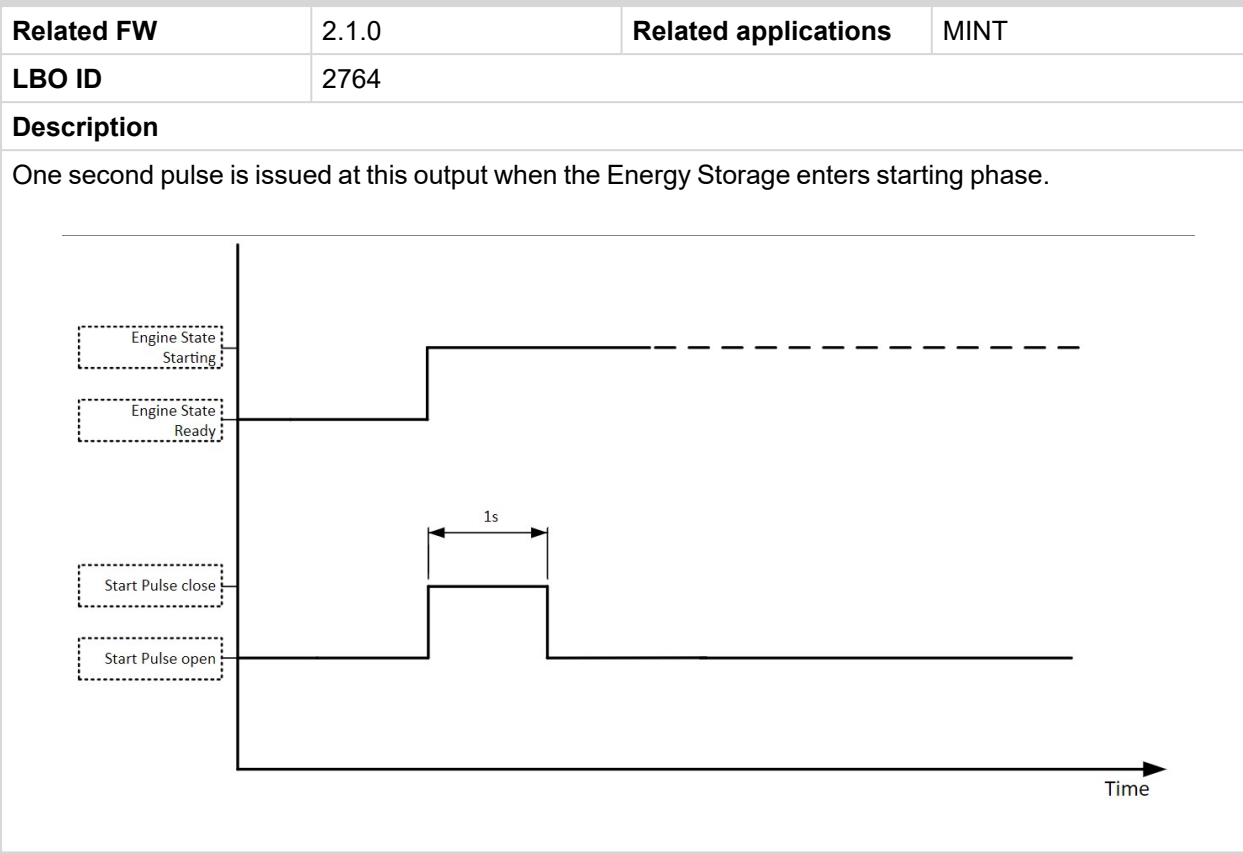
## ES SOC Discharge Disabled

Related FW	2.1.0	Related applications	MINT
LBO ID	2701		
<b>Description</b>			
<p>This output is active when state of charge of the BESS is too low and BESS cannot be discharged anymore.</p> <p>SOC Discharge Disabled change from 0 to 1: Value <b>ES SOC</b> <math>\leq</math> <b>SOC Low Target</b></p> <p>SOC Discharge Disabled change from 1 to 0: Value <b>ES SOC</b> <math>&gt;</math> <b>SOC Low Hysteresis</b></p> <p>The activation of this LBO does not occur when the LBI IGNORE LOW SOC is active.</p>			

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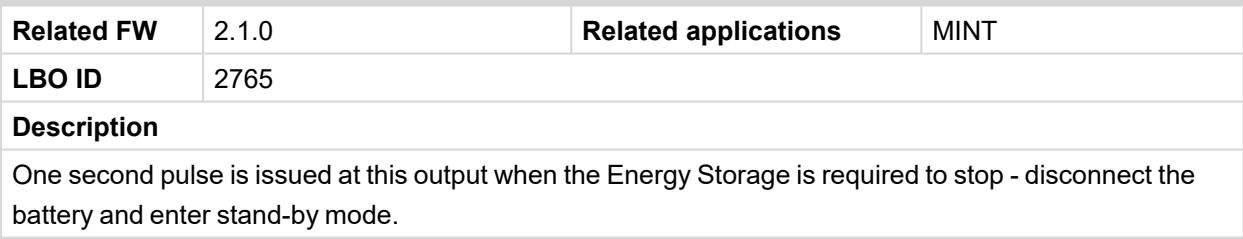


ES Start Pulse



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ES Stop Pulse

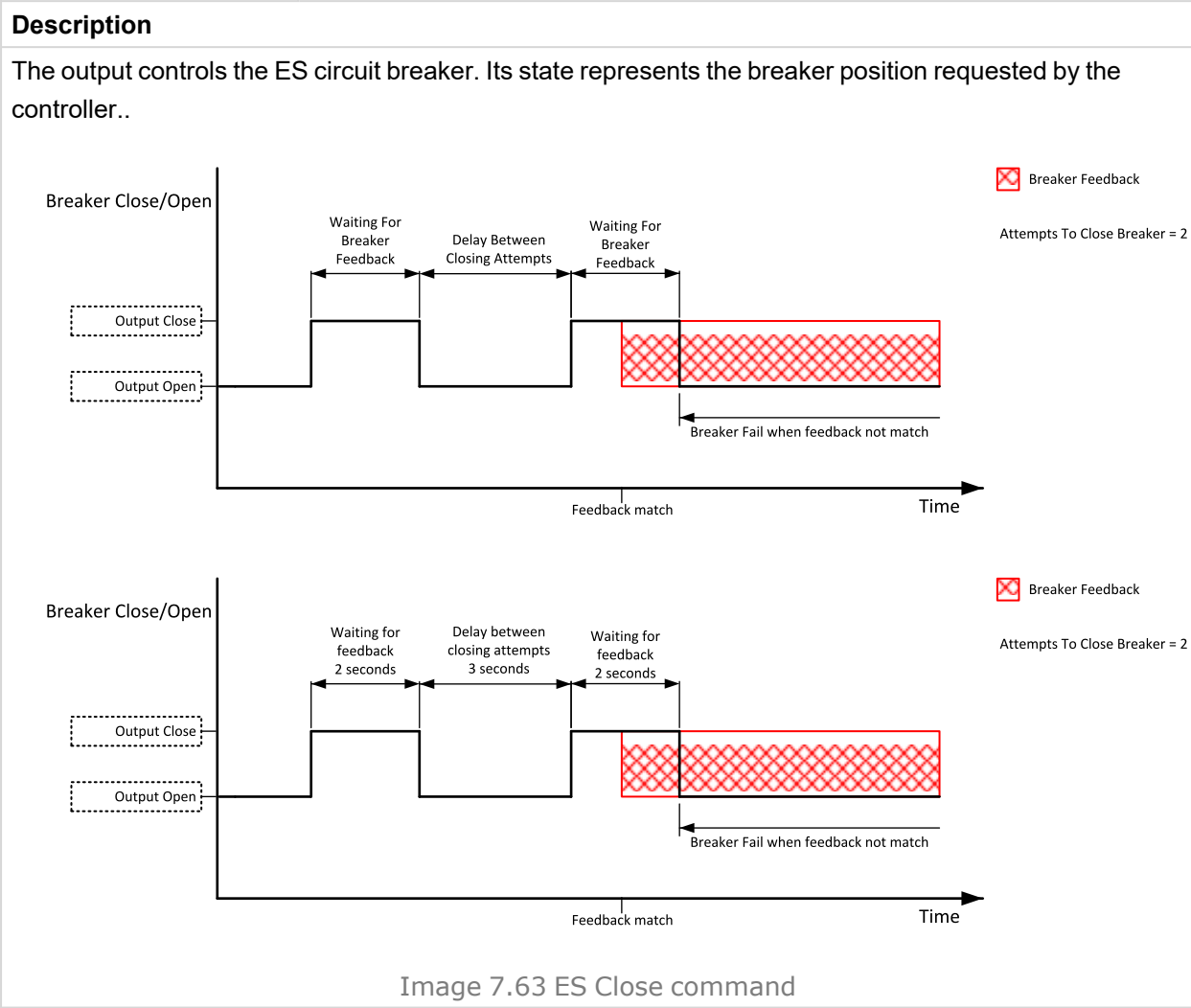


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ESCB Close/Open

Related FW	2.1.0	Related applications	MINT
LBO ID	2767		



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ESCB ON Coil

Related FW	2.1.0	Related applications	MINT
LBO ID	2768		

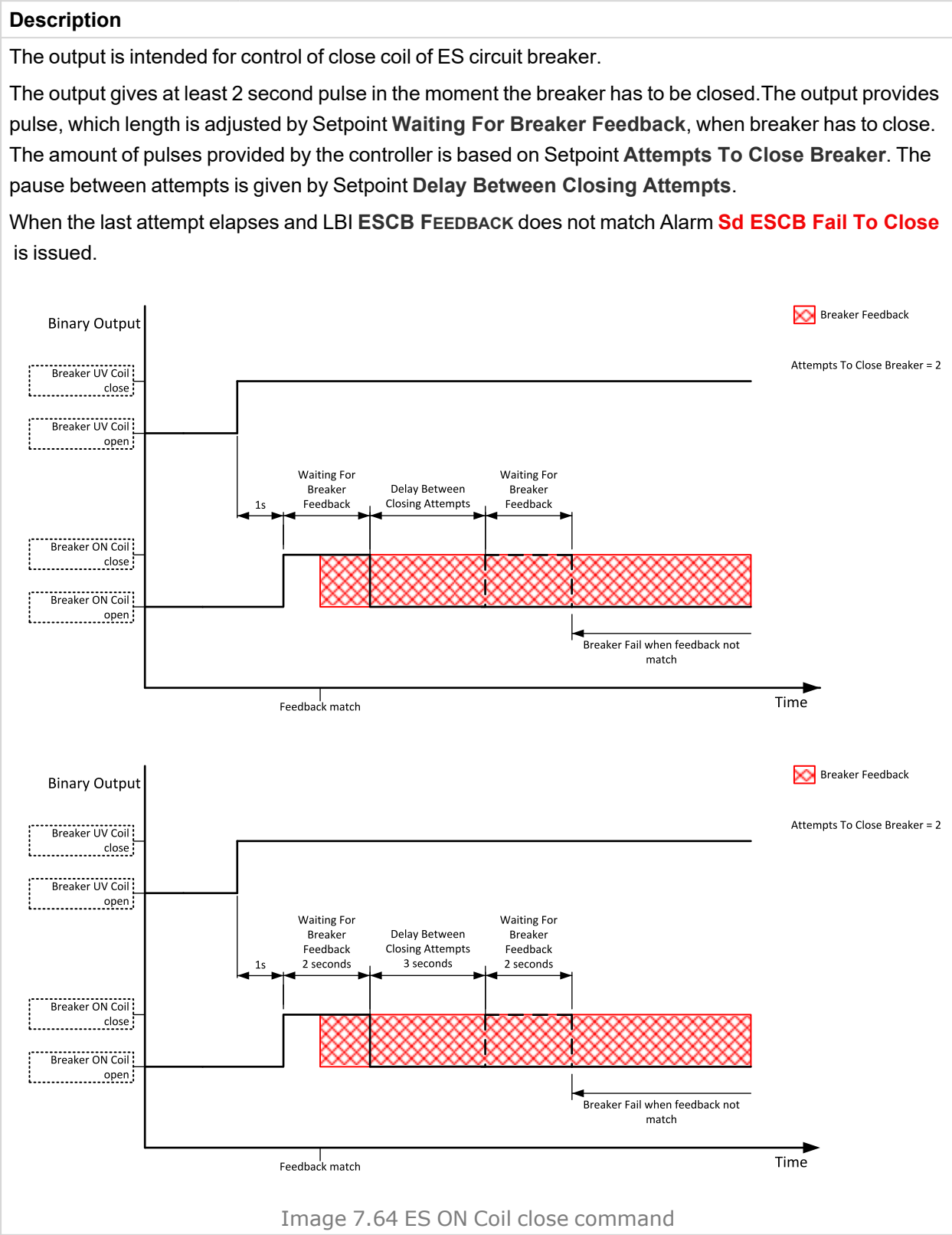


Image 7.64 ES ON Coil close command

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ESCB OFF Coil

Related FW	2.1.0	Related applications	MINT
LBO ID	2769		

Description

The output is intended for opening of ES 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 **ESCB FEEDBACK** does not match after second pulse elapses, Alarm **Sd ESCB Fail To Open** is issued.

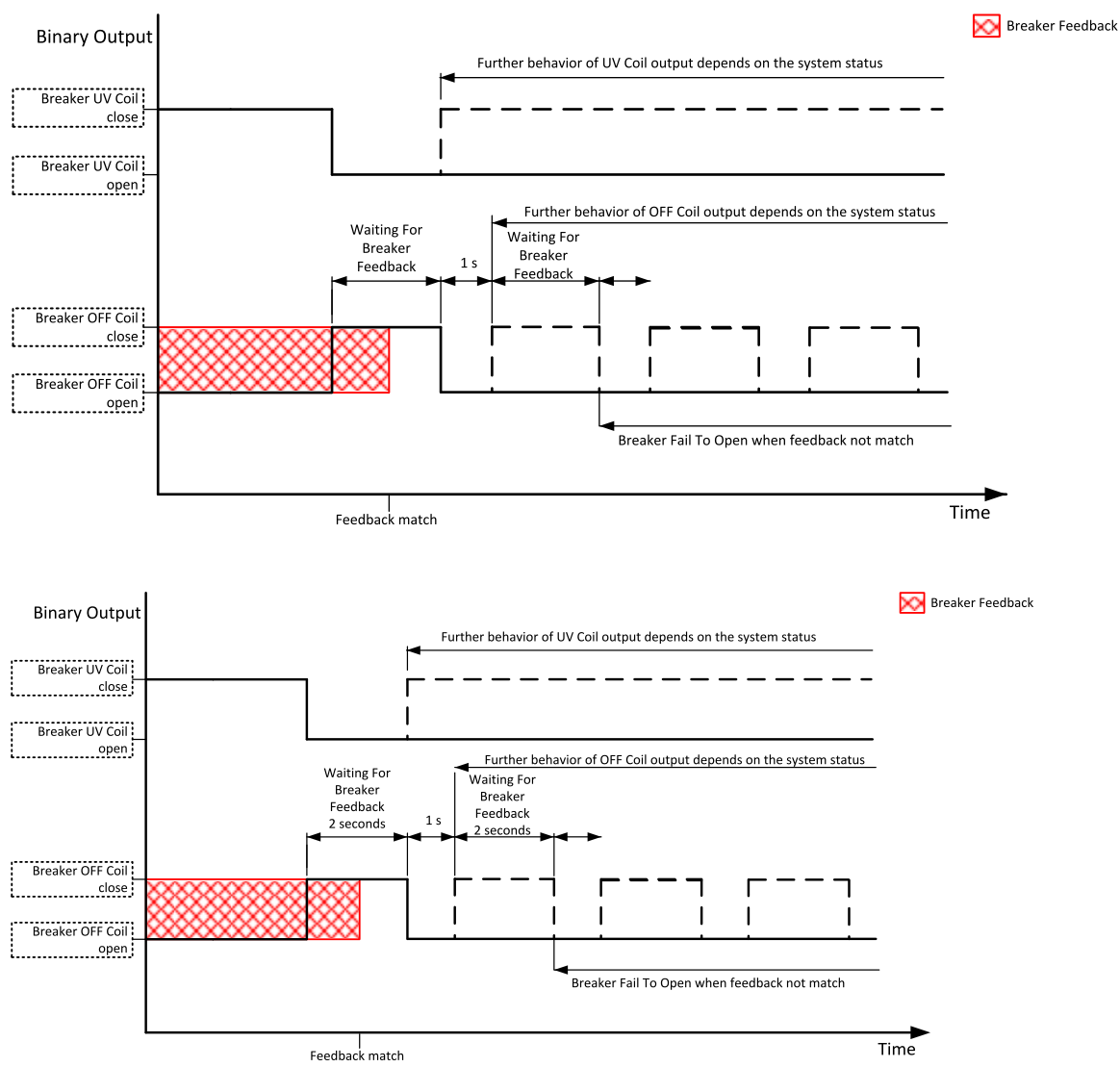


Image 7.65 ES OFF Coil command

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ESCB UV Coil

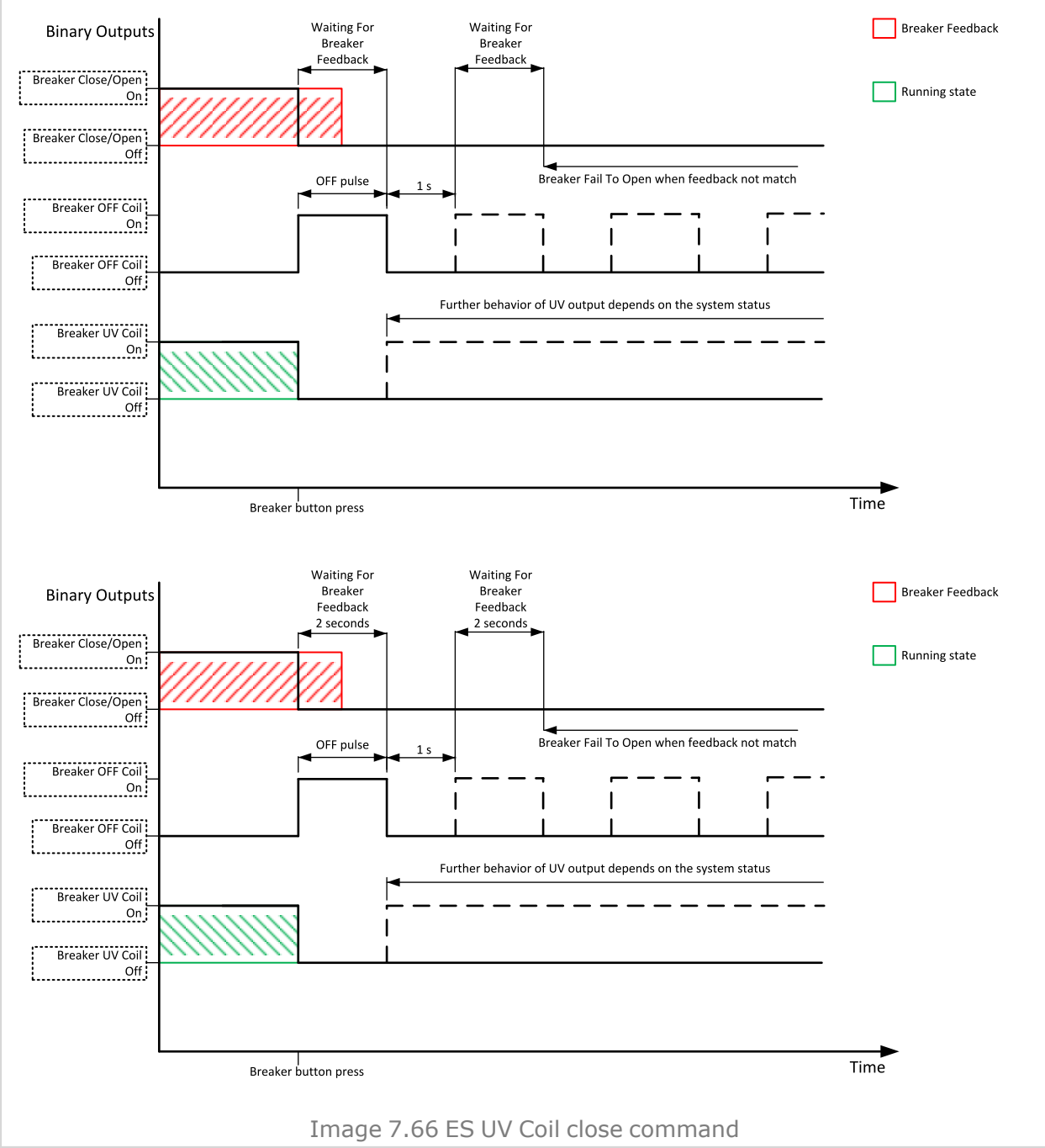
Related FW	2.1.0	Related applications	MINT
LBO ID	2770		

Description

The output is intended for control of undervoltage coil of ES circuit breaker.

The output is closed after the BESShas been started..ES 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 the duration set by Setpoint **Waiting For Breaker Feedback** when the ES has to open.

The output is closed again and remains closed while the ES voltage and frequency are within limits if the Running phase follows after the opening of the ES (e.g. in MAN). The output remains open if the Cooling phase follows after the opening of the ES.





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### ESCB Status

Related FW	2.1.0	Related applications	MINT
LBO ID	2771		
<b>Description</b>			
This output indicates the ES circuit breaker position as it is internally considered by the controller. The position is based on <b>ESCB FEEDBACK</b> and <b>ESCB FEEDBACK NEGATIVE</b> .			
➤ 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 ES circuit breaker position according to feedbacks.			
➤➤ Feedbacks do not match each other - output indicates last position when feedbacks matched.			

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### Event Post VRT

Related FW	2.1.0	Related applications	MINT
LBO ID	1438		
<b>Description</b>			
This output is closed when <b>Post VRT Ramp</b> is in use.			

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### Event Soft Unload

Related FW	2.1.0	Related applications	MINT
LBO ID	1437		
<b>Description</b>			
This output is closed when <b>Soft Unload Ramp</b> is in use.			

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### Exercise Timer 1

Related FW	2.1.0	Related applications	MINT
LBO ID	1250		
<b>Description</b>			
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 <b>Subgroup: Timer 1</b> subgroup.			
<b>Note:</b> 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	2.1.0	Related applications	MINT
LBO ID	1251		
Description			
<p>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.</p>			
<p><b>Note:</b> <i>If more than one timer is active at the same time, timer with selected higher priority function is applied.</i></p>			

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## Exercise Timer 3

Related FW	2.1.0	Related applications	MINT
LBO ID	1946		
Description			
<p>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.</p>			
<p><b>Note:</b> <i>If more than one timer is active at the same time, timer with selected higher priority function is applied.</i></p>			

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## Exercise Timer 4

Related FW	2.1.0	Related applications	MINT
LBO ID	1947		
Description			
<p>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.</p>			
<p><b>Note:</b> <i>If more than one timer is active at the same time, timer with selected higher priority function is applied.</i></p>			

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## Exercise Timer 5

Related FW	2.1.0	Related applications	MINT
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	2.1.0	Related applications	MINT
LBO ID	1949		
Description			
<p>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.</p>			
<p><b>Note:</b> <i>If more than one timer is active at the same time, timer with selected higher priority function is applied.</i></p>			

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## ES V Rel Discharge Disabled

Related FW	2.1.0	Related applications	MINT
LBO ID	7589		
Description			
<p>This LBO informs whether the Energy Storage charging is not allowed due to low value <b>ES Voltage</b>.</p> <p>ES V Rel Discharge Disabled change from 0 to 1:</p> <p>Value <b>ES Voltage</b> &lt;= <b>V Rel Low Target</b></p> <p>ES V Rel Discharge Disabled change from 1 to 0:</p> <p>Value <b>ES Voltage</b> &gt; <b>V Rel Low Hysteresis</b></p> <p>The activation of this LBO does not occur when the LBI <b>IGNORE LOW V REL</b> is active. <b>IGNORE LOW V REL</b></p>			

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## ES V Rel Charge Disabled


Related FW	2.1.0	Related applications	MINT
LBO ID	7588		
Description			
<p>This LBO informs whether the Energy Storage charging is not allowed due to high value <b>ES Voltage</b>.</p> <p>ES V Rel Charge Disabled change from 0 to 1: Value <b>ES Voltage</b> &gt;= <b>V Rel High Target</b></p> <p>ES V Rel Charge Disabled change from 1 to 0: Value <b>ES Voltage</b> &lt; <b>V Rel High Hysteresis</b></p> <p>The activation of this LBO does not occur when the LBI <b>IGNORE HIGH V REL</b> is active.</p>			

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## LBO: F

### FltRes Button Echo

Related FW	2.1.0	Related applications	MINT
LBO ID	30		
Description			
This output provides 1 s pulse when: <ul style="list-style-type: none"><li>&gt; Fault Reset button  is pressed on an <b>External display</b>Internal display.</li><li>&gt; Fault Reset command is received via communication line</li><li>&gt; LBI FAULT RESET BUTTON is activated.</li></ul>			

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### Forward Synchronization

Related FW	2.1.0	Related applications	MINT
LBO ID	68		
Description			
This output is closed when forward synchronization is active (synchronization via BCB breaker) and opens when LBO <b>BCB STATUS</b> closes.			

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### SpeedFrequencyFrequency Down

Related FW	2.1.0	Related applications	MINT
LBO ID	57		
Description			
This output together with the complementary output <b>SPEEDFREQUENCY UP</b> are designed for frequency and power control of the BESS where the BESS inverter regulatorspeed governor does not support analogue control.			

⬅ back to Logical binary outputs alphabetically

### SpeedFrequency Up

Related FW	2.1.0	Related applications	MINT
LBO ID	56		
Description			
This output together with the complementary output <b>SPEEDFREQUENCYFREQUENCY DOWN</b> are designed for frequency and power control of the BESS where the BESS inverter regulatorspeed governor does not support analogue control.			

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## LBO: G

### GPS Coordinates Detected

Related FW	2.1.0	Related applications	MINT
LBO ID	5930		
Description			
This LBO is active if the GPS coordinates obtained from the GPS module are valid..			

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## LBO: H

### Heartbeat

Related FW	2.1.0	Related applications	MINT
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	2.1.0	Related applications	MINT
LBO ID	1		
Description			
This output is closed when any <b>Alarms</b> is activated and stays closed until:			
<div><div>&gt;</div><div>Fault reset  is pressed</div></div> <div><div>&gt;</div><div>Horn reset  is pressed</div></div> <div><div>&gt;</div><div><b>Horn Timeout</b> elapses</div></div>			

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### Horn Flashing

Related FW	2.1.0	Related applications	MINT
LBO ID	29		
Description			
This is the flashing alternative of the output <b>HORN</b> , i.e. the output flashes with 1 Hz period while the output Horn is closed.			

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## HornRes Button Echo

Related FW	2.1.0	Related applications	MINT
LBO ID	31		
Description			
This output is closed for 1 s every time Horn Reset Button is pressed.			

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## HW AC Voltage Measurement Error

Related FW	2.1.0	Related applications	MINT
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.			
<b>IMPORTANT: This LBO only works on HW revision D and higher.</b>			

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## LBO: I

### In Synchronism

Related FW	2.1.0	Related applications	MINT
LBO ID	80		
Description			
This output is closed during synchronization when Slip Angle, Slip Frequency and Voltages are inside required windows. Required windows are: <ul style="list-style-type: none"><li>➤ <b>Slip Angle</b> between BESS and Bus Voltage is within range given by <b>Phase Window</b> for time longer than <b>Dwell Time</b>. Required if <b>Synchronization Type</b> = PhaseMatch.</li><li>➤ <b>Slip Frequency</b> between BESS and Bus Frequency is within range given by <b>Slip Frequency Window</b> for time longer than <b>Dwell Time</b>. Required if <b>Synchronization Type</b> = SlipSynchr.</li><li>➤ Voltage difference between BESS and Bus voltage in all phases must be lower or equal to <b>Voltage Window</b> for time longer than <b>Dwell Time</b>. Required always.</li></ul>			

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### Initialized

Related FW	2.1.0	Related applications	MINT
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.			

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## LBO: K

### kWh Pulse

Related FW	2.1.0	Related applications	MINT
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 Shedding Stage 1

Related FW	2.1.0	Related applications	MINT
LBO ID	51		
Description			
This is an output of <b>Load Shedding</b> .			
<ul style="list-style-type: none"><li>➤ The load shedding outputs are activated in the order 1, 2, 3, ..., X.</li><li>➤ The load shedding outputs are deactivated in the order X, ..., 3, 2, 1.</li><li>➤ The load disconnected by this LBO is the least essential load.</li></ul>			
<b>Note:</b> X is the highest configured Load shedding outputs.			

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### Load Shedding Stage 2

Related FW	2.1.0	Related applications	MINT
LBO ID	52		
Description			
This is an output of <b>Load Shedding</b> .			
<ul style="list-style-type: none"><li>➤ The load shedding outputs are activated in the order 1, 2, 3, ..., X.</li><li>➤ The load shedding outputs are deactivated in the order X, ..., 3, 2, 1.</li><li>➤ The load disconnected by LBO <b>LOAD SHEDDING STAGE 1</b> is the least essential load.</li></ul>			
<b>Note:</b> X is the highest configured Load shedding outputs.			

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### Load Shedding Stage 3

Related FW	2.1.0	Related applications	MINT
LBO ID	53		
<b>Description</b>			
This is an output of <b>Load Shedding</b> .			
<ul style="list-style-type: none"><li>&gt; The load shedding outputs are activated in the order 1, 2, 3, ..., X.</li><li>&gt; The load shedding outputs are deactivated in the order X, ..., 3, 2, 1.</li><li>&gt; The load disconnected by LBO <b>LOAD SHEDDING STAGE 1</b> is the least essential load.</li></ul>			
<i><b>Note:</b> X is the highest configured Load shedding outputs.</i>			

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### Load Shedding Stage 4

Related FW	2.1.0	Related applications	MINT
LBO ID	452		
<b>Description</b>			
This is an output of <b>Load Shedding</b> .			
<ul style="list-style-type: none"><li>&gt; The load shedding outputs are activated in the order 1, 2, 3, ..., X.</li><li>&gt; The load shedding outputs are deactivated in the order X, ..., 3, 2, 1.</li><li>&gt; The load disconnected by LBO <b>LOAD SHEDDING STAGE 1</b> is the least essential load.</li></ul>			
<i><b>Note:</b> X is the highest configured Load shedding outputs.</i>			

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### Load Shedding Stage 5

Related FW	2.1.0	Related applications	MINT
LBO ID	453		
<b>Description</b>			
This is an output of <b>Load Shedding</b> .			
<ul style="list-style-type: none"><li>&gt; The load shedding outputs are activated in the order 1, 2, 3, ..., X.</li><li>&gt; The load shedding outputs are deactivated in the order X, ..., 3, 2, 1.</li><li>&gt; The load disconnected by LBO <b>LOAD SHEDDING STAGE 1</b> is the least essential load.</li></ul>			
<i><b>Note:</b> X is the highest configured Load shedding outputs.</i>			

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## Loaded

Related FW	2.1.0	Related applications	MINT
LBO ID	72		
Description			
This output is closed while the BESS is loaded.			
<b>Note:</b> Output is opened when BESS starts unloading or opens the BCB without of unloading.			

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## LBO: M

## Manual Ready

Related FW	2.1.0	Related applications	MINT
LBO ID	1258		
Description			
This output is active when <b>Controller Mode</b> = MAN and the BESS is stopped and it is possible to start it. i.e. no red alarm is activated or <b>SD OVERRIDE</b> is active (Output <b>READY</b> is active).			

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## MCB Status

Related FW	2.1.0	Related applications	MINT
LBO ID	85		
Description			
This output indicates the MCB position as it is internally considered by the controller. The position is based on <b>MCB FEEDBACK</b> and <b>MCB FEEDBACK NEGATIVE</b> .			
<b>Note:</b> If the <b>LBI MCB FEEDBACK</b> is not configured the status is distributed automatically between all CUs in the group via CAN Intercontroller Communication.			
<ul style="list-style-type: none"><li>➤ In case that only <b>MCB FEEDBACK</b> is used, this output mirrors the input.</li><li>➤ In case that both <b>MCB FEEDBACK</b> and <b>MCB FEEDBACK NEGATIVE</b> are used and<ul style="list-style-type: none"><li>➤➤ Feedback match - output indicates MCB position according to feedbacks.</li><li>➤➤ Feedback do not match - output indicates last position when feedbacks matched.</li></ul></li></ul>			

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## Mode AUTO

Related FW	2.1.0	Related applications	MINT
LBO ID	19		
Description			
This output is active whenever <b>Controller Mode</b> = AUTO, i.e. when LBO <b>NOT IN AUTO</b> is opened.			

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### Mode MAN

Related FW	2.1.0	Related applications	MINT
LBO ID	18		
Description			
This output is active whenever <b>Controller Mode</b> = MAN.			

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### Mode OFFPRG

Related FW	2.1.0	Related applications	MINT
LBO ID	17		
Description			
This output is active whenever <b>Controller Mode</b> = OFF.			

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### LBO: N

### NCB Close/Open

Related FW	2.1.0	Related applications	MINT
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.			

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### Not In Auto

Related FW	2.1.0	Related applications	MINT
LBO ID	1248		
Description			
This output is closed whenever <b>Controller Mode</b> != AUTO, i.e. when <b>LBO MODE AUTO</b> is opened.			

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### Not Ready

Related FW	2.1.0	Related applications	MINT
LBO ID	63		
Description			
This output is closed when the BESS is not operable and is not ready to be started.			
Closed if:			
> <b>Controller Mode</b> = OFF			
> <b>LBI START BLOCKING</b> is closed			

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### Not Used

Related FW	2.1.0	Related applications	MINT
LBO ID	286		
Description			
Output has no function.			

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LBO: O

### Operational

Related FW	2.1.0	Related applications	MINT
LBO ID	61		
Description			
This output is closed when the BESS is ready for operation or is currently in operation.			

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LBO: P

### PCS Ready To Load

Related FW	2.1.0	Related applications	MINT
LBO ID	58		
Description			
<p>Through this output, the controller confirms that the initialization process has taken place and that BESS can be loaded.</p> <p>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.</p>			

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### PCS Run Request

Related FW	2.1.0	Related applications	MINT
LBO ID	2268		
Description			
This output is used for PCS activation.			

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### Peripheral Module Comm Fail

Related FW	2.1.0	Related applications	MINT
LBO ID	115		
Description			
This output is closed when there is no communication with at least one configured peripheral module.			

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## Precharge Relay

Related FW	2.1.0	Related applications	MINT
LBO ID	2782		
<b>Description</b>			
This LBO relates to the BESS start sequence described in <b>BESS Precharge Types</b> .			
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 <b>PRECHARGE FINISHED</b> gets active. Both signals are mandatory for correct operation.			

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## LBO: R

### Ready

Related FW	2.1.0	Related applications	MINT
LBO ID	62		
<b>Description</b>			
This output is closed when the BESS is stopped and it is possible to start it.			
➤ No <b>Alarms level 2</b> present in the alarmlist			
➤ LBI <b>SD OVERRIDE</b> is opened			

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### ROCOF 1 Active

Related FW	2.1.0	Related applications	MINT
LBO ID	1005		
<b>Description</b>			
This output is closed for 3 seconds when <b>ROCOF1 Protection</b> is activated.			

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### ROCOF 2 Active

Related FW	2.1.0	Related applications	MINT
LBO ID	2724		
<b>Description</b>			
This output is closed for 3 seconds when <b>ROCOF2 Protection</b> is activated.			

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### ROCOF 3 Active

Related FW	2.1.0	Related applications	MINT
LBO ID	2725		
<b>Description</b>			
This output is closed for 3 seconds when <b>ROCOF1 Protection</b> is activated.			

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## ROCOF 4 Active

Related FW	2.1.0	Related applications	MINT
LBO ID	2726		
Description			
This output is closed for 3 seconds when <b>ROCOF4 Protection</b> is activated.			

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## LBO: S

### Sd Override

Related FW	2.1.0	Related applications	MINT
LBO ID	962		
Description			
The output is closed if <b>SD OVERRIDE</b> input is active and opened if <b>SD OVERRIDE</b> input is inactive. This output is usually used to send information about <b>SD OVERRIDE</b> input into ECU.			

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### Soft Load

Related FW	2.1.0	Related applications	MINT
LBO ID	71		
Description			
This output is closed when BCB closes and BESS is being soft loaded via <b>Soft Load Ramp</b> . Later change of <b>BESS P</b> does not close this output again.			

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### Soft Unload

Related FW	2.1.0	Related applications	MINT
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 <b>Soft Unload Ramp</b> .			

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### Start Blocked

Related FW	2.1.0	Related applications	MINT
LBO ID	1226		
Description			
This output is closed while start of the BESS is blocked due to at least one of these reasons: ➤ <b>LBI START BLOCKING</b> is closed			

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## Start Button Echo

Related FW	2.1.0	Related applications	MINT
LBO ID	33		
Description			
This output is closed for 1 s every time Start Button is pressed.			

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## Starting

Related FW	2.1.0	Related applications	MINT
LBO ID	65		
Description			
This output is closed at the beginning of the <b>Precharging TO</b> period and opens after starting phase is finished or when <b>Start Fail</b> alarm is activated.			

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## Stop Button Echo

Related FW	2.1.0	Related applications	MINT
LBO ID	32		
Description			
This output is closed for 1 s every time Stop Button is pressed.			

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## Stopping

Related FW	2.1.0	Related applications	MINT
LBO ID	75		
Description			
This output is closed during stopping sequence after stop command is received and opens after the BESS is considered to be stopped.			
<b>Note:</b> Output is also closed if the engine begins to rotate spontaneously.			

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## System Ready

Related FW	2.1.0	Related applications	MINT
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.			
<b>Note:</b> Fulfilled reserve means that <b>Available Nominal Power</b> is above the <b>Minimal Running Nominal Power</b>			

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## System Reserve OK

Related FW	2.1.0	Related applications	MINT
LBO ID	87		
Description			
This output is closed when <b>Actual Reserve</b> is higher than the <b>Start Reserve</b> .			

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## Stop Bus Energize

Related FW	2.1.0	Related applications	MINT
LBO ID	7366		
Description			
<p>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.</p> <p>For setpoint <b>Starting Sequence BCB Control</b> = Starting with BCB Opened the lbo activates once the system is running <b>BESS State</b> = Energized and a command to close the BCB breaker occurs.</p> <p>With <b>Starting Sequence BCB Control</b> =Starting with BCB Closed the LBO activates after start command.</p>			

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## SBMB Close/Open 1

Related FW	2.1.0	Related applications	MINT
LBO ID	7352		
Description			
<p>The output controls the String Battery module breaker. Its state represents the breaker position requested by the controller. This logical output is active when the LAI <b>STRING VOLTAGE 1</b> is in <b>DC Voltage Window</b> limits and the LBO String Voltage Healthy 1 is active. Changing of the LBO occurs after start command or during stop command.</p> <p>The first among LBO SBMB Close/Open 1...8 to activate depends on which of the values String Voltage 1..8 is evaluated to have the Highest Voltage. Afterwards the next LBO SBMB Close/Open 1...8 activates with second highest String Voltage 1...8 value. This does only for all of the LBO String Voltage Healthy 1..8 that are active.</p>			

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## SBMB Close/Open 2

Related FW	2.1.0	Related applications	MINT
LBO ID	7353		
Description			
<p>The output controls the String Battery module breaker. Its state represents the breaker position requested by the controller. This logical output is active when the LAI is <b>STRING VOLTAGE 2</b> in <b>DC Voltage Window</b> limits and the LBO String Voltage Healthy 1 is active. Changing of the LBO occurs after start command or during stop command.</p>			



The first among LBO SBMB Close/Open 1...8 to activate depends on which of the values String Voltage 1..8 is evaluated to have the Highest Voltage. Afterwards the next LBO SBMB Close/Open 1...8 activates with second highest String Voltage 1...8 value. This does only for all of the LBO String Voltage Healthy 1..8 that are active.

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### SBMB Close/Open 3

Related FW	2.1.0	Related applications	MINT
LBO ID	7354		
Description			
<p>The output controls the String Battery module breaker. Its state represents the breaker position requested by the controller. This logical output is active when the LAI is<b>STRING VOLTAGE 3 in DC Voltage Window</b> limits and the LBO String Voltage Healthy 1 is active. Changing of the LBO occurs after start command or during stop command.</p> <p>The first among LBO SBMB Close/Open 1...8 to activate depends on which of the values String Voltage 1..8 is evaluated to have the Highest Voltage. Afterwards the next LBO SBMB Close/Open 1...8 activates with second highest String Voltage 1...8 value. This does only for all of the LBO String Voltage Healthy 1..8 that are active.</p>			

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### SBMB Close/Open 4

Related FW	2.1.0	Related applications	MINT
LBO ID	7355		
Description			
<p>The output controls the String Battery module breaker. Its state represents the breaker position requested by the controller. This logical output is active when the LAI is<b>STRING VOLTAGE 4</b> in <b>DC Voltage Window</b> limits and the LBO String Voltage Healthy 1 is active. Changing of the LBO occurs after start command or during stop command.</p> <p>The first among LBO SBMB Close/Open 1...8 to activate depends on which of the values String Voltage 1..8 is evaluated to have the Highest Voltage. Afterwards the next LBO SBMB Close/Open 1...8 activates with second highest String Voltage 1...8 value. This does only for all of the LBO String Voltage Healthy 1..8 that are active.</p>			

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### SBMB Close/Open 5

Related FW	2.1.0	Related applications	MINT
LBO ID	7356		
Description			
The output controls the String Battery module breaker. Its state represents the breaker position requested by the controller. This logical output is active when the LAI is <b>STRING VOLTAGE 5</b> in <b>DC Voltage</b>			



**Window** limits and the LBO String Voltage Healthy 1 is active. Changing of the LBO occurs after start command or during stop command.

The first among LBO SBMB Close/Open 1...8 to activate depends on which of the values String Voltage 1..8 is evaluated to have the Highest Voltage. Afterwards the next LBO SBMB Close/Open 1...8 activates with second highest String Voltage 1...8 value. This does only for all of the LBO String Voltage Healthy 1..8 that are active.

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### SBMB Close/Open 6

Related FW	2.1.0	Related applications	MINT
LBO ID	7357		
Description			
<p>The output controls the String Battery module breaker. Its state represents the breaker position requested by the controller. This logical output is active when the LAI is<b>STRING VOLTAGE 6</b> in <b>DC Voltage Window</b> limits and the LBO String Voltage Healthy 1 is active. Changing of the LBO occurs after start command or during stop command.</p> <p>The first among LBO SBMB Close/Open 1...8 to activate depends on which of the values String Voltage 1..8 is evaluated to have the Highest Voltage. Afterwards the next LBO SBMB Close/Open 1...8 activates with second highest String Voltage 1...8 value. This does only for all of the LBO String Voltage Healthy 1..8 that are active.</p>			

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### SBMB Close/Open 7

Related FW	2.1.0	Related applications	MINT
LBO ID	7358		
Description			
<p>The output controls the String Battery module breaker. Its state represents the breaker position requested by the controller. This logical output is active when the LAI is<b>STRING VOLTAGE 7</b> in <b>DC Voltage Window</b> limits and the LBO String Voltage Healthy 1 is active. Changing of the LBO occurs after start command or during stop command.</p> <p>The first among LBO SBMB Close/Open 1...8 to activate depends on which of the values String Voltage 1..8 is evaluated to have the Highest Voltage. Afterwards the next LBO SBMB Close/Open 1...8 activates with second highest String Voltage 1...8 value. This does only for all of the LBO String Voltage Healthy 1..8 that are active.</p>			

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### SBMB Close/Open 8

Related FW	2.1.0	Related applications	MINT
LBO ID	7359		
Description			



The output controls the String Battery module breaker. Its state represents the breaker position requested by the controller. This logical output is active when the LAI is **STRING VOLTAGE 8** in **DC Voltage Window** limits and the LBO String Voltage Healthy 1 is active. Changing of the LBO occurs after start command or during stop command.

The first among LBO SBMB Close/Open 1...8 to activate depends on which of the values String Voltage 1..8 is evaluated to have the Highest Voltage. Afterwards the next LBO SBMB Close/Open 1...8 activates with second highest String Voltage 1...8 value. This does only for all of the LBO String Voltage Healthy 1..8 that are active.

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### String Voltage Healthy 1

Related FW	2.1.0	Related applications	MINT
LBO ID	7344		
<b>Description</b>			
This logical binary output is active when battery string 1 indicates that it is healthy and is able to participate in <b>DC String Coupling</b> . Indication of healthiness is given by having the LBI <b>STRING HEALTHY 1</b> active and having value <b>String Voltage 1</b> in limits set by setpoints <b>String V&gt;</b> and <b>String V&lt;</b> . Evaluation of having the battery string to connect to DC bus is given by having value <b>String Voltage 1</b> in limits set by setpoint <b>DC Voltage Window</b>			

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### String Voltage Healthy 2

Related FW	2.1.0	Related applications	MINT
LBO ID	7345		
<b>Description</b>			
This logical binary output is active when battery string 2 indicates that it is healthy and is able to participate in <b>DC String Coupling</b> . Indication of healthiness is given by having the LBI <b>STRING HEALTHY 1</b> active and having value <b>String Voltage 1</b> in limits set by setpoints <b>String V&gt;</b> and <b>String V&lt;</b> . Evaluation of having the battery string to connect to DC bus is given by having value <b>String Voltage 1</b> in limits set by setpoint <b>DC Voltage Window</b>			

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### String Voltage Healthy 3

Related FW	2.1.0	Related applications	MINT
LBO ID	7346		
<b>Description</b>			
This logical binary output is active when battery string 3 indicates that it is healthy and is able to participate in <b>DC String Coupling</b> . Indication of healthiness is given by having the LBI <b>STRING HEALTHY 1</b> active and having value <b>String Voltage 1</b> in limits set by setpoints <b>String V&gt;</b> and <b>String V&lt;</b> . Evaluation of having the battery string to connect to DC bus is given by having value <b>String Voltage 1</b> in limits set by setpoint <b>DC Voltage Window</b>			

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### String Voltage Healthy 4

Related FW	2.1.0	Related applications	MINT
LBO ID	7347		
Description			
This logical binary output is active when battery string 4 indicates that it is healthy and is able to participate in <b>DC String Coupling</b> . Indication of healthiness is given by having the LBI <b>STRING HEALTHY 1</b> active and having value <b>String Voltage 1</b> in limits set by setpoints <b>String V&gt;</b> and <b>String V&lt;</b> .Evaluation of having the battery string to connect to DC bus is given by having value <b>String Voltage 1</b> in limits set by setpoint <b>DC Voltage Window</b>			

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### String Voltage Healthy 5

Related FW	2.1.0	Related applications	MINT
LBO ID	7348		
Description			
<p>This logical binary output is active when battery string 5 indicates that it is healthy and is able to participate in <b>DC String Coupling</b>. Indication of healthiness is given by having the LBI <b>STRING HEALTHY 1</b> active and having value <b>String Voltage 1</b> in limits set by setpoints <b>String V&gt;</b> and <b>String V&lt;</b>. Evaluation of having the battery string to connect to DC bus is given by having value <b>String Voltage 1</b> in limits set by setpoint <b>DC Voltage Window</b></p>			

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### String Voltage Healthy 6

Related FW	2.1.0	Related applications	MINT
LBO ID	7349		
Description			
<p>This logical binary output is active when battery string 6 indicates that it is healthy and is able to participate in <b>DC String Coupling</b>. Indication of healthiness is given by having the LBI <b>STRING HEALTHY 1</b> active and having value <b>String Voltage 1</b> in limits set by setpoints <b>String V&gt;</b> and <b>String V&lt;</b>. Evaluation of having the battery string to connect to DC bus is given by having value <b>String Voltage 1</b> in limits set by setpoint <b>DC Voltage Window</b></p>			

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### String Voltage Healthy 7

Related FW	2.1.0	Related applications	MINT
LBO ID	7350		
Description			
<p>This logical binary output is active when battery string 1 indicates that it is healthy and is able to participate in <b>DC String Coupling</b>. Indication of healthiness is given by having the LBI <b>STRING HEALTHY 1</b> active and having value <b>String Voltage 1</b> in limits set by setpoints <b>String V&gt;</b> and <b>String V&lt;</b>. Evaluation of having the battery string to connect to DC bus is given by having value <b>String Voltage 1</b> in limits set by setpoint <b>DC Voltage Window</b></p>			

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## String Voltage Healthy 8

Related FW	2.1.0	Related applications	MINT
LBO ID	7351		
Description			
<p>This logical binary output is active when battery string 8 indicates that it is healthy and is able to participate in <b>DC String Coupling</b>. Indication of healthiness is given by having the LBI <b>STRING HEALTHY 1</b> active and having value <b>String Voltage 1</b> in limits set by setpoints <b>String V&gt;</b> and <b>String V&lt;</b>. Evaluation of having the battery string to connect to DC bus is given by having value <b>String Voltage 1</b> in limits set by setpoint <b>DC Voltage Window</b></p>			

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## Synchronizing

Related FW	2.1.0	Related applications	MINT
LBO ID	325		
Description			
The output is active during synchronization when controller is in the Synchro or RevSync state.			

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LBO: V

## Vector Shift Active

Related FW	2.1.0	Related applications	MINT
LBO ID	93		
Description			
This output is closed for 3 seconds when <b>Vector Shift Protection</b> is activated.			

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## Voltage Up

Related FW	2.1.0	Related applications	MINT
LBO ID	54		
Description			
This output together with the complementary output <b>VOLTAGE DOWN</b> are designed for voltage and power factor control of the BESS, where the BESS inverter regulator does not support analogue control.			

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## Voltage Down

Related FW	2.1.0	Related applications	MINT
LBO ID	55		
Description			
This output together with the complementary output <b>VOLTAGE UP</b> are designed for voltage and power factor control of the BESS, where the BESS inverter regulator does not support analogue control.			

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# 9.1.8 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 .....	924
LAI: B .....	929
LAI: C .....	930
LAI: D .....	931
LAI: E .....	932
LAI: G .....	935
LAI: H .....	936
LAI: L .....	936
LAI: P .....	937
LAI: Q .....	938
LAI: S .....	938

For full list of Logical analog inputs go to the chapter **Logical analog inputs alphabetically**.



## Logical analog inputs alphabetically

LAI: A	924	Reserve		String Voltage 5	939
AIN Switch01	924	Dynamic Spinning		String Voltage 6	939
AIN Switch02	924	Reserve Offset	932	String Voltage 7	939
AIN Switch03	924	LAI: E	932	String Voltage 8	939
AIN Switch04	924	ES Charge kWh	932		
AIN Switch05	924	BESS Cycles	933		
AIN Switch06	925	ES Current	933		
AIN Switch07	925	ES Discharge kWh	933		
AIN Switch08	925	ES kWh NominalCapacity	933		
AIN Switch09	925	ES Max Charging Current	934		
AIN Switch10	925	ES Max Discharging			
AC BUS Voltage L1	926	Current	934		
AC BUS Voltage L2	926	ES SOC	934		
AC BUS Voltage L3	926	ES Temperature	934		
AC BUS Frequency	926	ES Voltage	934		
AC BESS Current L1	927	ES Voltage Meas	935		
AC BESS Current L2	927	LAI: G	935		
AC BESS Current L3	927	Gen P Min	935		
AC BESS Frequency	927	LAI: H	936		
AC BESS P	928	HLC U-f Control: P			
AC BESS Q	928	Request	936		
AC BESS Voltage L1	928	HLC U-f Control: Q			
AC BESS Voltage L2	929	Request	936		
AC BESS Voltage L3	929	LAI: L	936		
LAI: B	929	Load Control: ANEXT			
BESS P Request	929	Baseload	936		
BESS Q Request	930	LAI: P	937		
LAI: C	930	PCS Current Meas	937		
Cell Max Temperature	930	PCS Voltage Meas	937		
Cell Max Voltage	930	PF Control: ANEXT Base			
Cell Min Temperature	931	PF	937		
Cell Min Voltage	931	LAI: Q	938		
LAI: D	931	Q Control: ANEXT Base Q	938		
DC PV kWh	931	LAI: S	938		
DC PV Nominal P	931	String Voltage 1	938		
DC PV P	932	String Voltage 2	938		
Dynamic Spinning	932	String Voltage 3	938		
		String Voltage 4	939		

 **back to Controller objects**



LAI: A

### AIN Switch01

Related FW	2.1.0	Related applications	MINT
LAI ID	209		
Description			
LAI is representing value of AIN Switch 1.			

⬅ back to Logical analog inputs alphabetically

### AIN Switch02

Related FW	2.1.0	Related applications	MINT
LAI ID	210		
Description			
LAI is representing value of AIN Switch 2.			

⬅ back to Logical analog inputs alphabetically

### AIN Switch03

Related FW	2.1.0	Related applications	MINT
LAI ID	211		
Description			
LAI is representing value of AIN Switch 3.			

⬅ back to Logical analog inputs alphabetically

### AIN Switch04

Related FW	2.1.0	Related applications	MINT
LAI ID	212		
Description			
LAI is representing value of AIN Switch 4.			

⬅ back to Logical analog inputs alphabetically

### AIN Switch05

Related FW	2.1.0	Related applications	MINT
LAI ID	278		
Description			
LAI is representing value of AIN Switch 5.			

⬅ back to Logical analog inputs alphabetically



### AIN Switch06

Related FW	2.1.0	Related applications	MINT
LAI ID	279		
Description			
LAI is representing value of AIN Switch 6.			

⬅ back to Logical analog inputs alphabetically

### AIN Switch07

Related FW	2.1.0	Related applications	MINT
LAI ID	280		
Description			
LAI is representing value of AIN Switch 7.			

⬅ back to Logical analog inputs alphabetically

### AIN Switch08

Related FW	2.1.0	Related applications	MINT
LAI ID	281		
Description			
LAI is representing value of AIN Switch 8.			

⬅ back to Logical analog inputs alphabetically

### AIN Switch09

Related FW	2.1.0	Related applications	MINT
LAI ID	282		
Description			
LAI is representing value of AIN Switch 9.			

⬅ back to Logical analog inputs alphabetically

### AIN Switch10

Related FW	2.1.0	Related applications	MINT
LAI ID	283		
Description			
LAI is representing value of AIN Switch 10.			

⬅ back to Logical analog inputs alphabetically



### AC BUS Voltage L1

Related FW	2.1.0	Related applications	MINT
LAI ID	730		
<b>Description</b>			
This LAI is used as the input for BUS Voltage L1 (Ph-N) measurement where the BUS AC values measured over LAIs function will be used. This input is mandatory if setpoint <b>Bus AC Measurement</b> setpoint = Voltage Analog Input.			

⬅ back to Logical analog inputs alphabetically

### AC BUS Voltage L2

Related FW	2.1.0	Related applications	MINT
LAI ID	731		
<b>Description</b>			
This LAI is used as the input for BUS Voltage L2 (Ph-N) measurement where the BUS AC values measured over LAIs function will be used. This input is mandatory if setpoint <b>Bus AC Measurement</b> setpoint = Voltage Analog Input.			

⬅ back to Logical analog inputs alphabetically

### AC BUS Voltage L3

Related FW	2.1.0	Related applications	MINT
LAI ID	732		
<b>Description</b>			
This LAI is used as the input for BUS Voltage L3 (Ph-N) measurement where the BUS AC values measured over LAIs function will be used. This input is mandatory if setpoint <b>Bus AC Measurement</b> setpoint = Voltage Analog Input.			

⬅ back to Logical analog inputs alphabetically

### AC BUS Frequency

Related FW	2.1.0	Related applications	MINT
LAI ID	733		
<b>Description</b>			
This LAI is used as the input for BUS Frequency measurement where the BUS AC values measured over LAIs function will be used. This input is mandatory if the BUS AC Measurement setpoint = Voltage Analog Input.			

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### AC BESS Current L1

Related FW	2.1.0	Related applications	MINT
LAI ID	563		
Expected format of source value	Units: [A] Effective resolution: 1		
Description			
This LAI is used as input for <b>BESS Current L1</b> Measurement in function <b>BESS AC values measured over LAIs</b> .			

⬅ back to Logical analog inputs alphabetically

### AC BESS Current L2

Related FW	2.1.0	Related applications	MINT
LAI ID	564		
Expected format of source value	Units: [A] Effective resolution: 1		
Description			
This LAI is used as input for <b>BESS Current L2</b> Measurement in function <b>BESS AC values measured over LAIs</b> .			

⬅ back to Logical analog inputs alphabetically

### AC BESS Current L3

Related FW	2.1.0	Related applications	MINT
LAI ID	565		
Expected format of source value	Units: [A] Effective resolution: 1		
Description			
This LAI is used as input for <b>BESS Current L3</b> Measurement in function <b>BESS AC values measured over LAIs</b> .			

⬅ back to Logical analog inputs alphabetically

### AC BESS Frequency

Related FW	2.1.0	Related applications	MINT
LAI ID	566		
Expected format of source value	Units: [Hz] Effective resolution: 0,001		
Description			
This LAI is used as input for <b>BESS Frequency</b> Measurement in function <b>BESS AC values measured over LAIs</b> .			
This input is mandatory if setpoint <b>AC BESS P/Q/A Measurement</b> = Current & Voltage Analog Input.			

⬅ back to Logical analog inputs alphabetically



## AC BESS P

Related FW	2.1.0	Related applications	MINT
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 <b>BESS P</b> Measurement in function <b>BESS AC values measured over LAIs</b> . This input is mandatory if setpoint <b>AC BESS P/Q/A Measurement</b> = Current Analog Input OR Current & Voltage Analog Input.			

◀ back to Logical analog inputs alphabetically

## AC BESS Q

Related FW	2.1.0	Related applications	MINT
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 <b>BESS Q</b> Measurement in function <b>BESS AC values measured over LAIs</b> . This input is mandatory if setpoint <b>AC BESS P/Q/A Measurement</b> = Current Analog Input OR Current & Voltage Analog Input			

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## AC BESS Voltage L1

Related FW	2.1.0	Related applications	MINT
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 <b>BESS Voltage L1</b> (Ph-N) Measurement in function <b>BESS AC values measured over LAIs</b> .			
This input is mandatory if setpoint <b>AC BESS P/Q/A Measurement</b> = Current & Voltage Analog Input.			

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## AC BESS Voltage L2

Related FW	2.1.0	Related applications	MINT
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 <b>BESS Voltage L2</b> (Ph-N) Measurement in function <b>BESS AC values measured over LAIs</b> .			
This input is mandatory if setpoint <b>AC BESS P/Q/A Measurement</b> = Current & Voltage Analog Input.			

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## AC BESS Voltage L3

Related FW	2.1.0	Related applications	MINT
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 <b>BESS Voltage L3</b> (Ph-N) Measurement in function <b>BESS AC values measured over LAIs</b> .			
This input is mandatory if setpoint <b>AC BESS P/Q/A Measurement</b> = Current & Voltage Analog Input.			

⬅ back to Logical analog inputs alphabetically

LAI: B

## BESS P Request

Related FW	2.1.0	Related applications	MINT
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.			

⬅ back to Logical analog inputs alphabetically



## BESS Q Request

Related FW	2.1.0	Related applications	MINT
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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## LAI: C

### Cell Max Temperature

Related FW	2.1.0	Related applications	MINT
LAI ID	1049		
Expected format of source value	Units: °C / °F (based on Units selected in configuration) Effective resolution: 1 °C / °F (based on Units selected in configuration)		
Description			
This LAI is used to receive the information on what was the maximum cell temperature evaluated in the BMS. From the input a value is available for monitoring. Wrn or a SD protection can be activated depending on the value.			

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### Cell Max Voltage

Related FW	2.1.0	Related applications	MINT
LAI ID	1047		
Expected format of source value	Units: V Effective resolution: 0,01 V		
Description			
This LAI is used to receive the information on what was the maximum cell voltage evaluated in the BMS. From the input a value is available for monitoring. Wrn or a SD protection can be activated depending on the value.			

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## Cell Min Temperature

Related FW	2.1.0	Related applications	MINT
LAI ID	1050		
Expected format of source value	Units: °C / °F (based on Units selected in configuration)		
	Effective resolution: 1 °C / °F (based on Units selected in configuration)		
Description			
This LAI is used to receive the information on what was the minimum cell temperature evaluated in the BMS. From the input a value is available for monitoring. Wrn or a SD protection can be activated depending on the value.			

⬅ back to Logical analog inputs alphabetically

## Cell Min Voltage

Related FW	2.1.0	Related applications	MINT
LAI ID	1048		
Expected format of source value	Units: V Effective resolution: 0,01 V		
Description			
This LAI is used to receive the information on what was the minimum cell voltage evaluated in the BMS. From the input a value is available for monitoring. Wrn or a SD protection can be activated depending on the value.			

⬅ back to Logical analog inputs alphabetically

LAI: D

## DC PV kWh

Related FW	2.1.0	Related applications	MINT
LAI ID	1046		
Description			
This LAI is used to receive the information on what is the total accumulated DC energy of a PV site connected on the DC bus line. From the input a value DC PV kWh is available for monitoring.			

⬅ back to Logical analog inputs alphabetically

## DC PV Nominal P

Related FW	2.1.0	Related applications	MINT
LAI ID	360		
Expected format of source value	Units: [kW] Effective resolution: 0,1		
Description			
This LAI is used to receive the information on what is the total nominal DC power of a PV site connected on the dc bus line. From the input a value DC PV Nominal P is available for monitoring..			

⬅ back to Logical analog inputs alphabetically



## DC PV P

Related FW	2.1.0	Related applications	MINT
LAI ID	1044		
<b>Description</b>			
This LAI is used to receive the information on what is the actual DC power of a PV site connected on the dc bus line. From the input a value DC PV Actual P is available for monitoring. .			

⬅ back to Logical analog inputs alphabetically

## Dynamic Spinning Reserve

Related FW	2.1.0	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 <b>Dynamic Spinning Reserve</b> .			

⬅ back to Logical analog inputs alphabetically

## Dynamic Spinning Reserve Offset

Related FW	2.1.0	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 <b>Dynamic Spinning Reserve Offset</b> .			

⬅ back to Logical analog inputs alphabetically

## LAI: E

## ES Charge kWh

Related FW	2.1.0	Related applications	MINT
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.			

⬅ back to Logical analog inputs alphabetically



## BESS Cycles

Related FW	2.1.0	Related applications	MINT
LAI ID	428		
Expected format of source value	Units: [] Effective resolution: 1		
Description			
This analog input is used as source for the statistic value <b>BESS Cycles</b> For more information see <b>Daily BESS cycles control</b> .			

⬅ back to Logical analog inputs alphabetically

## ES Current

Related FW	2.1.0	Related applications	MINT
LAI ID	535		
<b>Description</b>			
This LAI is used for reading of the Energy Storage DC current from the BMS.			
<i><b>Note:</b> In order to physically measure high DC current the InteliDC 4/4 module can provide such need. For more information see <b>Inteli DC4/4</b>.</i>			

⬅ back to Logical analog inputs alphabetically

## ES Discharge kWh

Related FW	2.1.0	Related applications	MINT
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.			

⬅ back to Logical analog inputs alphabetically

## ES kWh NominalCapacity

Related FW	2.1.0	Related applications	MINT
LAI ID	370		
Expected format of source value	Units: [kWh] Effective resolution: 1		
Description			
LAI is used for reading the capacity (nominal) of the Energy Storage. Its input value is mirrored to the value <b>ES Nominal Capacity</b> . This LAI is important to be configured and have a valid input in order to utilize the energy equalization function using SOC. More information can be seen here <b>Energy Equalization based on SOC</b>			

⬅ back to Logical analog inputs alphabetically



### ES Max Charging Current

Related FW	2.1.0	Related applications	MINT
LAI ID	536		
Description			
This LAI is used for limiting charging of energy storage.			

⬅ back to Logical analog inputs alphabetically

### ES Max Discharging Current

Related FW	2.1.0	Related applications	MINT
LAI ID	537		
Description			
This LAI is used for limiting discharging of energy storage.			

⬅ back to Logical analog inputs alphabetically

### ES SOC

Related FW	2.1.0	Related applications	MINT
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.			

⬅ back to Logical analog inputs alphabetically

### ES Temperature

Related FW	2.1.0	Related applications	MINT
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.			

⬅ back to Logical analog inputs alphabetically

### ES Voltage

Related FW	2.1.0	Related applications	MINT
LAI ID	534		
Description			
This LAI is used for reading of the Energy Storage DC voltage from the BMS.			

⬅ back to Logical analog inputs alphabetically



## ES Voltage Meas

Related FW	2.1.0	Related applications	MINT
LAI ID	527		
Description			
<p>This LAI is used for measurement of Energy Storage DC voltage. The input value is mirrored to the value <b>ES Voltage Meas</b>. This LAI is mandatory to have configured for the operation of the controllers application.</p> <p><b>Note:</b> <i>In order to physically measure high DC voltage the IntelDC 4/4 module can provide such need. For more information see <b>Intel DC4/4</b>.</i></p>			

⬅ back to Logical analog inputs alphabetically

## LAI: G

### Gen P Min

Related FW	2.1.0	Related applications	MINT
LAI ID	742		
Expected format of source value	Units: [%] Effective resolution: 1		
Description			
<p>The LAI serves as an alternative configuration for the setpoint <b>#Gen P Min</b>, used in the power balancing function of gensets (see <b>Active power control in Off-grid operation</b>).</p> <p>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.</p> <p><b>Note:</b> <i>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.</i></p>			

⬅ back to Logical analog inputs alphabetically



## LAI: H

### HLC U-f Control: P Request

Related FW	2.1.0	Related applications	MINT
LAI ID	567		
Description			
This logical analog input is used as relative (-100 .. 100 %) P/f request related to the <b>BESS Nominal power</b> for U-f control mode. In order for this LAI to be utilized the setpoint <b>HLC Control Mode</b> must be Enabled			
<i><b>Note:</b> It is advised to have the range of the input number be with two decimals if possible. Utilizing integers for this input can lead to large steps in regulation.</i>			
<i><b>Note:</b> It is advised to have the range of the input number be with two decimals if possilbe. Utilizing integers for this input can lead to large steps in regulation.</i>			

⬅ back to Logical analog inputs alphabetically

### HLC U-f Control: Q Request

Related FW	2.1.0	Related applications	MINT
LAI ID	568		
Description			
This logical analog input is used as relative (-100 .. 100 %) Q/V request related to the <b>BESS Nominal power</b> for U-f control mode. In order for this LAI to be utilized the setpoint <b>HLC Control Mode</b> must be Enabled			
<i><b>Note:</b> It is advised to have the range of the input number be with two decimals if possible. Utilizing integers for this input can lead to large steps in regulation.</i>			

⬅ back to Logical analog inputs alphabetically

## LAI: L

### Load Control: ANEXT Baseload

Related FW	2.1.0	Related applications	MINT
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			
<p>This LAI is source value for control of Active Power if <b>Load Request Source</b> = Analog External Value.</p> <p>The Baseload is active if:</p> <ul style="list-style-type: none"><li>&gt; MINT: <b>#System Load Control PTM</b> = Baseload</li><li>&gt;</li></ul> <p>This function LAI can be given negative value for charging of the BESS if necessary.</p>			

⬅ back to Logical analog inputs alphabetically



## LAI: P

### PCS Current Meas

Related FW	2.1.0	Related applications	MINT
LAI ID	530		
<b>Description</b>			
This LAI is used for measurement of Power Conversion System DC current.			
<b>Note:</b> In order to physically measure high DC current the InteliDC 4/4 module can provide such need. For more information see <i>Inteli DC4/4</i> .			

⬅ back to Logical analog inputs alphabetically

### PCS Voltage Meas

Related FW	2.1.0	Related applications	MINT
LAI ID	528		
<b>Description</b>			
This LAI is used for measurement of Power Conversion System DC voltage. The input value is mirrored to the value <b>PCS Voltage Meas</b> . This LAI is mandatory to have configured for the operation of the controllers application.			
<b>Note:</b> In order to physically measure high DC voltage the InteliDC 4/4 module can provide such need. For more information see <i>Inteli DC4/4</i> .			

⬅ back to Logical analog inputs alphabetically

### PF Control: ANEXT Base PF

Related FW	2.1.0	Related applications	MINT
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 <b>PF/Q Request Source</b> = Analog External Value or when <b>HLC Control Mode</b> = Enabled.			
The Base PF is active if			
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	
<b>Note:</b> Always use a three decimal number for this LAI. Thus the range for this LAI is 0.600 to 1.200.			

⬅ back to Logical analog inputs alphabetically



## LAI: Q

### Q Control: ANEXT Base Q

Related FW	2.1.0	Related applications	MINT
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 <b>PF/Q Request Source</b> = Analog External Value			
<i><b>Note:</b> If all setpoints are adjusted as mentioned above and <b>Breaker state</b> = ParalOper, and at least one gen-set is connected to the bus, but this LAI is not configured, alarm <b>Wrn Q Control Fail</b> is activated.</i>			

⬅ back to Logical analog inputs alphabetically

## LAI: S

### String Voltage 1

Related FW	2.1.0	Related applications	MINT
LAI ID	743		
Description			
This LAI is used for reading of the DC voltage from one of the BMS in the MultiBMS system.			

⬅ back to Logical analog inputs alphabetically

### String Voltage 2

Related FW	2.1.0	Related applications	MINT
LAI ID	744		
Description			
This LAI is used for reading of the DC voltage from one of the BMS in the MultiBMS system.			

⬅ back to Logical analog inputs alphabetically

### String Voltage 3

Related FW	2.1.0	Related applications	MINT
LAI ID	745		
Description			
This LAI is used for reading of the DC voltage from one of the BMS in the MultiBMS system.			

⬅ back to Logical analog inputs alphabetically



### String Voltage 4

Related FW	2.1.0	Related applications	MINT
LAI ID	746		
Description			
This LAI is used for reading of the DC voltage from one of the BMS in the MultiBMS system.			

⬅ back to Logical analog inputs alphabetically

### String Voltage 5

Related FW	2.1.0	Related applications	MINT
LAI ID	747		
Description			
This LAI is used for reading of the DC voltage from one of the BMS in the MultiBMS system.			

⬅ back to Logical analog inputs alphabetically

### String Voltage 6

Related FW	2.1.0	Related applications	MINT
LAI ID	748		
Description			
This LAI is used for reading of the DC voltage from one of the BMS in the MultiBMS system.			

⬅ back to Logical analog inputs alphabetically

### String Voltage 7

Related FW	2.1.0	Related applications	MINT
LAI ID	749		
Description			
This LAI is used for reading of the DC voltage from one of the BMS in the MultiBMS system.			

⬅ back to Logical analog inputs alphabetically

### String Voltage 8

Related FW	2.1.0	Related applications	MINT
LAI ID	751		
Description			
This LAI is used for reading of the DC voltage from one of the BMS in the MultiBMS system.			

⬅ back to Logical analog inputs alphabetically



# 9.1.9 Fixed Protection States

## List of Fixed Protection States

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## Fixed Protections States 1

Related FW	2.1.0	Related applications	MINT
Comm object	20744		
Description			
<p>This is a group of fixed protection states.</p> <p>List of protection states by bits:</p> <ol style="list-style-type: none"><li>1. <b>Wrn Brute Force Protection Active</b></li><li>2. Not Used</li><li>3. <b>Wrn CAN2 Empty (page 1)</b></li><li>4. <b>Sd PCS Short Circuit</b></li><li>5. <b>Sd PCS IDMT &gt;A</b></li><li>6. <b>Sd ESCB Fail</b></li><li>7. <b>Sd ESCB Fail To Open</b></li><li>8. <b>Sd ESCB Fail To Close</b></li><li>9. <b>Sd ESCB Not Closed</b></li><li>10. Not Used</li><li>11. Not Used</li><li>12. Not Used</li><li>13. Not Used</li><li>14. Not Used</li><li>15. Not Used</li><li>16. <b>Wrn Battery Undervoltage</b></li><li>17. <b>Wrn Battery Overvoltage</b></li><li>18. <b>ALI BCB Closing Is Blocked</b></li><li>19. Not Used</li><li>20. Not Used</li><li>21. <b>Wrn Energy Storage Not Ready</b></li><li>22. <b>Source Not Ready</b></li><li>23. <b>Wrn Override All Sd</b></li><li>24. Not Used</li><li>25. Not Used</li><li>26. <b>Wrn PF Control Fail (page 1)</b></li><li>27. <b>Wrn Q Control Fail</b></li></ol>			

 [back to Fixed Protection States](#)



## Fixed Protections States 2

Related FW	2.1.0	Related applications	MINT
Comm object	20745		
Description			
<p>This is a group of fixed protection states.</p> <p>List of protection states by bits:</p> <ol style="list-style-type: none"><li>1. <b>Sd BESS &gt;V L1-N</b></li><li>2. <b>Sd BESS &gt;V L2-N</b></li><li>3. <b>Sd BESS &gt;V L3-N</b></li><li>4. <b>SdBESS &gt;V L1-L2</b></li><li>5. <b>Sd BESS &gt;V L2-L3</b></li><li>6. <b>Sd BESS &gt;V L3-L1</b></li><li>7. <b>Sd BESS &gt;&gt;V L1-N</b></li><li>8. <b>Sd BESS &gt;&gt;V L2-N</b></li><li>9. <b>Sd BESS &gt;&gt;V L3-N</b></li><li>10. <b>Sd BESS &gt;&gt;V L1-L2</b></li><li>11. <b>Sd BESS &gt;&gt;V L2-L3</b></li><li>12. <b>Sd BESS &gt;&gt;V L3-L1</b></li><li>13. <b>Sd BESS &lt;V L1-N</b></li><li>14. <b>Sd BESS &lt;V L2-N</b></li><li>15. <b>Sd BESS &lt;V L3-N</b></li><li>16. <b>Sd BESSMains &lt;V L1-L2</b></li><li>17. <b>Sd BESSMains &lt;V L2-L3</b></li><li>18. <b>Sd BESSMains &lt;V L3-L1</b></li><li>19. <b>Sd BESS Voltage Unbalance Ph-N</b></li><li>20. <b>Sd BESS V Unbalance Ph-Ph</b></li><li>21. <b>Sd BESS &gt;f</b></li><li>22. <b>Sd BESS &lt;f</b></li><li>23. Not Used</li><li>24. Not Used</li><li>25. <b>Sd IDMT Overload</b></li><li>26. <b>Sd Short Circuit</b></li><li>27. <b>Sd IDMT BESS &gt;A</b></li><li>28. <b>Sd IDMT Earth Fault Current</b></li><li>29. <b>Sd BESS Current Unbalance</b></li><li>30. <b>ALI BESS Ph Rotation Opposite</b></li></ol>			

[🔍 back to Fixed Protection States](#)



Fixed Protections States 3

Related FW	2.1.0	Related applications	MINT
Comm object	20746		
Description			
This is a group of fixed protection states. List of protection states by bits:			

 [back to Fixed Protection States](#)



## Fixed Protections States 4

Related FW	2.1.0	Related applications	MINT
Comm object	20747		
Description			
<p>This is a group of fixed protection states.</p> <ol style="list-style-type: none"><li>1. Bus &gt;V L1-N</li><li>2. Bus &gt;V L2-N</li><li>3. Bus &gt;V L3-N</li><li>4. Bus &gt;V L1-L2</li><li>5. Bus &gt;V L2-L3</li><li>6. Bus &gt;V L3-L1</li><li>7. Bus &gt;&gt;V L1-N</li><li>8. Bus &gt;&gt;V L2-N</li><li>9. Bus &gt;&gt;V L3-N</li><li>10. Bus &gt;&gt;V L1-L2</li><li>11. Bus &gt;&gt;V L2-L3</li><li>12. Bus &gt;&gt;V L3-L1</li><li>13. Bus &lt;V L1-N</li><li>14. Bus &lt;V L2-N</li><li>15. Bus &lt;V L3-N</li><li>16. Bus &lt;V L1-L2</li><li>17. Bus &lt;V L2-L3</li><li>18. Bus &lt;V L3-L1</li><li>19. Bus &lt;&lt;V L1-N</li><li>20. Bus &lt;&lt;V L2-N</li><li>21. Bus &lt;&lt;V L3-N</li><li>22. Bus &lt;&lt;V L1-L2</li><li>23. Bus &lt;&lt;V L2-L3</li><li>24. Bus &lt;&lt;V L3-L1</li><li>25. Mains/BusV Unbalance Ph-Ph</li><li>26. Mains/Bus V Unbalance Ph-N</li></ol>			

 [back to Fixed Protection States](#)



**Fixed Protections States 5**

Related FW	2.1.0	Related applications	MINT
Comm object	20748		
Description			
This is a group of fixed protection states. List of protection states by bits:			

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# 9.1.10 User Protection States

## List of User Protection States

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## User Protections States 1

<b>Related FW</b>	2.1.0	<b>Related applications</b>	MINT
<b>Comm object</b>	20759		
<b>Description</b>			
This is a group of user protection states.			

[back to User Protection States](#)

## User Protections States 2

<b>Related FW</b>	2.1.0	<b>Related applications</b>	MINT
<b>Comm object</b>	20760		
<b>Description</b>			
This is a group of user protection states.			

[back to User Protection States](#)

## User Protections States 3

<b>Related FW</b>	2.1.0	<b>5Related applications</b>	MINT
<b>Comm object</b>	20761		
<b>Description</b>			
This is a group of user protection states.			

[back to User Protection States](#)

## User Protections States 4

Related FW	2.1.0	Related applications	MINT
Comm object	20762		
Description			
This is a group of user protection states.			

[back to User Protection States](#)

## User Protections States 5

<b>Related FW</b>	2.1.0	<b>Related applications</b>	MINT
<b>Comm object</b>	20763		
<b>Description</b>			
This is a group of user protection states.			

[back to User Protection States](#)



## User Protections States 6

<b>Related FW</b>	2.1.0	<b>Related applications</b>	MINT
<b>Comm object</b>	20764		
<b>Description</b>			
This is a group of user protection states.			

[◀ back to User Protection States](#)

## User Protections States 7

<b>Related FW</b>	2.1.0	<b>Related applications</b>	MINT
<b>Comm object</b>	20765		
<b>Description</b>			
This is a group of user protection states.			

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## User Protections States 8

<b>Related FW</b>	2.1.0	<b>Related applications</b>	MINT
<b>Comm object</b>	20766		
<b>Description</b>			
This is a group of user protection states.			

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## User Protections States 9

<b>Related FW</b>	2.1.0	<b>Related applications</b>	MINT
<b>Comm object</b>	20767		
<b>Description</b>			
This is a group of user protection states.			

[◀ back to User Protection States](#)

## User Protections States 10

Related FW	2.1.0	Related applications	MINT
Comm object	20768		
Description			
This is a group of user protection states.			

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## 9.1.11 PLC

### List of PLC blocks

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## Group: Logical functions

### OR/AND

PLC group	Logical functions	
Related FW	2.1.0	
Related applications	MINT	
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.



PLC Editor: Function block

+

No.	Input		Inv.
1		...	<input type="checkbox"/>
2		...	<input type="checkbox"/>
3		...	<input type="checkbox"/>
4		...	<input type="checkbox"/>
5		...	<input type="checkbox"/>
6		...	<input type="checkbox"/>
7		...	<input type="checkbox"/>
8		...	<input type="checkbox"/>

• Output: PLC-BOUT 1.8

☐ Inverted output

Function type:

AND

OK

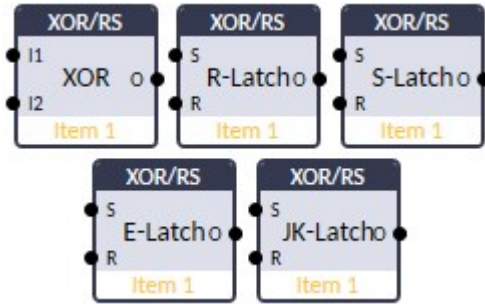
Cancel

Image 7.67 Configuration of OR/AND block

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## XOR/RS

PLC group	Logical functions				
Related FW	2.1.0				
Related applications	MINT				
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 <sup>-1</sup>	Q <sup>-1</sup>	Q <sup>-1</sup>	Q <sup>-1</sup>
0	1	1	1	1	1
1	0	0	0	0	0
1	1	0	1	Q <sup>-1</sup>	NOT(Q <sup>-1</sup> )
The Q <sup>-1</sup> 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).

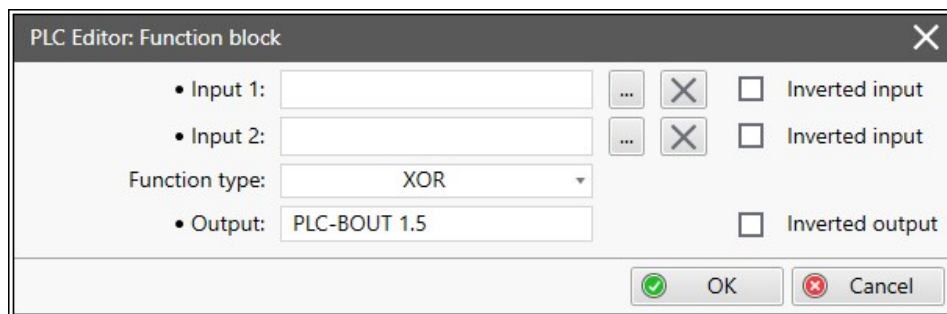


Image 7.68 Configuration of XOR/RS block

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## Group: Comparators

### Comp Delay


PLC group	Comparators			
Related FW	2.1.0			
Related applications	MINT			
PLC Block ID	46			
Inputs				
Input	Type	Negation	Range	Function
Input 1	Analog	No	$-2^{32} .. 2^{32}$	Compared value
Input 2	Analog	No	$-2^{32} .. 2^{32}$	Comparison 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				
<p>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.</p>				
Relation			Name	
">" (default)			greater than	
">="			greater than equal	
"=="			equal	
"<="			less than equal	
"<"			less than	





Image 7.69 Configuration of Comp Delay block

⬆ back to List of PLC blocks

## Comp Hyst


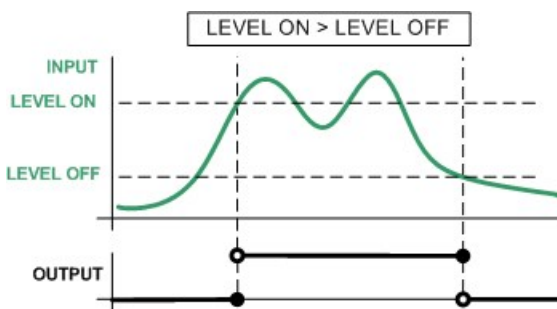
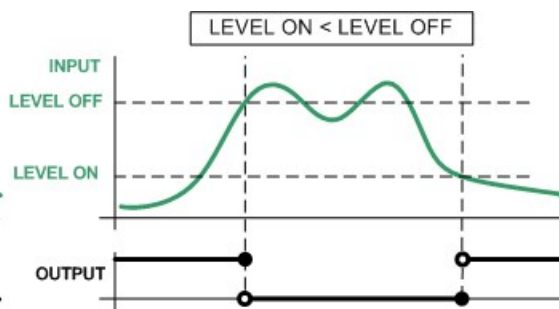
PLC group	Comparators			
Related FW	2.1.0			
Related applications	MINT			
PLC Block ID	3			
Inputs				
Input	Type	Negation	Range	Function
Input	Analog	No	$-2^{32} .. 2^{32}$	Compared value
Input ON	Analog	No	$-2^{32} .. 2^{32}$	Comparative level for switching on
Input OFF	Analog	No	$-2^{32} .. 2^{32}$	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.				
<div><div><p>LEVEL ON &gt; LEVEL OFF</p></div><div><p>LEVEL ON &lt; LEVEL OFF</p></div></div>				

Image 7.70 Different On and Off levels

Image 7.70 Different On and Off levels



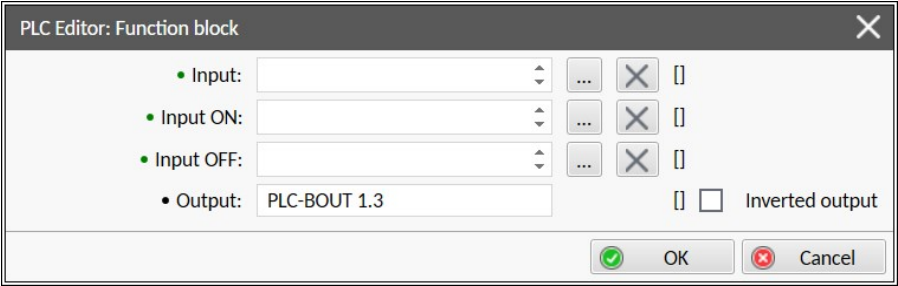


Image 7.71 Configuration of Comp Hyst block

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### Comp Win


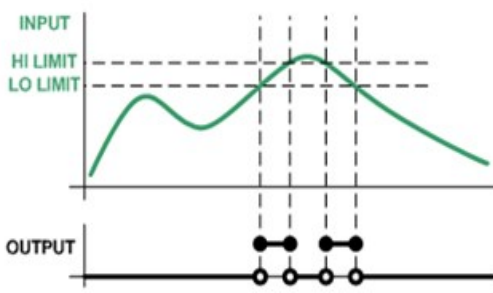
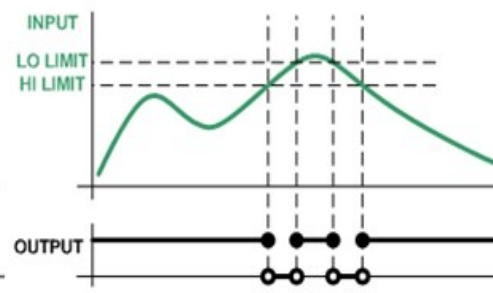
PLC group	Comparators			
Related FW	2.1.0			
Related applications	MINT			
PLC Block ID	18			
Inputs				
Input	Type	Negation	Range	Function
Input	Analog	No	$-2^{32} .. 2^{32}$	Compared value
Input HIGH	Analog	No	$-2^{32} .. 2^{32}$	Upper window limit
Input LOW	Analog	No	$-2^{32} .. 2^{32}$	Lower window 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.				
<div><div><div>HI LIMIT &gt; LO LIMIT</div></div><div><div>LO LIMIT &gt; HI LIMIT</div></div></div>				

Image 7.72 Principle of delay

Image 7.72 Principle of delay



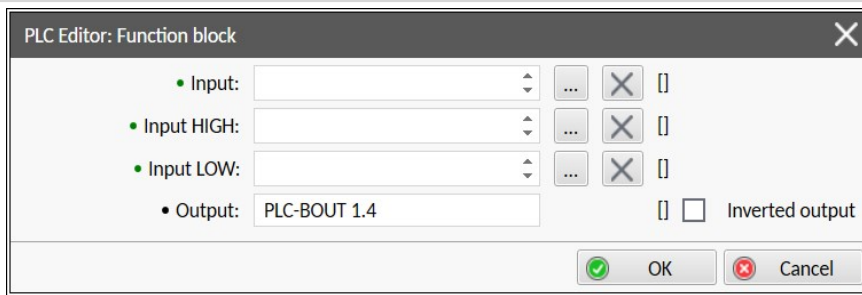


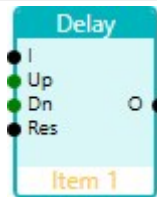
Image 7.73 Configuration of Comp Time block

**Note:** All inputs and can be constants or values from controller.

## back to List of PLC blocks

### Group: Time functions

#### Delay

PLC group	Time functions			
Related FW	2.1.0			
Related applications	MINT			
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				
<p>This block can operate in two operating modes (Delay mode, Pulse mode) = the block mode is defined by the Pulse on edge checkbox option - if checked, the Pulse mode is active.</p> <p>➤ <b>Delay mode</b> - 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</p>				



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.

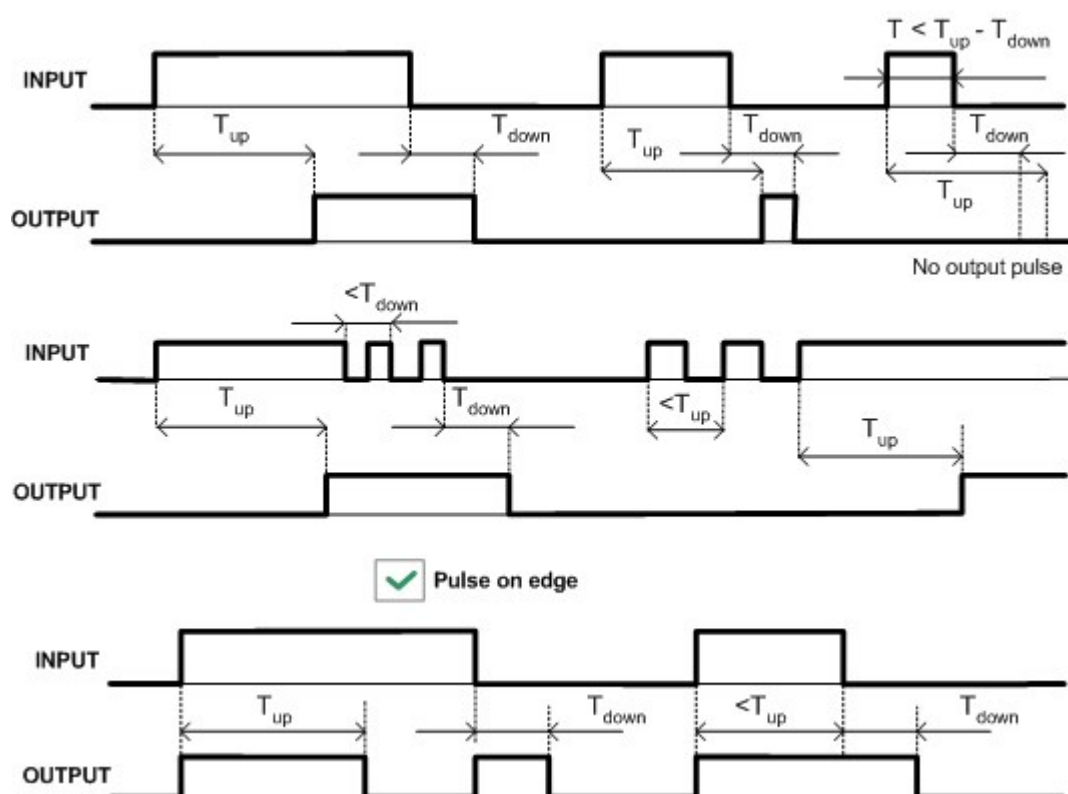


Image 7.74 Delay modes principles

PLC Editor: Function block

• Input:  ... X

• Input time up:  [s] ... X

• Input time down:  [s] ... X

• Input reset:  ... X

• Output: PLC-BOUT 1.5

☐ Pulse on edge

Time unit: s

☐ Inverted input

☐ Inverted input

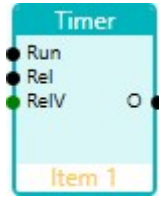
☐ Inverted output

OK Cancel

Image 7.75 Configuration of Delay block



## Timer

PLC group	Time functions	
Related FW	2.1.0	
Related applications	MINT	
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

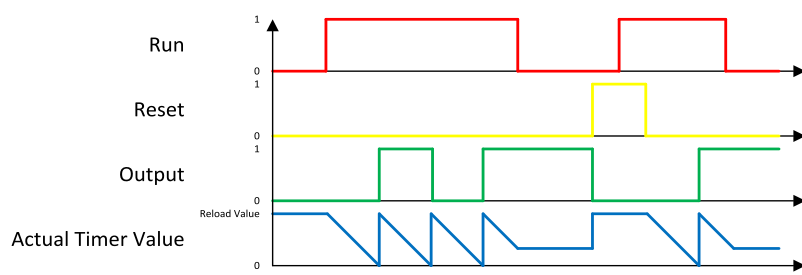
The block performs countdown Timer according to the selected Timer mode and actual inputs values.

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 Input by a defined time.

#### Timer mode ComAp

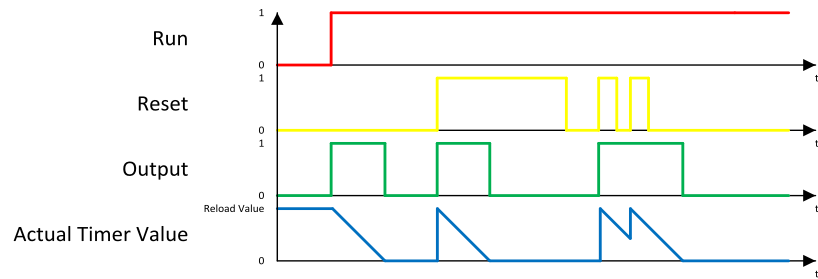
The Timer is counting down only when the Run is on and Reset is off. It is also reset to the Reload value if it reaches 0 or Reset is enabled. The state of the binary Output is negated whenever the Timer value is zero.



#### Timer mode TP

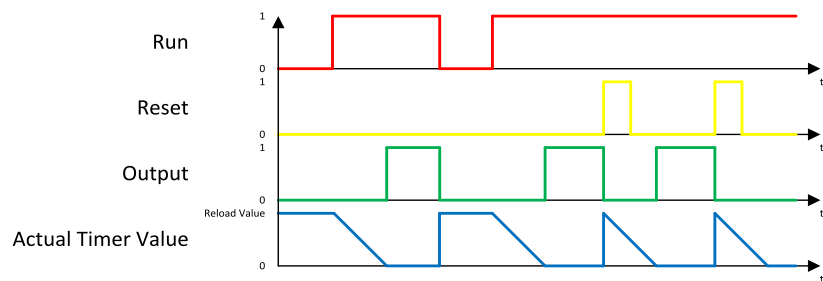


The Timer counts down when Run is on. The Reset accepts only the rising edge and is required to load the Reload value to the actual Timer value. The Output is set as long as the Actual Timer Value is not equal to 0 (the countdown is in progress).



### 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).

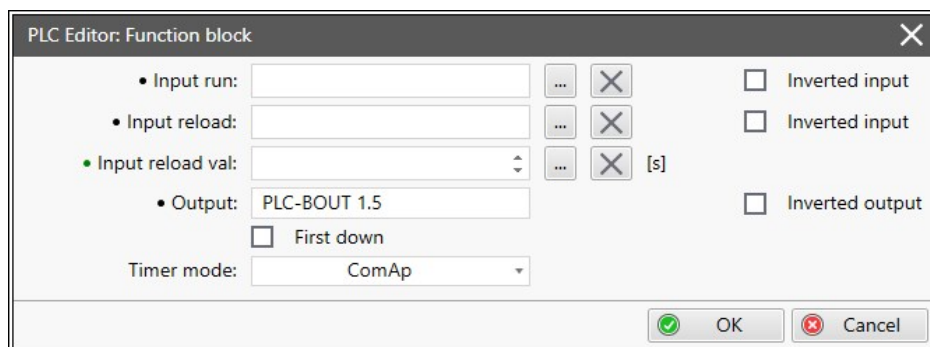
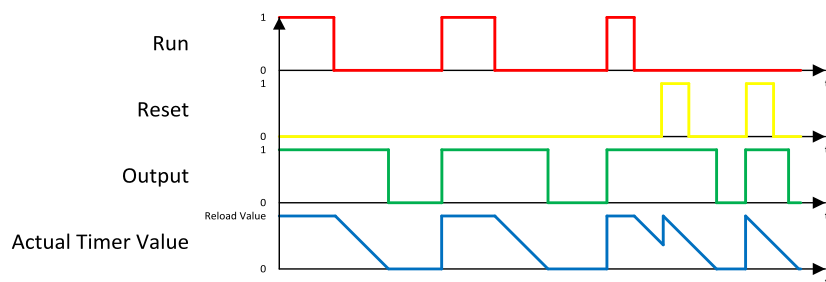


Image 7.76 Configuration of Timer block



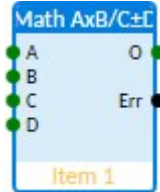
**Note:** For ComAp Timer mode: if you want the Output to start at logic 0, check the First down option. Otherwise, the Output will start at logical 1.

**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	2.1.0			
Related applications	MINT			
PLC Block ID	51			
Inputs				
Input	Abbr.	Type	Range	Function
Input A	A	Analog	$-2^{32}-1 \dots +2^{32}-1$	First multiplicand
Input B	B	Analog	$-2^{32}-1 \dots +2^{32}-1$	Second multiplicand
Input C	C	Analog	$-2^{32}-1 \dots +2^{32}-1$	Divider
Input D	D	Analog	$-2^{32}-1 \dots +2^{32}-1$	Additive term (optional)
Outputs				
Output	Abbr.	Type	Range	Function
Output	O	Binary	$-2^{32}-1 \dots +2^{32}-1$	Result of the $O = \frac{A \cdot B}{C} \pm D$ operation
Data invalid	Err	Binary	0/1	Set when <b>Output</b> is out of range or when dividing by zero occurs
Description				
The block realizes the mathematical operation $AxB/C\pm D$ . The operation $\pm$ is selected by <b>Function typeselector</b> . In case of any invalid data on any of the inputs, the <b>Output</b> is set to invalid value and <b>Data Invalid</b> is closed. The <b>Output</b> has resolution and dimension based on setting of the block.				



PLC Editor: Function block

Input A:

...

×

□

Input B:

...

×

□

Input C:

...

×

□

Input D:

...

×

[-]

Output:

PLC-AOUT 1

[-]

Dimension:

-

▼

Resolution:

1

▼

Data Invalid:

PLC-BOUT 1.1

□

□

Inverted output

Function type:

ADD

▼

✓

OK

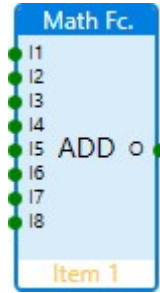
✗

Cancel

Image 7.77 Configuration of Math AxB/C±D block

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### Math Fc.

PLC group				
Related FW	2.1.0			
Related applications	MINT			
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	$-2^{32} \dots 2^{32}$	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
<b>ADD</b> - Addition	Input 1 + Input 2 + ... + Input N
<b>SUB</b> - Substraction	Input 1 - Input 2 - ... - Input N
<b> SUB </b> - Absolute value of subtraction	ABS(Input 1 - Input 2 - ... - Input N)
<b>AVG</b> - Average	Input 1 + Input 2 + ... + Input N) / N
<b>MIN</b> - Minimal value	MIN(Input 1, Input 2, ... ,Input N)
<b>MAX</b> - 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.

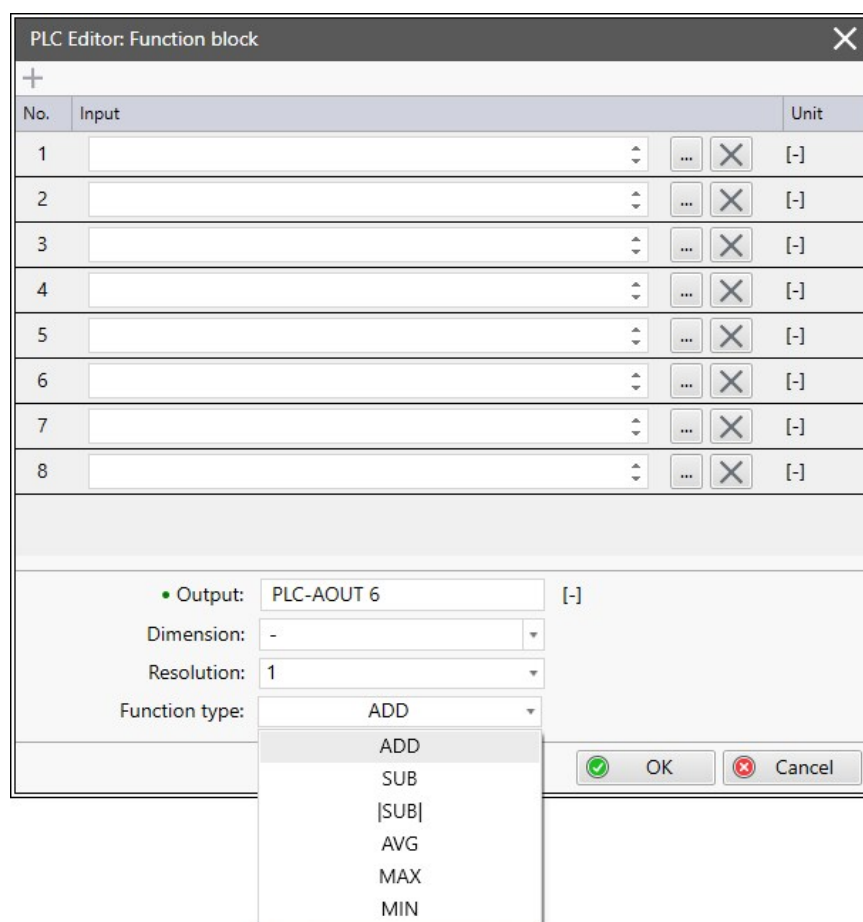
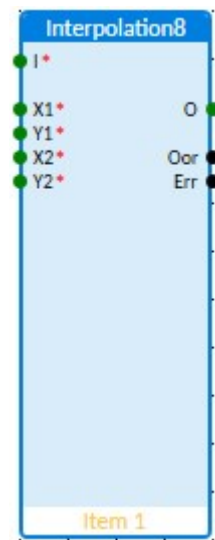


Image 7.78 Configuration of Math Fc. block



## Interpolation8

PLC group		
Related FW	2.1.0	
Related applications	MINT	
PLC Block ID	59	

### Inputs

Input	Type	Range	Function
Input	Analog	$-2^{32} \dots 2^{32}$	Input value
X1	Analog	$-2^{32} \dots 2^{32}$	X coordinate of the first point
Y1	Analog	$-2^{32} \dots 2^{32}$	Y coordinate of the first point
X2	Analog	$-2^{32} \dots 2^{32}$	X coordinate of the second point
Y2	Analog	$-2^{32} \dots 2^{32}$	Y coordinate of the second point
...			
X8	Analog	$-2^{32} \dots 2^{32}$	X coordinate of the eight point
Y8	Analog	$-2^{32} \dots 2^{32}$	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**.



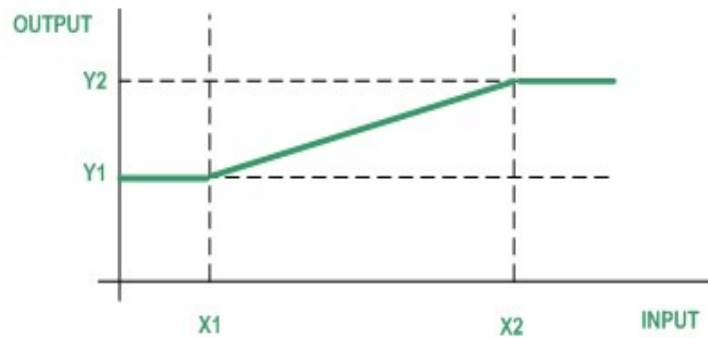


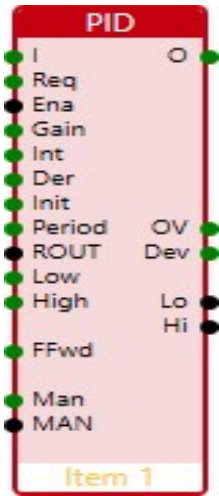
Image 7.79 Principle of Interpolation

Image 7.80 Configuration of Interpolation block

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## Group: Regulators

### PID

PLC group		
Related FW	2.1.0	
Related applications	MINT	
PLC Block ID	41	
Inputs		



Input	Type	Negation	Range	Function
Input Value	Analog	No	$-2^{32} \dots 2^{32}$	Actual (controlled) value "process value".
Requested Value	Analog	No	$-2^{32} \dots 2^{32}$	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	Binary	Yes	0/1	Reverse Output:



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
<b>Outputs</b>				
<b>Output</b>	<b>Type</b>	<b>Negation</b>	<b>Range</b>	<b>Function</b>
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.
<b>Description</b>				
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	[%]	[-]	$\text{isa\_gain} = \text{comap\_gain} / 100.0$	$\text{comap\_gain} = \text{isa\_gain} * 100.0$
Int	[%]	[s]	$\text{isa\_int} = 100 / \text{comap\_int}$	$\text{comap\_int} = 100 / \text{isa\_int}$
Der	[%]	[s]	$\text{isa\_der} = \text{comap\_der} * 0.06$	$\text{comap\_der} = \text{isa\_der} / 0.06$



PLC Editor: Function block

Input Value:

...

X

[-]

Requested Value:

...

X

[-]

PID Enable:

...

X

☐ Inverted input

Gain:

...

X

[-]

Int:

...

X

[s]

Der:

...

X

[s]

Init Value:

...

X

[-]

Period:

...

X

[s]

Reverse Output:

...

X

☐ Inverted input

Low Limit:

...

X

[-]

High Limit:

...

X

[-]

FeedForward Value:

...

X

[]

FeedForward Weight

0.000000000

Manual Value:

...

X

[-]

MANual mode:

...

X

☐ Inverted input

Output:

PLC-AOUT 1

[-]

Dimension:

-

Resolution:

1

Output Velocity:

PLC-AOUT 2

[-]

Dimension:

-

Resolution:

1

Control Deviation:

PLC-AOUT 3

[-]

Out Low Limit:

PLC-BOUT 1.1

☐ Inverted output

Out High Limit:

PLC-BOUT 1.2

☐ Inverted output

OK

Cancel

Image 7.81 Configuration of PID block

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## Up/Down Ctrl Block

PLC group		
Related FW	2.1.0	
Related applications	MINT	
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
<b>Outputs</b>				
<b>Output</b>	<b>Type</b>	<b>Negation</b>	<b>Range</b>	<b>Function</b>
Output Up	Binary	Yes	0/1	Actuator control - Raise
Output Down	Binary	Yes	0/1	Actuator control - Lower
<b>Description</b>				
<p>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 &lt;-10000; +10000&gt;.</p> <p>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.</p> <p>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.</p> <p>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.</p>				
<b>Use case:</b>				
<ul style="list-style-type: none"> <li>➤ 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).</li> <li>➤ Block parameters are therefore set according to the characteristics of the actuator connected onward.</li> <li>➤ The PID block and U/D Ctrl block connected together thus forms PID controller with relay controlled Up / Down outputs.</li> <li>➤ The U/D Ctrl block itself could also act as converting block from analog value to PWM modulated signals.</li> <li>➤ If the U/D Ctrl block is operating in MANual mode, the manual setting of respective outputs (Output Up / Output Down) is possible.</li> </ul>				



PLC Editor: Function block

Input Value:

...

X

[]

Control Deviation:

...

X

[]

U/D Enable:

...

X

☐ Inverted input

Period:

...

X

[s]

Actuator Time:

...

X

[s]

Min On Time:

...

X

[s]

Min Off Time:

...

X

[s]

Deadband:

...

X

[]

Low Limit:

...

X

☐ Inverted input

High Limit:

...

X

☐ Inverted input

Manual Up:

...

X

☐ Inverted input

Manual Down:

...

X

☐ Inverted input

MANual Mode:

...

X

☐ Inverted input

Output Up:

PLC-BOU1 1.3

X

☐ Inverted output

Output Down:

PLC-BOU1 1.2

X

☐ Inverted output

OK


Cancel

Image 7.82 Configuration of Up/Down Ctrl Block

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## Group: Ramp functions

### Inc/Dec

PLC group				
Related FW	2.1.0			
Related applications	MINT			
PLC Block ID	22			
Inputs				
Input	Type	Negation	Range	Function
Increment	Binary	No	0/1	Rising edge increase value of <b>Output</b> by 1
Decrement	Binary	No	0/1	Rising edge decrease value of <b>Output</b> by 1
Reset	Binary	No	0/1	Rising edge resets <b>Output</b> to <b>Default</b>
Maximum	Analog	No	$-2^{32} .. 2^{32}$	Maximum value of <b>Output</b>
Default	Analog	No	$-2^{32} .. 2^{32}$	Initial value of <b>Output</b>
Outputs				



Output	Type	Negation	Range	Function
Output	Analog	No	$-2^{32} \dots \text{Maximum}$	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.

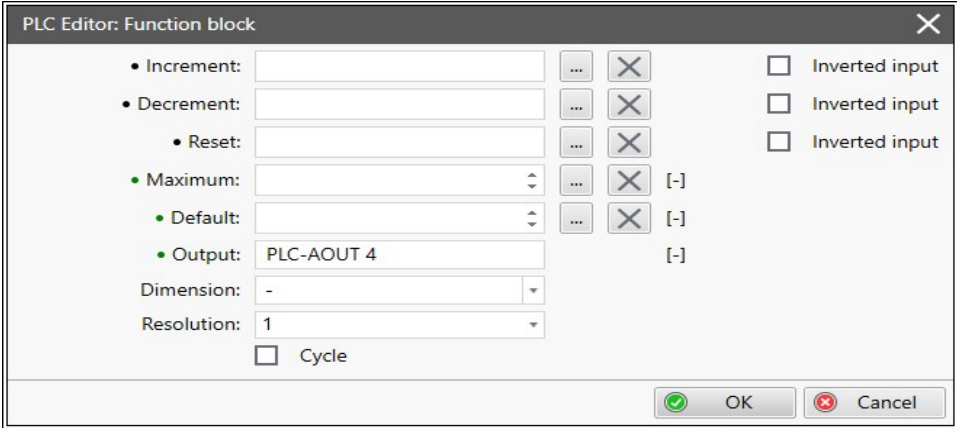
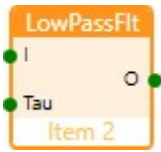


Image 7.83 Configuration of Inc/Dec block

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## LowPassFit

PLC group				
Related FW	2.1.0			
Related applications	MINT			
PLC Block ID	40			
Inputs				
Input	Type	Negation	Range	Function
Input	Analog	No	$-2^{32} \dots 2^{32}$	Input Value
Tau	Analog	No	0,0 .. 60,0 [s]	Time Constant of the filter
Outputs				
Output	Type	Negation	Range	Function
Output	Analog	No	$-2^{32} \dots 2^{32}$	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.

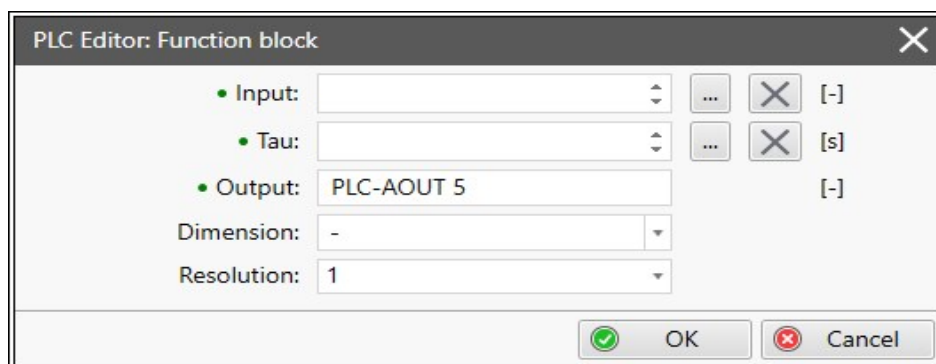
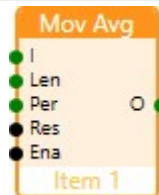


Image 7.84 Configuration of LowPassFlt block

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### Mov Avg

PLC group					
Related FW	2.1.0				
Related applications	MINT				
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.

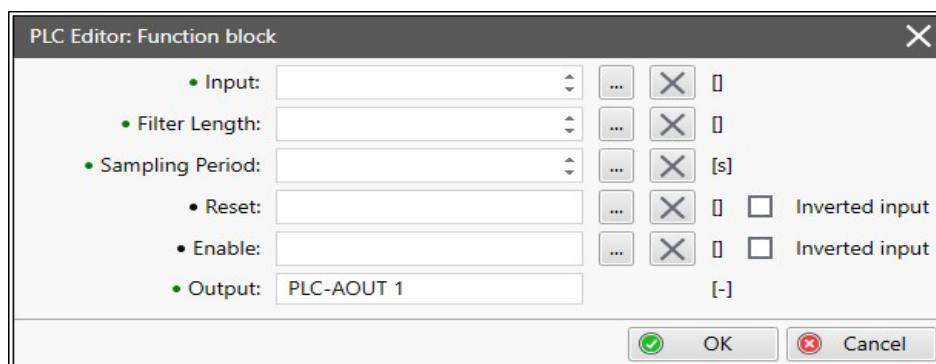



Image 7.85 Configuration of Moving Average block

⬅ back to List of PLC blocks

## Ramp

PLC group				
Related FW	2.1.0			
Related applications	MINT			
PLC Block ID	19			
Inputs				
Input	Type	Negation	Range	Function
Input	Analog	No	$-2^{32} \dots 2^{32}$	Value to be ramped
Up	Analog	No	$-2^{32} \dots 2^{32}$	Maximal rising rate of the <b>Output</b> per second /minute (based on <b>Time unit</b> setting)
Down	Analog	No	$-2^{32} \dots 2^{32}$	Maximal lowering rate of the <b>Output</b> per second/minute (based on <b>Time unit</b> setting)
Outputs				
Output	Type	Negation	Range	Function
Output	Analog	No	$-2^{32} \dots 2^{32}$	Ramped value
Description				
This block limits maximal rate of change of <b>Output</b> . The maximal rates <b>Up</b> and <b>Down</b> are adjustable separately and ramping is based on enabled ramps. Time base of the Up/Down rate is defined by <b>Time unit</b> setting. The <b>Output</b> has resolution and dimension based on setting of the block.				



Function	Description
Enabled Up	<b>Output</b> can be ramped only up.
Enabled Down	<b>Output</b> can be ramped only down.
Enabled Up/Down	<b>Output</b> can be ramped up and down.

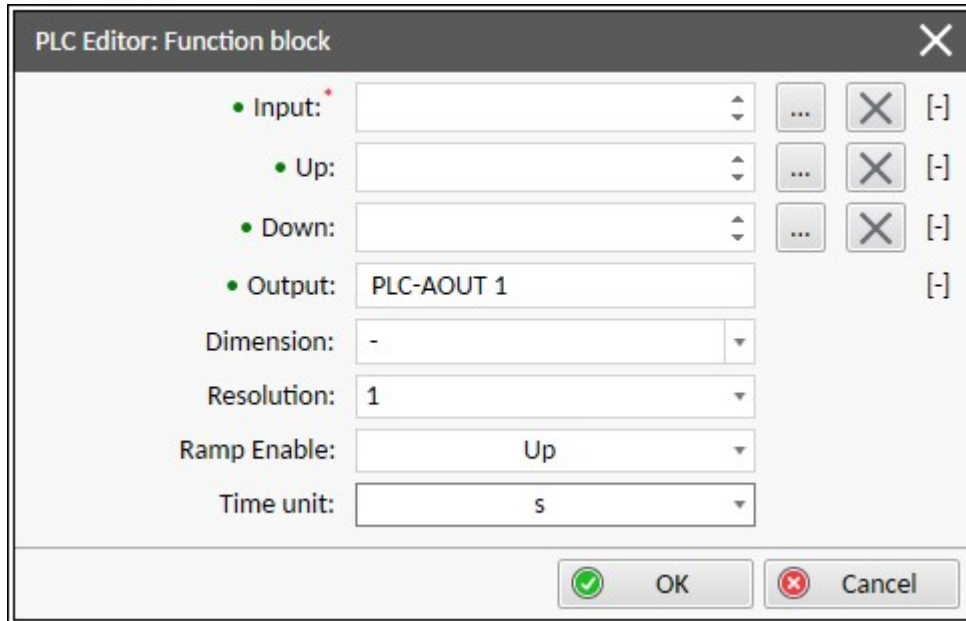
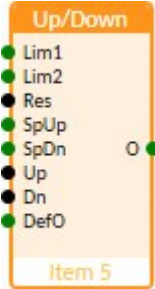


Image 7.86 Configuration of Ramp block

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### Up/Down

PLC group				
Related FW	2.1.0			
Related applications	MINT			
PLC Block ID	20			
Inputs				
Input	Type	Negation	Range	Function
Limit Low	Analog	No	$-2^{32} .. 2^{32}$	First limit of <b>Output</b>
Limit High	Analog	No	$-2^{32} .. 2^{32}$	Second limit of <b>Output</b>
Reset	Binary	No	0/1	Resets <b>Output</b> to <b>Default Output Value</b> when active
Speed Up	Analog	No	$-2^{32} .. 2^{32}$	Rising rate of <b>Output</b> per second



Speed Down	Analog	No	$-2^{32} \dots 2^{32}$	Lowering rate of <b>Output</b> per second
Up	Binary	No	0/1	Activates rising of <b>Output</b>
Down	Binary	No	0/1	Activates lowering of <b>Output</b>
Default Output Value	Analog	No	$-2^{32} \dots 2^{32}$	Initial value of <b>Output</b>
<b>Outputs</b>				
<b>Output</b>	<b>Type</b>	<b>Negation</b>	<b>Range</b>	<b>Function</b>
Output	Analog	No	Limit 1 .. Limit 2	Output value
<b>Description</b>				
<p>This block works as an analog ramp controlled by binary inputs <b>Up</b> and <b>Down</b> with a defined rate of increase/decrease.</p> <p>The ramp speed is adjusted by <b>Speed Up</b> and <b>Speed Down</b>.</p> <p>Time unit of the speed of change is defined by <b>Time unit</b> setting.</p> <p>The <b>Output</b> limitation is set by <b>Limit 1</b> and <b>Limit 2</b>. The default value of <b>Output</b> is set by <b>Default Output Value</b>.</p> <p>Activate <b>Reset</b> to reset <b>Output</b> to <b>Default Output Value</b>. The <b>Output</b> has resolution and dimension based on setting of the block.</p>				
<p><b>IMPORTANT:</b> If both the inputs <b>Up</b> and <b>Down</b> are active, the <b>Output</b> is set to <b>Default Output Value</b>.</p>				



PLC Editor: Function block

Low Limit:

...

×

{-}

High Limit:

...

×

{-}

Reset:

...

×

[]

☐ Inverted input

Speed Up:

...

×

{-}

Speed Down:

...

×

{-}

Up:

...

×

[]

☐ Inverted input

Down:

...

×

[]

☐ Inverted input

Default Output Value:

...

×

{-}

Output:

PLC-AOUT 1

{-}

Dimension:

-

▼

Resolution:

1

▼

Time unit:

s

▼

OK


Cancel

Image 7.87 Configuration of Up/Down block

⬅ back to List of PLC blocks

## Group: Other functions

### Analog Switch

PLC group	Others			
Related FW	2.1.0			
Related applications	MINT			
PLC Block ID	5			
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 SW	Binary	No	0/1	Switching between Input value 1 and 2
Outputs				
Output	Type	Negation	Range	Function
Output	Analog	No	$-2^{32} .. 2^{32}$	Switch output
Description				
The block is switching <b>Input 1</b> and <b>Input 2</b> based on value of <b>Input SW</b> (0 = Input1, 1 = Input2). The <b>Output</b> has resolution and dimension based on setting of the block.				



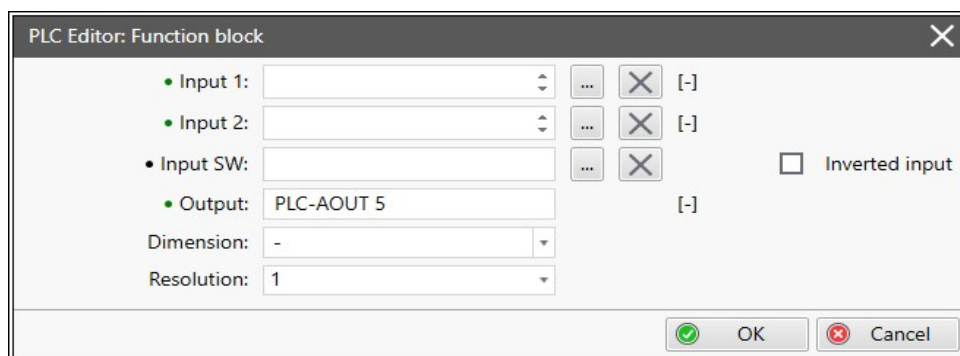
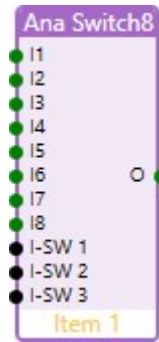


Image 7.88 Configuration of Analog Switch block

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## Analog Switch 8

PLC group	Others			
Related FW	2.1.0			
Related applications	MINT			
PLC Block ID	45			
Inputs				
Input	Type	Negation	Range	Function
Input 1	Analog	No	$-2^{32} \dots 2^{32}$	Input value 1
Input 2	Analog	No	$-2^{32} \dots 2^{32}$	Input value 2
Input 3	Analog	No	$-2^{32} \dots 2^{32}$	Input value 3 (optional)
Input 4	Analog	No	$-2^{32} \dots 2^{32}$	Input value 4 (optional)
Input 5	Analog	No	$-2^{32} \dots 2^{32}$	Input value 5 (optional)
Input 6	Analog	No	$-2^{32} \dots 2^{32}$	Input value 6 (optional)
Input 7	Analog	No	$-2^{32} \dots 2^{32}$	Input value 7 (optional)
Input 8	Analog	No	$-2^{32} \dots 2^{32}$	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	$-2^{32} \dots 2^{32}$	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

PLC Editor: Function block

No.	Input	Unit
1		[-]
2		[-]
3		[-]
4		[-]
5		[-]
6		[-]
7		[-]
8		[-]

• Input SW 1:    ☐ Inverted input  
 • Input SW 2:    ☐ Inverted input  
 • Input SW 3:    ☐ Inverted input

• Output:  [-]  
 Dimension:   
 Resolution:

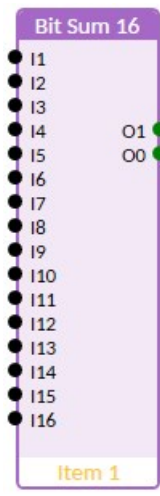
OK Cancel

Image 7.89 Configuration of Analog Switch 8 block

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## Bit Sum 16

PLC group	Others	
Related FW	2.1.0	
Related applications	MINT	
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.

PLC Editor: Function block

+

No.	Input	...	×	Inv.
1		...	×	<input type="checkbox"/>
2		...	×	<input type="checkbox"/>
3		...	×	<input type="checkbox"/>
4		...	×	<input type="checkbox"/>
5		...	×	<input type="checkbox"/>
6		...	×	<input type="checkbox"/>
7		...	×	<input type="checkbox"/>
8		...	×	<input type="checkbox"/>
9		...	×	<input type="checkbox"/>
10		...	×	<input type="checkbox"/>

• Output Sum 1:

PLC-AOUT 2

[-]

• Output Sum 0:

PLC-AOUT 3

[-]

✓ OK

✗ Cancel

Image 7.90 Configuration of Bit Sum 16 block

⬅ back to List of PLC blocks

### Circuit Breaker

PLC group	Others	
Related FW	2.1.0	
Related applications	MINT	
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 <b>Circuit Breaker (CB)</b> control based on the state machine principle.
<b>Inputs</b>
<ul style="list-style-type: none"> <li>➤ <b>Close/Open:</b> 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 <b>CB</b> Close request and a falling edge as a <b>CB</b> Open request.</li> <li>➤ <b>Feedback:</b> 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).</li> <li>➤ <b>Feedback Negative:</b> It is not required to be configured together with the <b>CBFeedback</b> input. However, if <b>Feedback Negative</b> is configured, the <b>Feedback</b> input must be configured too. Then, not only the mismatch between the desired state and the feedback is always evaluated, but also</li> </ul>



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.



PLC Editor: Function block

• Close/Open:

...

×

☐

Inverted input

• Feedback:

...

×

☐

Inverted input

• Negative Feedback:

...

×

☐

Inverted input

• Disabled:

...

×

☐

Inverted input

• Charged:

...

×

☐

Inverted input

• Fail Reset:

...

×

☐

Inverted input

• ON Coil:

PLC-BOUT 1.1

☐

Inverted output

• OFF Coil:

PLC-BOUT 1.2

☐

Inverted output

• UV Coil:

PLC-BOUT 1.3

☐

Inverted output

• Output Close/Open:

PLC-BOUT 1.4

☐

Inverted output

• Status Close/Open:

PLC-BOUT 1.5

☐

Inverted output

• Fail to Close:

PLC-BOUT 1.6

☐

Inverted output

• Fail to Open:

PLC-BOUT 1.7

☐

Inverted output

• Other Fail:

PLC-BOUT 1.8

☐

Inverted output

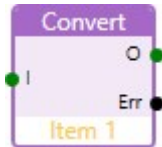
✓ OK

✗ Cancel

Image 7.91 Configuration of Circuit Breaker block

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## Convert

PLC group	Others			
Related FW	2.1.0			
Related applications	MINT			
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.

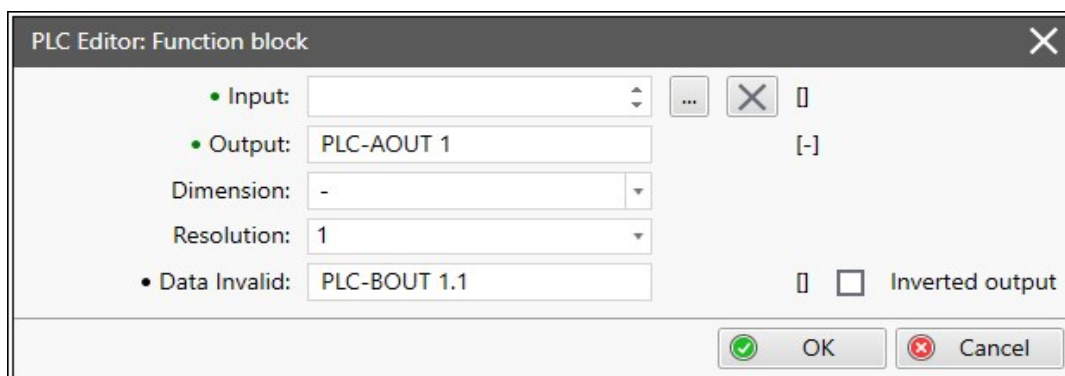
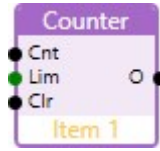
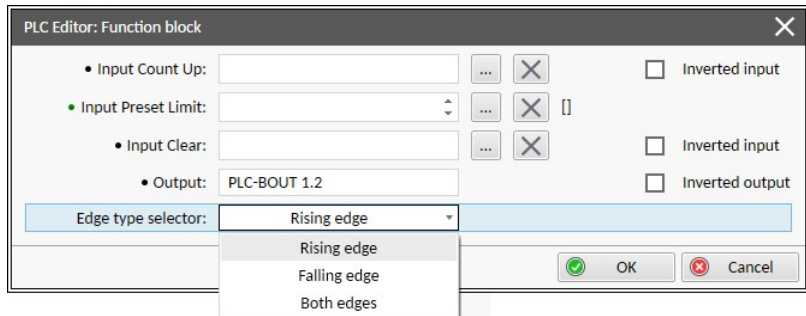


Image 7.92 Configuration of Convert block

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## Counter

PLC group	Others			
Related FW	2.1.0			
Related applications	MINT			
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 <sup>32</sup>	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				
<p>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.</p>				
<div>IMPORTANT: The counter value is lost when the controller is switched off.</div>				
				
Image 7.93 Configuration of the Counter block				

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## Comp. 4

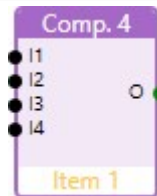
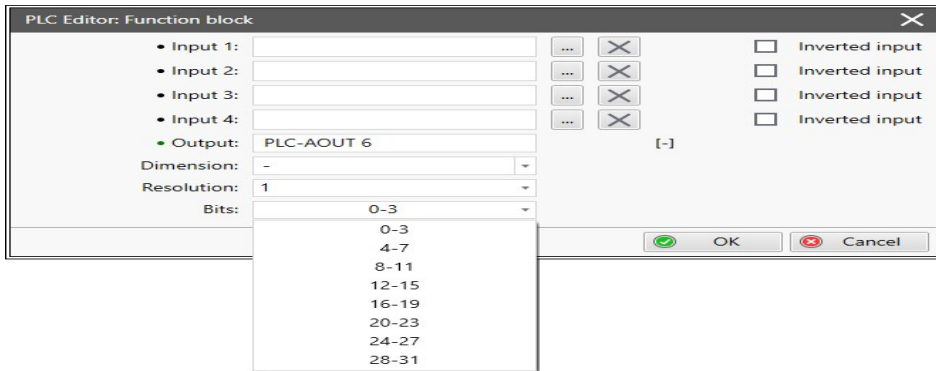
PLC group	Others			
Related FW	2.1.0			
Related applications	MINT			
PLC Block ID	49			
Inputs				
Input	Type	Negation	Range	Function
Input 1	Binary	Yes	0/1	Bit 0,4,8,12,16,20,24,28 - according to selected group of bits.
Input 2	Binary	Yes	0/1	Bit 1,5,9,13,17,21,25,29 - according to selected group of 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).				
				

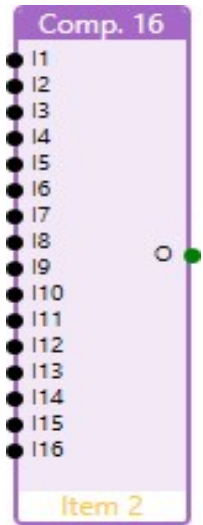
Image 7.94 Configuration of Comp. 4 block

Image 7.94 Configuration of Comp. 4 block

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## Comp. 16

PLC group	Others			
Related FW	2.1.0			
Related applications	MINT			
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.				



PLC Editor: Function block

• Input 1:

...

✕

☐ Inverted input

• Input 2:

...

✕

☐ Inverted input

• Input 3:

...

✕

☐ Inverted input

• Input 4:

...

✕

☐ Inverted input

• Input 5:

...

✕

☐ Inverted input

• Input 6:

...

✕

☐ Inverted input

• Input 7:

...

✕

☐ Inverted input

• Input 8:

...

✕

☐ Inverted input

• Input 9:

...

✕

☐ Inverted input

• Input 10:

...

✕

☐ Inverted input

• Input 11:

...

✕

☐ Inverted input

• Input 12:

...

✕

☐ Inverted input

• Input 13:

...

✕

☐ Inverted input

• Input 14:

...

✕

☐ Inverted input

• Input 15:

...

✕

☐ Inverted input

• Input 16:

...

✕

☐ Inverted input

• Output:

PLC-AOUT 2

[-]

Bits:

0-15

▼


✓ OK

✕ Cancel

Image 7.95 Configuration of Comp. 16 block

⬅ back to List of PLC blocks

## Decomp. 4

PLC group	Others			
Related FW	2.1.0			
Related applications	MINT			
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).

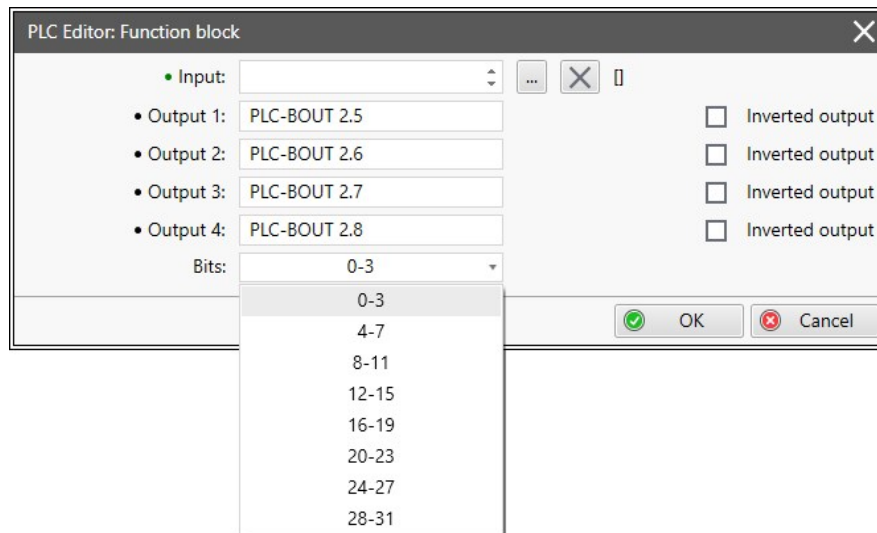
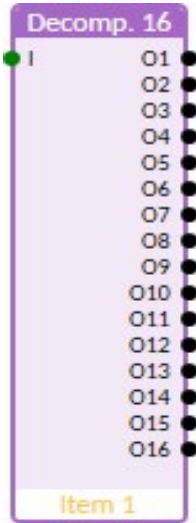


Image 7.96 Configuration of Decomp. 4 block

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### Decomp. 16

PLC group	Others			
Related FW	2.1.0			
Related applications	MINT			
PLC Block ID	48			
<b>Inputs</b>				
<b>Input</b>	<b>Type</b>	<b>Negation</b>	<b>Range</b>	<b>Function</b>
Input	Analog	No	$-2^{32} .. 2^{32}$	Value to be "decomposed" to bits
<b>Outputs</b>				



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.

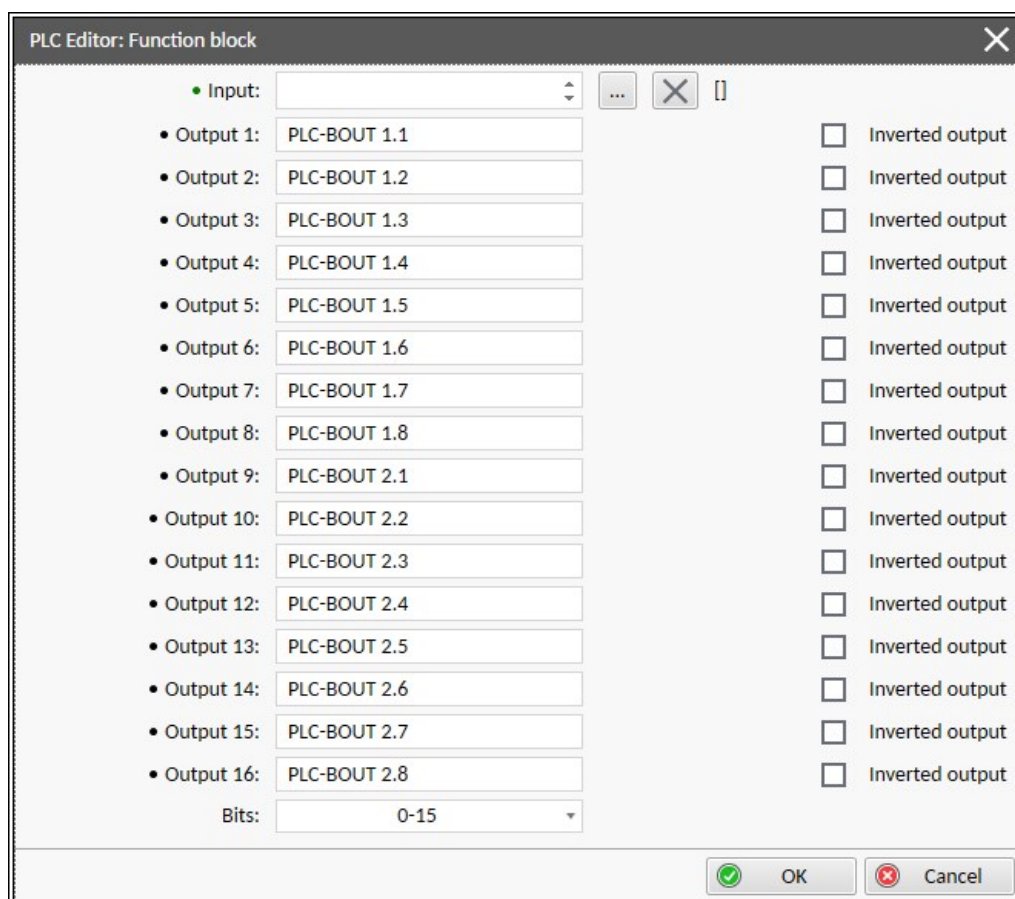
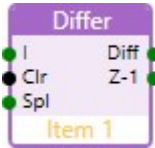


Image 7.97 Configuration of Decomp. 16 block

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## Differ

PLC group	Others	
Related FW	2.1.0	
Related applications	MINT	
PLC Block ID	55	

Input	Type	Negation	Range	Function
Input	Analog	No	$-2^{32}-1 \dots +2^{32}-1$	Input value
Clear	Binary	Yes	0/1	Clear (reset) internal values
Sampling Interval	Analog	No	0,1 - 3600,0 s	Sampling period (interval between samples)

Output	Type	Negation	Range	Function
$\Delta$ / Difference	Analog	No	$-2^{32}-1 \dots +2^{32}-1$	Difference-by-Time of <b>Input</b> values evaluated over four samples
Z-1	Analog	No	$-2^{32}-1 \dots +2^{32}-1$	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  $\Delta$  is calculated from four successive internal values based on this equation :

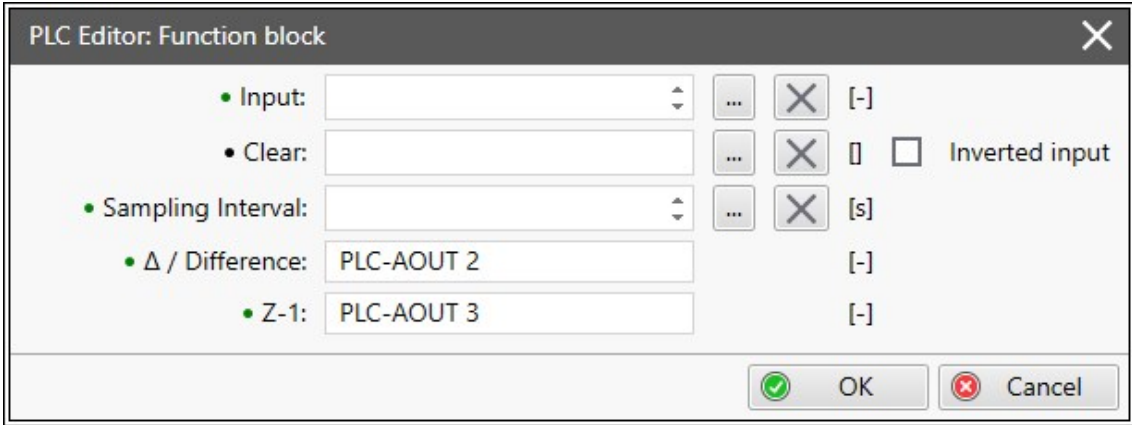
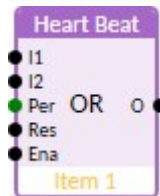
$$\Delta k = \frac{e_k + 3e_{k-1} - 3e_{k-2} - e_{k-3}}{6\Delta T}$$
  


Image 7.98 Configuration of the Differ block



## Heartbeat

PLC group	Others			
Related FW	2.1.0			
Related applications	MINT			
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				
<p>The PLC block performs Heart Beat signal checking.</p> <p>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.</p> <p>The internal counter is re-set to the Checking Period value in the cases (Reset Action):</p> <ul style="list-style-type: none"><li>➤ The Enable input is false.</li><li>➤ The internal counter reaches the zero value.</li></ul> <p>The Heart Beat check operation is valid:</p> <ul style="list-style-type: none"><li>➤ On Input 1 is detected rising edge (only Input 1 is configured) or on the Input 2 is detected rising</li></ul>				



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 executed.

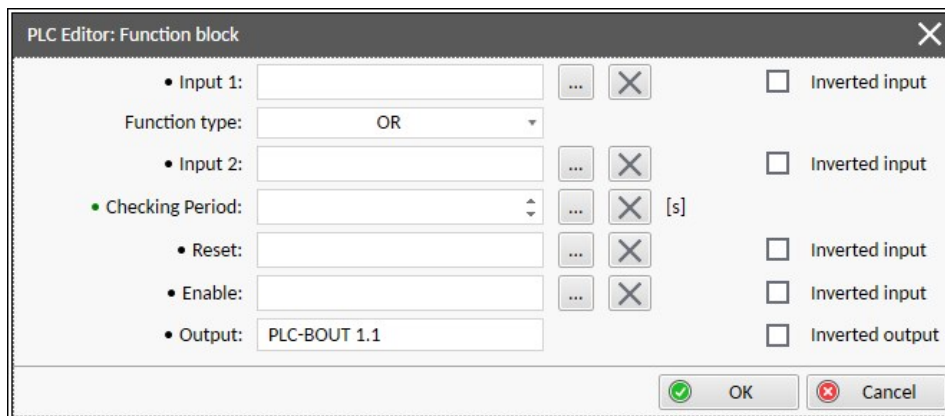



Image 7.99 Configuration of Heartbeat block

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Hold

PLC group	Others	
Related FW	2.1.0	
Related applications	MINT	
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 <b>Hold</b> behaves like the reload trigger and reacts on rising edge. The initial value of the <b>Output</b> after restart of the controller is 0.
Level	The block is like a mirror of the <b>Input</b> while the <b>Hold</b> is inactive. The value of <b>Output</b> is latched at the last value while <b>Hold</b> is active.

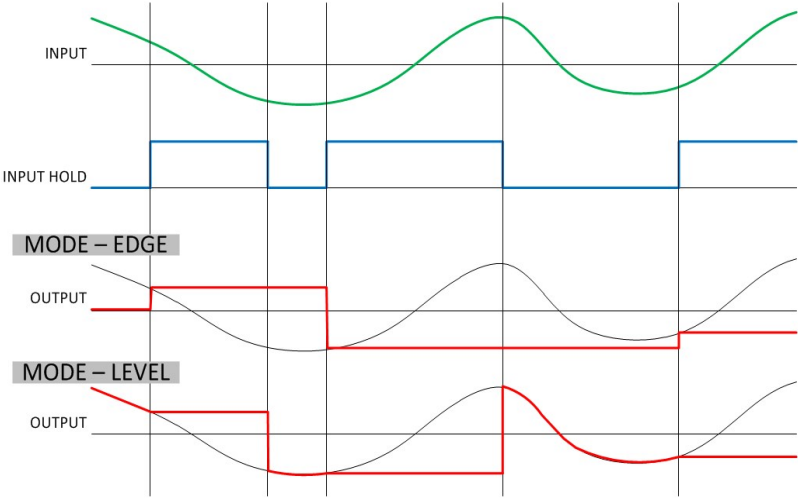


Image 7.100 Principle of the Hold modes



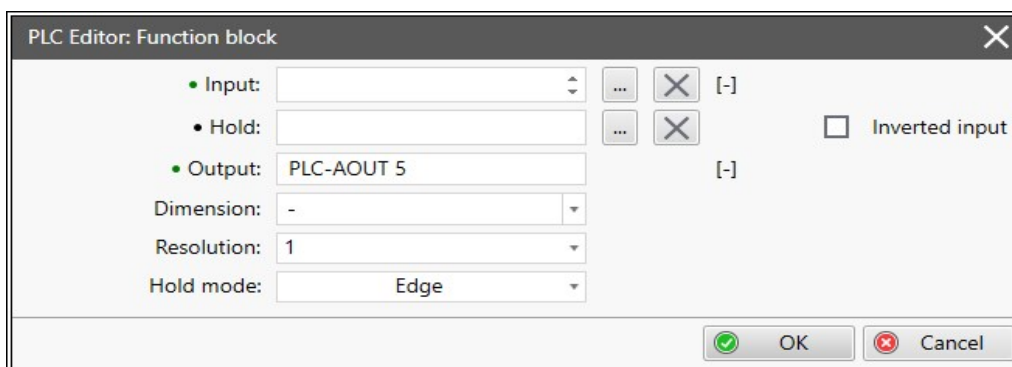
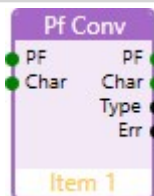


Image 7.101 Configuration of the Hold block

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## PF Conv

PLC group	Others			
Related FW	2.1.0			
Related applications	MINT			
PLC Block ID	57			
Inputs				
Input	Abbr.	Type	Range	Function
Input Power factor*	PF	Analog	$-2^{32}-1 \dots +2^{32}-1$	Power Factor
Input Character	Char	Analog	$-2^{32}-1 \dots +2^{32}-1$	PF ASCII annotation: "L" = inductive, lagging; "R" = resistive; "C" = capacitive, leading
Outputs				
Output	Abbr.	Type	Range	Function
Output Power Factor	PF	Analog	$-2^{32}-1 \dots +2^{32}-1$	Power Factor
Output Character	Char	Analog	$-2^{32}-1 \dots +2^{32}-1$	PF ASCII annotation: "L" = inductive, lagging; "R" = resistive; "C" = capacitive, leading
Output Load Type	Type	Analog	$-2^{32}-1 \dots +2^{32}-1$	Load type indication: 0 = inductive, lagging; 1 = capacitive, leading
Data Invalid	Err	Analog	$-2^{32}-1 \dots +2^{32}-1$	Ramped value
Description				
This block perform format conversion of <b>Input Power Factor</b> to <b>Output Power Factor</b> format. The conversion type is set using the <b>Conversion</b> 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.

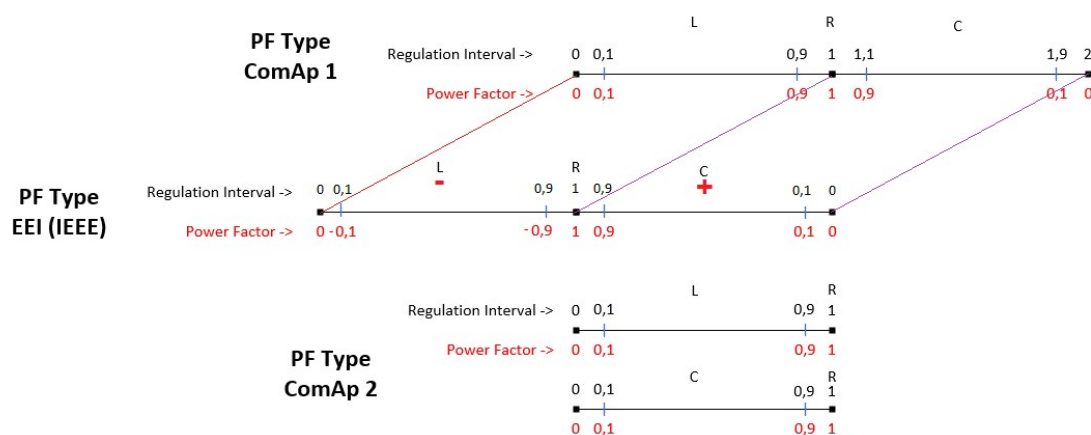


Image 7.102 Power factor formats ranges

The **Output** has a **Resolution** and **Dimension** according to the block settings.



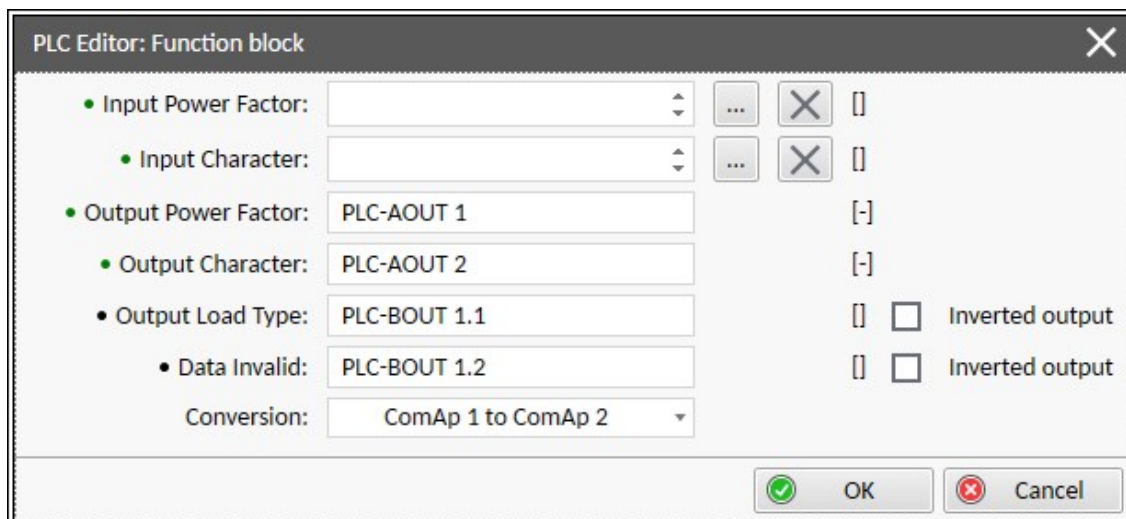
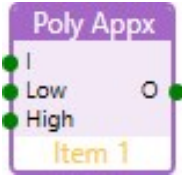


Image 7.103 Configuration of PfConv block

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## Poly Appx

PLC group	Others			
Related FW	2.1.0			
Related applications	MINT			
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				
<p>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.</p> $output = coeff0 + coeff1 * input1 + coeff2 * input2 + coeff3 * input3 + coeff4 * input4 + coeff5 * input5 + coeff6 * input6$				



PLC Editor: Function block

• Input:  ...

• Low Limit:  ...

• High Limit:  ...

• Output:

Dimension:

Resolution:

Coeff 0

Coeff 1

Coeff 2

Coeff 3

Coeff 4

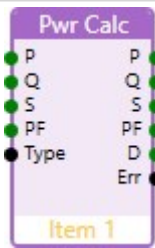
Coeff 5

Coeff 6

Image 7.104 Configuration of Polynomial Approximation block

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### PWR Calc

PLC group	Others			
Related FW	2.1.0			
Related applications	MINT			
PLC Block ID	56			
Inputs				
Input	Abbr.	Type	Range	Function
Input Active Power	P	Analog	$-2^{32}-1 \dots +2^{32}-1$	Active power
Input Reactive Power	Q	Analog	$-2^{32}-1 \dots +2^{32}-1$	Reactive power
Input Apparent Power	S	Analog	$-2^{32}-1 \dots +2^{32}-1$	Apparent power
Input Power Factor	PF	Analog	$-2^{32}-1 \dots +2^{32}-1$	Power factor
Input Load Type	Type	Binary	$-2^{32}-1 \dots +2^{32}-1$	Load type (0 = inductive, lagging; 1 = capacitive, leading)
Outputs				



Output	Abbr.	Type	Range	Function
Output Active Power	P	Analog	$-2^{32}-1 \dots +2^{32}-1$	Active power
Output Reactive Power	Q	Analog	$-2^{32}-1 \dots +2^{32}-1$	Reactive power
Output Apparent Power	S	Analog	$-2^{32}-1 \dots +2^{32}-1$	Apparent power
Output Power Factor	PF	Analog	$-2^{32}-1 \dots +2^{32}-1$	Power Factor
Output Deformed Power	D	Analog	$-2^{32}-1 \dots +2^{32}-1$	Deformed Power (only with all powers P, Q, S are provided)
Data Invalid	Err	Binary	$-2^{32}-1 \dots +2^{32}-1$	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	$P$	$Q$	$S = \sqrt{P^2 + Q^2}$	$PF = \frac{ P }{S}$	not valid
In P,S Out Q, PF	$P$	$Q = \sqrt{S^2 - P^2}$	$S$	$PF = \frac{ P }{S}$	not valid
In P,PF Out Q,S	$P$	$Q = P \frac{\sqrt{1-PF^2}}{PF}$	$S = \frac{ P }{PF}$	$PF$	not valid



In Q,S Out P,PF	$P = \sqrt{S^2 - Q^2}$	$Q$	$S$	$PF = \frac{ P }{S}$	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	$P$	$Q$	$S$	$PF = \frac{ P }{S}$	$D = \sqrt{S^2 - P^2 - Q^2}$

PLC Editor: Function block

☒ Input Active Power:  [-]

☒ Input Reactive Power:  [-]

☒ Input Apparent Power:  [-]

☒ Input Power Factor:  [-]

☐ Input Load Type:  [-]    ☐ Inverted input

☒ Output Active Power: PLC-AOUT 1 [-]

Dimension: -   
 Resolution: 1

☒ Output Reactive Power: PLC-AOUT 2 [-]

Dimension: -   
 Resolution: 1

☒ Output Apparent Power: PLC-AOUT 3 [-]

Dimension: -   
 Resolution: 1

☒ Output Power Factor: PLC-AOUT 4 [-]

Resolution: 1

☐ Output Deformed Power: PLC-AOUT 5 [-]

Dimension: -   
 Resolution: 1

☐ Data Invalid: PLC-BOUT 1.1  ☐ Inverted output

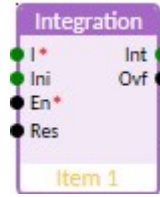
Calculation: Calculate S, PF from P, Q

Image 7.105 Configuration of PWR Calc block

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## Integration

PLC group	Others			
Related FW	2.1.0			
Related applications	MINT			
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 overflows (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.				
<div>Example:</div> Input value is flow in l/h. Integrated value is total number of l.				
<div>Example:</div> Input value is actual value of kW. Integrated value is total number of kWh.				



PLC Editor: Function block

Input:

...

×

Initial:

...

×

[-]

Enable:

...

×

☐ Inverted input

Reset:

...

×

☐ Inverted input

Memory:

1

Integration:

PLC-AOUT 1

[-]

Dimension:

-

Resolution:

1

Overflow:

PLC-BOUT 1.1

☐ Inverted output

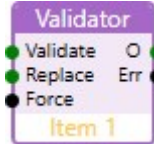
OK

Cancel

Image 7.106 Configuration of Integration block

⬅ back to List of PLC blocks

## Validator

PLC group	Others			
Related FW	2.1.0			
Related applications	MINT			
PLC Block ID	54			
Inputs				
Input	Type	Negation	Range	Function
Validate	Analog	No	$-2^{32}-1 \dots +2^{32}-1$	Input value
Replace	Analog	No	$-2^{32}-1 \dots +2^{32}-1$	Replacement value
Force	Binary	Yes	0/1	Forcing of replacement
Outputs				
Output	Type	Negation	Range	Function
Output	Analog	No	$-2^{32}-1 \dots +2^{32}-1$	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 <b>Output</b> 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

PLC Editor: Function block

• Validate:  ...  [-]

• Replace:  ...  [-]

• Force:  ...  ☐ ☐ Inverted input

• Output:  [-]

• Data Invalid:  ☐ ☐ Inverted output

Image 7.107 Configuration of Validator block

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# 9.2 Alarms

**What alarms are:**

The controller evaluates two levels of alarms. For more information **see Alarm Management on page 126.**

## 9.2.1 Alarm levels in the controller

9.2.2 Alarms level 1 .....	1006
9.2.3 Alarms level 2 .....	1028
9.2.4 Other alarms .....	1062

## 9.2.2 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 .....	1008	Wrn Unsupported PMS Mode .....	1017	ALI Wrong Power Format	1025
Wrn Battery Overvoltage	1008	Wrn Voltage Regulation Limit .....	1017	AHI SW Key Multi	
Wrn Battery Undervoltage .....	1008	Wrong PLC Configuration	1017	BMS Control Error .....	1025
Wrn Brute Force Protection Active .....	1008	Wrn String 1 Diff Voltage	1018	AHI Ignore High Target Activated .....	1026
Wrn ICC Units Missing ..	1009	Wrn String 2 Diff Voltage	1018	AHI Ignore Low Target Activated .....	1026
Wrn Cell < Temperature	1009	Wrn String 3 Diff Voltage	1018	History Record Only .....	1026
Wrn Cell < Voltage .....	1009	Wrn String 4 Diff Voltage	1019	Hst ROCOF 1 .....	1026
Wrn Cell > Temperature	1009	Wrn String 5 Diff Voltage	1019	Hst ROCOF2 .....	1026
Wrn Cell > Voltage .....	1010	Wrn String 6 Diff Voltage	1019	Hst ROCOF3 .....	1027
Wrn DC Measurement Error .....	1010	Wrn String 7 Diff Voltage	1019	Hst ROCOF4 .....	1027
Wrn Default Password ..	1010	Wrn String 8 Diff Voltage	1020	Hst Ignore High Target Deactivated .....	1027
Wrn Discharging - System Safety .....	1010	Wrn Unknown Capacity ..	1020	Hst Ignore Low Target Deactivated .....	1027
Wrn ES > Temperature ..	1011	Alarm List Indication .....	1020	Hst Vector Shift .....	1028
Wrn ES >V .....	1011	ALI AC BusMains Ph L1 Inverted .....	1020		
Wrn ES <V .....	1011	ALI AC BusMains Ph L2 Inverted .....	1021		
Wrn Energy Storage Not Ready .....	1012	ALI AC BusMains Ph L3 Inverted .....	1021		
Wrn Event e-mail 1 Fail ..	1012	ALI BESS Ph Rotation Opposite .....	1021		
Wrn Event e-mail 2 Fail ..	1012	ALI CU Restart Required	1022		
Wrn Event e-mail 3 Fail ..	1012	ALI ICC Mode Inconsistency .....	1022		
Wrn Event e-mail 4 Fail ..	1013	ALI BCB Closing Is Blocked .....	1022		
Wrn Frequency Regulation Limit .....	1013	ALI Ethernet Port Inconsistency .....	1023		
Wrn Override All Sd .....	1014	Daily BESS Cycles Reached .....	1023		
Wrn Password reset e- mail addr is not set .....	1014	BCB Closing Is Blocked ..	1023		
Wrn PCS >V .....	1014	ALI BESS Ph L1 Inverted	1024		
Wrn PCS <V .....	1014	ALI BESS Ph L2 Inverted	1024		
Wrn Q Control Fail .....	1015	ALI BESS Ph L3 Inverted	1024		
Wrn RTC Battery Flat .....	1015	ALI BESS Ph Rotation Opposite .....	1025		
Wrn Safety mode .....	1015	ALI Start Blocking .....	1025		
Wrn SOC High Alarm .....	1016				
Wrn SOC Low Alarm .....	1016				
Wrn Stop Fail .....	1017				

 **back to Alarms**



## Warning

### Wrn Battery Overvoltage

Alarm Type	WarningAlarm List + History Record Indication
Alarmlist message	WrnAHI Battery Overvoltage
Alarm evaluated	All the time
Related applications	MINT
Alarm ID	941
Description	<p>This alarm is activated when <b>Battery Voltage</b> is over <b>Power Supply &gt;V</b> for period longer than <b>Power Supply &lt;&gt; Delay</b>.</p> <p>This alarm has FPS - <b>FIXED PROTECTIONS STATES 1</b></p>

⬅ 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
Alarm ID	940
Description	<p>This alarm is activated when <b>Battery Voltage</b> is below <b>Power Supply &lt;V</b> for period longer than <b>Power Supply &lt;&gt; Delay</b>.</p> <p>This alarm has FPS - <b>FIXED PROTECTIONS STATES 1</b></p>

⬅ 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
Alarm ID	1237
Description	<p>This alarm is activated when account break protection detects possible attack and at least one account is blocked according to <b>Account break protection</b>Account break protection rules.</p> <p>This alarm has FPS - <b>FIXED PROTECTIONS STATES 1</b>.</p> <p><b>Note:</b> In case that the alarm stays active even that it should already be inactive, do the following to get rid of it:</p> <ol style="list-style-type: none"><li>1. Disconnect all peripherals (displays, ethernet, etc.)</li><li>2. Wait for 20 minutes - the alarm should become inactive</li><li>3. Connect with IntelliConfig using USB - Quick connection</li><li>4. Acknowledge the alarm</li></ol>

⬅ back to List of alarms level 1



## Wrn ICC Units Missing

Alarm Type	Warning/
Alarmlist message	Wrn ICC Units Missing
Alarm evaluated	Only when <b>#Number Of Units On ICC Check</b> = Enabled
Related applications	MINT
Alarm ID	1624
Description	This alarm is activated when actual number of unit on CAN2 is lower than value adjusted in setpoint <b>#Number Of Units On ICC</b> and <b>#Number Of Units On ICC Check</b> is Enabled and <b>#ICC Units Missing Protection</b> is adjusted to Warning.

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## Wrn Cell < Temperature

Alarm Type	Warning
Alarmlist message	Wrn Cell < Temperature
Alarm evaluated	All the time
Related applications	MINT
Alarm ID	3798
Description	This alarm is activated when the value <b>Cell Min Temperature</b> is below the setting of setpoint <b>Cell &lt;Temperature</b> after elapsed time from the setpoint <b>Cell &lt;&gt;Temperature Delay</b> .

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## Wrn Cell < Voltage

Alarm Type	Warning
Alarmlist message	Wrn Cell < Voltage
Alarm evaluated	All the time
Related applications	MINT
Alarm ID	3802
Description	This alarm is activated when the value <b>Cell Min Voltage</b> is below the setting of setpoint <b>Cell &lt;V</b> after elapsed time from the setpoint <b>Cell &lt;&gt;V Delay</b> .

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## Wrn Cell > Temperature

Alarm Type	Warning
Alarmlist message	Wrn Cell > Temperature
Alarm evaluated	All the time
Related applications	MINT
Alarm ID	3796
Description	This alarm is activated when the value <b>Cell Max Temperature</b> exceeds the setting of setpoint <b>Cell &gt;Temperature</b> after elapsed time from the setpoint <b>Cell &lt;&gt;Temperature Delay</b> .



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### Wrn Cell > Voltage

Alarm Type	Warning
Alarmlist message	Wrn Cell > Voltage
Alarm evaluated	All the time
Related applications	MINT
Alarm ID	3800
Description	This alarm is activated when the value <b>Cell Max Voltage</b> exceeds the setting of setpoint <b>Cell &gt;V</b> after elapsed time from the setpoint <b>Cell &lt;&gt;V Delay</b> .

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### Wrn DC Measurement Error

Alarm Type	Warning
Alarmlist message	Wrn DC Measurement Error
Alarm evaluated	All the time
Related applications	MINT
Alarm ID	1654
Description	This alarm is activated when controller expects to measure DC voltage but values are 0. Measured DC voltage is expected to be received by LAI <b>ES VOLTAGE MEAS</b> .

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### Wrn Default Password

Alarm Type	Warning
Alarmlist message	Wrn Default Credentials
Alarm evaluated	All the time
Related applications	MINT
Alarm ID	1071
Description	This alarm is active until the default password for administrator account is changed.

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### Wrn Discharging - System Safety

Alarm Type	Warning
Alarmlist message	Wrn Discharging - System Safety
Alarm evaluated	All the time
Related applications	MINT
Alarm ID	2242
Description	The alarm is activated when the controller is measuring that the BESS is discharging above a threshold set by the Setpoint <b>System Safety Discharging Level</b> , despite the request to discharge is not active (value <b>BESS Required P Target=0</b> ).



	<p>Condition that needs to meet when the <b>BESS Required P Target=0</b> is: <b>BESS P / BESS Max Discharging P &gt; System Safety Discharging Level / BESS Max Discharging P</b></p> <p>The activation of the alarm does not occur when the system of the controller is unloading and the required power is being ramped to 0.</p>
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### Wrn ES > Temperature

<b>Alarm Type</b>	<b>Warning</b>
<b>Alarmlist message</b>	Wrn ES > Temperature
<b>Alarm evaluated</b>	Only if Setpoint <b>ES Temperature Protection</b> = Enabled or Protection Force Block 1/2/3 and the state of LBI <b>PROTECTION FORCE DISABLE BLOCK 1 / PROTECTION FORCE DISABLE BLOCK 2 / PROTECTION FORCE DISABLE BLOCK 3</b> is inactive
<b>Related applications</b>	MINT
<b>Alarm ID</b>	3783
<b>Description</b>	This alarm is activated when the value <b>ES Temperature</b> exceeds the setting of setpoint <b>ES &gt; Temperature</b> after elapsed time from the setpoint <b>ES &lt;&gt; Temperature Delay</b> .

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### Wrn ES >V

<b>Alarm Type</b>	<b>Warning</b>
<b>Alarmlist message</b>	Wrn ES >V
<b>Alarm evaluated</b>	All the time
<b>Related applications</b>	MINT
<b>Alarm ID</b>	1657
<b>Description</b>	<p>This alarm is activated when Energy Storage Volts over <b>ES &gt;V</b> for period longer than <b>ES &gt;V Delay</b>. The evaluation of this protection starts to be evaluated once the PCS is started.</p> <p><b>Note:</b> This alarm has FPS - Fixed Protections States 5</p>

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### Wrn ES <V

<b>Alarm Type</b>	<b>Warning</b>
<b>Alarmlist message</b>	Wrn ES <V
<b>Alarm evaluated</b>	All the time
<b>Related applications</b>	MINT
<b>Alarm ID</b>	1659
<b>Description</b>	This alarm is activated when Energy Storage Voltage is below <b>ES</b>



	<p>&lt;V for period longer than <b>ES &lt; VDelay</b>. The evaluation of this protection starts to be evaluated once the PCS is started.</p> <p><b>Note:</b> This alarm has FPS - Fixed Protections States 5</p>
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### Wrn Energy Storage Not Ready

Alarm Type	Warning
Alarmlist message	Wrn Energy Storage Not Ready
Alarm evaluated	All the time
Related applications	MINT
Alarm ID	1651
Description	This alarm is activated when LBI <b>ES READY TO START</b> is 0. When this protection is active it will keep the value BESS State in Not Ready state when the system is stopped.

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### 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
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 <b>E-mail Address 1</b> and email wasn't send.

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### 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
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 <b>E-mail Address 2</b> and email wasn't send.

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### Wrn Event e-mail 3 Fail

Alarm Type	Warning
Alarmlist message	Wrn Event e-mail 3 Fail
Alarm evaluated	All the time



<b>Related applications</b>	MINT
<b>Alarm ID</b>	736
<b>Description</b>	The alarm indicates that there was a request to send an event email to email address which is adjusted by setpoint <b>E-mail Address 3</b> and email wasn't send.

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#### Wrn Event e-mail 4 Fail

<b>Alarm Type</b>	<b>Warning</b>
<b>Alarmlist message</b>	Wrn Event e-mail 4 Fail
<b>Alarm evaluated</b>	All the time
<b>Related applications</b>	MINT
<b>Alarm ID</b>	737
<b>Description</b>	The alarm indicates that there was a request to send an event email to email address which is adjusted by setpoint <b>E-mail Address 4</b> and email wasn't send.

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#### Wrn Fence 1 Alarm

<b>Alarm Type</b>	WRN
<b>Alarmlist message</b>	Wrn Fence 1 Alarm
<b>Alarm evaluated</b>	Only if <b>Geo-Fencing</b> != Disabled
<b>Related applications</b>	MINT
<b>Description</b>	This alarm evaluates the GPS position of BESS. <i>Note: This alarm has FPS - Fixed Protections States 5</i>

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#### Wrn Fence 2 Alarm

<b>Alarm Type</b>	WRN
<b>Alarmlist message</b>	Wrn Fence 2 Alarm
<b>Alarm evaluated</b>	Only if <b>Geo-Fencing</b> != Disabled
<b>Related applications</b>	MINT
<b>Description</b>	This alarm evaluates the GPS position of BESS. <i>Note: This alarm has FPS - Fixed Protections States 5</i>

🔍 back to List of alarms level 1

#### Wrn Frequency Regulation Limit

<b>Alarm Type</b>	<b>WarningAlarm List + History Record Indication</b>
<b>Alarmlist message</b>	Wrn Frequency Regulation Limit
<b>Alarm evaluated</b>	While BESS is running
<b>Related applications</b>	MINT
<b>Alarm ID</b>	151



<b>Description</b>	<p>This alarm is activated when <b>Frequency Regulator Output</b> stays close to <b>Frequency Governor Low Limit</b> or <b>Frequency Governor High Limit</b> for at least 2 seconds and will remain active as long as the cause is present.</p> <p>This alarm has FPS - <b>FIXED PROTECTIONS STATES 3</b><b>FIXED PROTECTIONS STATES 1</b>.</p>
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### Wrn Override All Sd

<b>Alarm Type</b>	<b>Warning</b>
<b>Alarmlist message</b>	Override All Sd
<b>Alarm evaluated</b>	Only if LBI <b>SD OVERRIDE</b> is configured
<b>Related applications</b>	MINT
<b>Alarm ID</b>	674
<b>Description</b>	<p>This alarm is activated when LBI <b>SD OVERRIDE</b> is closed.</p> <p>This alarm has FPS - <b>FIXED PROTECTIONS STATES 1</b>.</p>

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### Wrn Password reset e-mail addr is not set

<b>Alarm Type</b>	<b>Warning</b>
<b>Alarmlist message</b>	Wrn Password reset e-mail addr is not set
<b>Alarm evaluated</b>	All the time
<b>Related applications</b>	MINT
<b>Alarm ID</b>	1292
<b>Description</b>	<p>This alarm is active when password reset e-mail address is not filled. Fill out the password reset e-mail via IntelliConfig to remove this alarm.</p>

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### Wrn PCS >V

<b>Alarm Type</b>	<b>Warning</b>
<b>Alarmlist message</b>	Wrn PCS >V
<b>Alarm evaluated</b>	All the time
<b>Related applications</b>	MINT
<b>Alarm ID</b>	2231
<b>Description</b>	<p>This alarm is activated when PCS (Power Conversion System)Volts is over <b>PCS &gt;V</b> for period longer than <b>PCS &gt;V Delay</b>. The evaluation of this protection starts to be evaluated once the PCS is started.</p> <p><b>Note:</b> This alarm has FPS - <b>Fixed Protections States 5</b></p>

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### Wrn PCS <V

<b>Alarm Type</b>	<b>Warning</b>
<b>Alarmlist message</b>	Wrn PCS <V



Alarm evaluated	All the time
Related applications	MINT
Alarm ID	2233
Description	<p>This alarm is activated when PCS (Power Conversion System)Volts is below <b>PCS &lt;V</b> for period longer than <b>PCS &lt;V Delay</b>. The evaluation of this protection starts to be evaluated once the PCS is started.</p> <p><b>Note: This alarm has FPS - Fixed Protections States 5</b></p>

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### Wrn Q Control Fail

Alarm Type	Warning
Alarmlist message	Wrn Q Control Fail
Alarm evaluated	Only when <b>PF/Q Request Source</b> = Analog External Value, <b>HLC Control Mode</b> and <b>Breaker state</b> = ParalOper
Related applications	MINT
Alarm ID	1049
Description	This alarm is activated when least one gen-set is connected to the bus, but LAI <b>Q CONTROL: ANEXT BASE Q</b> is not configured.

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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
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 <b>Backup battery replacement</b> .

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### Wrn Safety mode

Alarm Type	Warning
Alarmlist message	Wrn Safety Mode
Alarm evaluated	Always if LAI <b>ES MAX CHARGING CURRENT</b> or LAI <b>ES MAX DISCHARGING CURRENT</b> have invalid data or the setpoint <b>Safety Mode</b> = Enabled
Related applications	MINT
Alarm ID	2331
Description	<p>This alarm is activated when the input to the LAI <b>ES MAX CHARGING CURRENT</b> or LAI <b>ES MAX DISCHARGING CURRENT</b> have invalid data or data not meeting certain thresholds.</p> <p>If setpoint <b>Safety Mode</b> = Enabled, the protection and function is activated</p>



	<p>when the BMS connection has been severed meaning the values that are read through LAI are invalid or smaller than set thresholds.</p> <ul style="list-style-type: none"> <li>&gt; Value (at least one of them) from LAI <b>ES MAX CHARGING CURRENT</b> or LAI <b>ES MAX DISCHARGING CURRENT</b> has an invalid value - BMS connection is lost</li> <li>&gt; Value (at least one of them) from LAI <b>ES MAX CHARGING CURRENT</b> or LAI <b>ES MAX DISCHARGING CURRENT</b> has value that is smaller than value in Setpoint <b>ES Safety Charging Current</b> or Setpoint <b>ES Safety Discharging Current</b></li> </ul> <p>Controller when conditions are applied, switches the calculation of Value <b>ES Max Charging Power</b> and Value <b>ES Max Discharging Power</b> from LAI <b>ES MAX CHARGING CURRENT</b> and LAI <b>ES MAX DISCHARGING CURRENT</b> to Setpoint <b>ES Safety Charging Current</b> and Setpoint <b>ES Safety Discharging Current</b> while at the same time activation of alarm <b>Wrn Safety Mode</b> occurs.</p> <p>The activation of this alarm can be disabled using the setpoint <b>Safety Mode</b>. When disabled the switching of the calculation and activation of the alarm is not relevant for the evaluation with LAI being under the set threshold. If the LAI receive invalid data the protection will still appear.</p>
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### Wrn SOC High Alarm

<b>Alarm Type</b>	<b>Warning</b>
<b>Alarmlist message</b>	Wrn SOC High Alarm
<b>Alarm evaluated</b>	All the time
<b>Related applications</b>	MINT
<b>Alarm ID</b>	1595
<b>Description</b>	<p>This alarm is activated by <b>ES &gt;SOC Protection</b>.</p> <p>This alarm has FPS - <b>FIXED PROTECTIONS STATES 3</b>.</p>

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### Wrn SOC Low Alarm

<b>Alarm Type</b>	<b>Warning</b>
<b>Alarmlist message</b>	Wrn SOC Low Alarm
<b>Alarm evaluated</b>	All the time
<b>Related applications</b>	MINT
<b>Alarm ID</b>	1594
<b>Description</b>	<p>This alarm is activated by <b>ES &lt;SOC Protection</b>.</p> <p>This alarm has FPS - <b>FIXED PROTECTIONS STATES 3</b>.</p>

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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
Alarm ID	48
Description	<p>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.</p> <p><b>Note:</b> BESS cannot be started while this alarm is active.</p> <p>This alarm has FPS - FIXED PROTECTIONS STATES 3.</p>

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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
Alarm ID	1044
Description	This alarm is active if setpoint #Power Management Mode = N/A Mode.

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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
Alarm ID	152
Description	<p>This alarm is issued when <b>Voltage Regulator Output</b> stays close to <b>Voltage Regulator Low Limit</b> or <b>Voltage Regulator High Limit</b> for at least 2 seconds and will remain active as long as the cause is present.</p> <p>This alarm has FPS - FIXED PROTECTIONS STATES 3FIXED PROTECTIONS STATES 1.</p>

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## Wrong PLC Configuration

Alarm Type	Warning
Alarmlist message	Wrong PLC Configuration
Alarm evaluated	Always



<b>Related applications</b>	MINT
<b>Alarm ID</b>	41
<b>Description</b>	This alarm is activated when the <b>PLC - Programmable Logic Controller</b> 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

<b>Alarm Type</b>	WRN
<b>Alarmlist message</b>	Wrn Production Mode
<b>Alarm evaluated</b>	All the time
<b>Related applications</b>	MINT
<b>Description</b>	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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### Wrn String 1 Diff Voltage

<b>Alarm Type</b>	WarningAlarm List + History Record Indication
<b>Alarmlist message</b>	Wrn String 1 Diff Voltage
<b>Alarm evaluated</b>	Only if setpoint Multi BMS = Enabled
<b>Related applications</b>	MINT
<b>Alarm ID</b>	3634
<b>Description</b>	When the LAI <b>STRING VOLTAGE 1</b> is above the setpoint <b>String V&gt;</b> or below the setpoint <b>String V&lt;</b> the protection Wrn String 1 Diff Voltage appears after countdown of setpoint <b>String &lt;&gt; V Delay</b>

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### Wrn String 2 Diff Voltage

<b>Alarm Type</b>	WarningAlarm List + History Record Indication
<b>Alarmlist message</b>	Wrn String 2 Diff Voltage
<b>Alarm evaluated</b>	Only if setpoint Multi BMS = Enabled
<b>Related applications</b>	MINT
<b>Alarm ID</b>	3635
<b>Description</b>	When the LAI <b>STRING VOLTAGE 2</b> is above the setpoint <b>String V&gt;</b> or below the setpoint <b>String V&lt;</b> the protection Wrn String 2 Diff Voltage appears after countdown of setpoint <b>String &lt;&gt; V Delay</b>

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### Wrn String 3 Diff Voltage

<b>Alarm Type</b>	WarningAlarm List + History Record Indication
<b>Alarmlist message</b>	Wrn String 3 Diff Voltage



<b>Alarm evaluated</b>	Only if setpoint Multi BMS = Enabled
<b>Related applications</b>	MINT
<b>Alarm ID</b>	3636
<b>Description</b>	When the LAI <b>STRING VOLTAGE 3</b> is above the setpoint <b>String V&gt;</b> or below the setpoint <b>String V&lt;</b> the protection Wrn String 3 Diff Voltage appears after countdown of setpointString <> V Delay

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### Wrn String 4 Diff Voltage

<b>Alarm Type</b>	<b>WarningAlarm List + History Record Indication</b>
<b>Alarmlist message</b>	Wrn String 4 Diff Voltage
<b>Alarm evaluated</b>	Only if setpoint Multi BMS = Enabled
<b>Related applications</b>	MINT
<b>Alarm ID</b>	3637
<b>Description</b>	When the LAI <b>STRING VOLTAGE 4</b> is above the setpoint <b>String V&gt;</b> or below the setpoint <b>String V&lt;</b> the protection Wrn String 4 Diff Voltage appears after countdown of setpointString <> V Delay

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### Wrn String 5 Diff Voltage

<b>Alarm Type</b>	<b>WarningAlarm List + History Record Indication</b>
<b>Alarmlist message</b>	Wrn String 5 Diff Voltage
<b>Alarm evaluated</b>	Only if setpoint Multi BMS = Enabled
<b>Related applications</b>	MINT
<b>Alarm ID</b>	3638
<b>Description</b>	When the LAI <b>STRING VOLTAGE 5</b> is above the setpoint <b>String V&gt;</b> or below the setpoint <b>String V&lt;</b> the protection Wrn String 5 Diff Voltage appears after countdown of setpointString <> V Delay

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### Wrn String 6 Diff Voltage

<b>Alarm Type</b>	<b>WarningAlarm List + History Record Indication</b>
<b>Alarmlist message</b>	Wrn String 6 Diff Voltage
<b>Alarm evaluated</b>	Only if setpoint Multi BMS = Enabled
<b>Related applications</b>	MINT
<b>Alarm ID</b>	3639
<b>Description</b>	When the LAI <b>STRING VOLTAGE 6</b> is above the setpoint <b>String V&gt;</b> or below the setpoint <b>String V&lt;</b> the protection Wrn String 6 Diff Voltage appears after countdown of setpointString <> V Delay

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### Wrn String 7 Diff Voltage

<b>Alarm Type</b>	<b>WarningAlarm List + History Record Indication</b>
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<b>Alarmlist message</b>	Wrn String 7 Diff Voltage
<b>Alarm evaluated</b>	Only if setpoint Multi BMS = Enabled
<b>Related applications</b>	MINT
<b>Alarm ID</b>	3640
<b>Description</b>	When the LAI <b>STRING VOLTAGE 7</b> is above the setpoint <b>String V&gt;</b> or below the setpoint <b>String V&lt;</b> the protection Wrn String 7 Diff Voltage appears after countdown of setpoint <b>String &lt;&gt; V Delay</b>

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### Wrn String 8 Diff Voltage

<b>Alarm Type</b>	<b>WarningAlarm List + History Record Indication</b>
<b>Alarmlist message</b>	Wrn String 8 Diff Voltage
<b>Alarm evaluated</b>	Only if setpoint Multi BMS = Enabled
<b>Related applications</b>	MINT
<b>Alarm ID</b>	3641
<b>Description</b>	When the LAI <b>STRING VOLTAGE 8</b> is above the setpoint <b>String V&gt;</b> or below the setpoint <b>String V&lt;</b> the protection Wrn String 8 Diff Voltage appears after countdown of setpoint <b>String &lt;&gt; V Delay</b>

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### Wrn Unknown Capacity

<b>Alarm Type</b>	<b>Warning</b>
<b>Alarmlist message</b>	Wrn Unknown Capacity
<b>Alarm evaluated</b>	Only when <b>SOC Balance</b> = Enabled
<b>Related applications</b>	MINT
<b>Alarm ID</b>	3795
<b>Description</b>	Having the SOC Balance enabled and the LAI is not configured or configured but the LAI has invalid data (###) the Wrn Unknown Capacity will appear in the alarm list.

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## Alarm List Indication

### ALI AC BusMains Ph L1 Inverted

<b>Alarm Type</b>	<b>Alarm List Indication</b>
<b>Alarmlist message</b>	ALI AC BusMains Ph L1 Inverted
<b>Alarm evaluated</b>	All the time
<b>Related applications</b>	MINT
<b>Alarm ID</b>	928
<b>Description</b>	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
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
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
Alarm ID	847
Description	<p>This alarm is activated when controller detects wrong phase rotation, e.g. <b>Phase Rotation</b> is set to Clockwise and actual rotation is Counterclockwise, on the AC BusMains side.</p> <p>This alarm has FPS - FIXED PROTECTIONS STATES 1.</p>

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### ALI CU Restart Required

Alarm Type	Alarm List Indication
Alarmlist message	ALI CU Restart Required
Alarm evaluated	All the time
Related applications	MINT
Alarm ID	2672
Description	This alarm is active when any setpoint which requires restart of the controller was changed and controller is waiting for restart to apply changes. The controller might be restarted via power cycle (disconnecting and connecting of power terminal) or via writing the same configuration. If changed configuration is written in and any setpoint which requires restart of the controller was changed, the alarm will not disappear and another restart will be required.

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### ALI ICC Mode Inconsistency

Alarm Type	Alarm List Indication
Alarmlist message	ALI CAN Mode Inconsistency
Alarm evaluated	All the time
Related applications	MINT
Alarm ID	1291
Description	This alarm is active when there is mismatch between setpoint <b>CAN ICC Mode</b> and value <b>CAN ICC Mode</b> . After changing the setpoint <b>CAN ICC Mode</b> , it is needed to power cycle the controller to get rid of the alarm.

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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
Alarm ID	2339
Description	Alarm is active in case the BCB breaker is blocked due to some of the generator protections being disabled: <ul style="list-style-type: none"><li>&gt; BESS &lt;f Protection</li><li>&gt; BESS &gt;f Protection</li><li>&gt; BESS &lt;&lt;V Protection</li><li>&gt; BESS &gt;V Protection and BESS &gt;&gt;V Protection</li><li>&gt; Short Circuit Protection</li></ul>

◀ back to List of alarms level 1



## ALI Ethernet Port Inconsistency

Alarm Type	Alarm List Indication
Alarmlist message	ALI Ethernet Port Inconsistency
Alarm evaluated	All the time
Related applications	MINT
Alarm ID	1604
Description	<p>This alarm is active when any of the setpoints <b>Ethernet port - Ethernet port 3 (page 1)</b> is changed and it is activated until the controller is restarted.</p> <p>This alarm will disappear after the power cycle of the controller - the new settings of the setpoint is applied only while the controller is initialized.</p>

🔍 back to List of alarms level 1

## Daily BESS Cycles Reached

Alarm Type	Alarm List Indication
Alarmlist message	Daily BESS Cycles Reached
Alarm evaluated	All the time
Related applications	MINT
Alarm ID	1605
Description	<p>This alarm is activated if number of daily battery cycles specified by the setpoint <b>Max BESS Cycles Per Day</b> is reached.</p>

🔍 back to List of alarms level 1

## BCB Closing Is Blocked

Alarm Type	Alarm List Indication
Alarmlist message	ALI BCB Closing Is Blocked
Alarm evaluated	All the time
Related applications	MINT
Alarm ID	1445
Description	<p>Alarm is active in case the BCB breaker is blocked due to some of the BESS protections being disabled:</p> <ul style="list-style-type: none"><li>➤ <b>BESS &lt;f Protection</b></li><li>➤ <b>BESS &gt;f Protection</b></li><li>➤ <b>BESS &lt;&lt;V Protection</b></li><li>➤ <b>BESS &gt;V Protection and BESS &gt;&gt;V Protection</b></li><li>➤ <b>Short Circuit Protection</b></li></ul>

🔍 back to List of alarms level 1



### ALI BESS Ph L1 Inverted

Alarm Type	Alarm List Indication
Alarmlist message	ALIBESS Ph L1 Inverted
Alarm evaluated	All the time
Related applications	MINT
Alarm ID	922
Description	<p>This alarm is activated when BESS Phase L1 is inverted.</p> <p><b>Note:</b> 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.</p>

🔍 back to List of alarms level 1

### ALI BESS Ph L2 Inverted

Alarm Type	Alarm List Indication
Alarmlist message	ALIBESS Ph L2 Inverted
Alarm evaluated	All the time
Related applications	MINT
Alarm ID	923
Description	<p>This alarm is activated when BESS Phase L2 is inverted.</p> <p><b>Note:</b> 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.</p>

🔍 back to List of alarms level 1

### 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
Alarm ID	924
Description	<p>This alarm is activated when BESS Phase L3 is inverted.</p> <p><b>Note:</b> 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.</p>

🔍 back to List of alarms level 1



### 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
Alarm ID	154
Description	<p>This alarm is activated when controller detects wrong phase rotation, e.g. <b>Phase Rotation</b> is set to Clockwise and actual rotation is Counterclockwise, on the BESS side.</p> <p>This alarm has FPS - <b>FIXED PROTECTIONS STATES 2</b>.</p>

◀ back to List of alarms level 1

### ALI Start Blocking

Alarm Type	Alarm List Indication
Alarmlist message	ALI Start Blocking
Alarm evaluated	Only if LBI <b>START BLOCKING</b> is configured
Related applications	MINT
Alarm ID	56
Description	This alarm is active if LBI <b>START BLOCKING</b> is closed before BESS is started.

◀ back to List of alarms level 1

### ALI Wrong Power Format

Alarm Type	Alarm List Indication
Alarmlist message	ALI Wrong Power Format
Alarm evaluated	All the time
Related applications	MINT
Alarm ID	149
Description	This alarm is activated when there is inconsistency of <b>Power Formats And Units</b> on any controller which is connected via <b>CAN2</b> or <b>Communication peripherals</b> .

◀ back to List of alarms level 1

### AHI SW Key Multi BMS Control Error

Alarm Type	Alarm List + History Record Indication
Alarmlist message	AHI SW Key Multi BMS Control Error
Alarm evaluated	Only if missing SW Key + LAI/LBI Multi BMS functions configured
Related applications	MINT
Alarm ID	3622
Description	Alarm list SW Key Multi BMS Control Error appears for the user to see in the alarm list when one of the MultiBMS functions is configured despite of not



	having an active SW key bit for the function.
--	---

🔍 back to List of alarms level 1

### AHI Ignore High Target Activated

Alarm Type	Alarm List + History Record Indication
Alarmlist message	AHI Ignore High Target Activated
Alarm evaluated	All the time
Related applications	MINT
Alarm ID	3774
Description	This alarm is activated when LBI IGNORE HIGH SOC is active or LBI IGNORE HIGH V REL is active.

🔍 back to List of alarms level 1

### AHI Ignore Low Target Activated

Alarm Type	Alarm List + History Record Indication
Alarmlist message	AHI Ignore Low Target Activated
Alarm evaluated	All the time
Related applications	MINT
Alarm ID	3773
Description	This alarm is activated when LBI IGNORE LOW SOC is active or LBI IGNORE LOW V REL is active

🔍 back to List of alarms level 1

## History Record Only

### 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
Alarm ID	851
Description	<p>This alarm is activated by ROCOF1 Protection.</p> <p><b>Note:</b> There are 4 ROCOF Protections which can be enabled.</p> <ul style="list-style-type: none"> <li>&gt; ROCOF1 Protection</li> <li>&gt; ROCOF2 Protection</li> <li>&gt; ROCOF3 Protection</li> <li>&gt; ROCOF4 Protection</li> </ul>

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### Hst ROCOF2

Alarm Type	History Record Only
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<b>Alarmlist message</b>	Hst ROCOF2
<b>Alarm evaluated</b>	Only if <b>ROCOF2 Protection</b> = Enabled or ( <b>ROCOF2 Protection</b> = Parallel Only and <b>MCB FEEDBACK</b> is active)
<b>Related applications</b>	MINT
<b>Alarm ID</b>	1112
<b>Description</b>	This alarm is activated by <b>ROCOF2 Protection</b>

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### Hst ROCOF3

<b>Alarm Type</b>	<b>History Record Only</b>
<b>Alarmlist message</b>	Hst ROCOF3
<b>Alarm evaluated</b>	Only if <b>ROCOF3 Protection</b> = Enabled or ( <b>ROCOF3 Protection</b> = Parallel Only and <b>MCB FEEDBACK</b> is active)
<b>Related applications</b>	MINT
<b>Alarm ID</b>	1113
<b>Description</b>	This alarm is activated by <b>ROCOF3 Protection</b>

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### Hst ROCOF4

<b>Alarm Type</b>	<b>History Record Only</b>
<b>Alarmlist message</b>	Hst ROCOF4
<b>Alarm evaluated</b>	Only if <b>ROCOF4 Protection</b> = Enabled or ( <b>ROCOF4 Protection</b> = Parallel Only and <b>MCB FEEDBACK</b> is active)
<b>Related applications</b>	MINT
<b>Alarm ID</b>	1114
<b>Description</b>	This alarm is activated by <b>ROCOF4 Protection</b>

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### Hst Ignore High Target Deactivated

<b>Alarm Type</b>	<b>History Record Only</b>
<b>Alarmlist message</b>	Hst Ignore High Target Deactivated
<b>Alarm evaluated</b>	All the time
<b>Related applications</b>	MINT
<b>Alarm ID</b>	1048
<b>Description</b>	This alarm is activated when <b>LBI IGNORE HIGH SOC</b> is deactivated or <b>LBI IGNORE HIGH V REL</b> is deactivated. If both LBIs are active at the same time, the hst appears when both are deactivated.

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### Hst Ignore Low Target Deactivated

<b>Alarm Type</b>	<b>History Record Only</b>
<b>Alarmlist message</b>	Hst Ignore Low Target Deactivated



<b>Alarm evaluated</b>	All the time
<b>Related applications</b>	MINT
<b>Alarm ID</b>	1047
<b>Description</b>	This alarm is activated when LBI <b>IGNORE LOW SOC</b> is deactivated or LBI <b>IGNORE LOW V REL</b> is deactivated. If both LBIs are active at the same time, the hst appears when both are deactivated.

⬅ back to List of alarms level 1

### Hst Vector Shift

<b>Alarm Type</b>	History Record Only Warning
<b>Alarmlist message</b>	Hst Wrn Vector Shift
<b>Alarm evaluated</b>	Only if <b>Vector Shift Protection</b> = Enabled or ( <b>Vector Shift Protection</b> = Parallel Only and <b>MCB FEEDBACK</b> is closed)
<b>Related applications</b>	MINT
<b>Alarm ID</b>	850
<b>Description</b>	This alarm is activated when <b>Vector shift</b> is detected.

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## 9.2.3 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.



## List of alarms level 2

Shutdown .....	1031	Sd BESS <V L2-N .....	1042	SD Unexpected PCS	
Emergency Stop .....	1031	Sd BESS <V L3-N .....	1042	State .....	1050
E-STOP .....	1031	Sd BESSMains <V L1-L2 .....	1042	SD Unexpected Source	
BESS Anti Islanding .....	1031	Sd BESSMains <V L2-L3 .....	1043	State .....	1050
Sd BCB Feedback Not		Sd BESSMains <V L3-L1 .....	1043	SD AC Meas Sensing Fail	1050
Closed .....	1032	Sd BESS >f .....	1043	SD AC BUS Meas	
Sd Cell << Temperature .....	1032	Sd BESS <f .....	1043	Sensing Fail .....	1050
Sd Cell << Voltage .....	1032	Sd BESS Voltage		SD String 1 Not Ready ..	1051
Sd Cell >> Temperature .....	1033	Unbalance Ph-N .....	1044	SD String 2 Not Ready ..	1051
Sd Cell >> Voltage .....	1033	Sd BESS V Unbalance		SD String 3 Not Ready ..	1051
Sd DC Circuit Close Fail .....	1033	Ph-Ph .....	1044	SD String 4 Not Ready ..	1051
Source Not Ready .....	1033	Sd BESS Current		SD String 5 Not Ready ..	1052
ES Configuration		Unbalance .....	1044	SD String 6 Not Ready ..	1052
Incorrect .....	1034	Sd IDMT PCS Overload		SD String 7 Not Ready ..	1052
Sd ES << Temperature .....	1034	Protection .....	1044	SD String 8 Not Ready ..	1052
Sd ES >> Temperature .....	1035	Sd IDMT Earth Fault		SD SBMB 1 Fail .....	1053
Sd ESCB Fail To Close .....	1035	Current .....	1045	SD SBMB 2 Fail .....	1053
Sd ESCB Fail To Open .....	1036	Sd IDMT BESS >A .....	1045	SD SBMB 3 Fail .....	1053
Sd ESCB Fail .....	1036	Sd IDMT Overload .....	1045	SD SBMB 4 Fail .....	1054
Sd ESCB Not Closed .....	1037	Sd NCB Fail .....	1045	SD SBMB 5 Fail .....	1054
Sd ES >>V .....	1038	Sd PCS IDMT >A .....	1046	SD SBMB 6 Fail .....	1054
Sd ES <<V .....	1038	Sd PCS >>V .....	1046	SD SBMB 7 Fail .....	1055
Wrn Fence 1 Alarm .....	1038	Sd PCS Short Circuit .....	1046	SD SBMB 8 Fail .....	1055
Fence 2 Alarm .....	1038	Sd PCS <<V .....	1047	SD MultiBMS Incorrect	
Sd BESS >>V L1-N .....	1039	Sd Short Circuit .....	1047	Configuration .....	1056
Sd BESS >>V L2-N .....	1039	Sd SOC Critical High .....	1047	SD ICC Units Missing .....	1056
Sd BESS >>V L3-N .....	1039	Sd SOC Critical Low .....	1047	Slow Stop Offload System	
Sd BESS >>V L1-L2 .....	1039	Start Fail .....	1048	Protection .....	1057
Sd BESS >>V L2-L3 .....	1040	SD Wrong BESS Meas		Bus Meas Error .....	1057
Sd BESS >>V L3-L1 .....	1040	Config .....	1048	Stp BCB Fail .....	1057
Sd BESS >V L1-N .....	1040	SD Wrong BUS Meas		Sd BCB Fail To Close .....	1058
Sd BESS >V L2-N .....	1040	Config .....	1048	Sd BCB Fail To Open .....	1059
Sd BESS >V L3-N .....	1041	SD Wrong BCB Control		Stp BCB Secondary Fail ..	1060
Sd BESS >V L1-L2 .....	1041	Setting .....	1048	Stp BCB Secondary Fail	
Sd BESS >V L2-L3 .....	1041	SD Wrong Precharge		To Close .....	1060
Sd BESS >V L3-L1 .....	1041	Settings .....	1049	Stp BCB Secondary Fail	
Sd BESS <V L1-N .....	1042	SD Wrong P-Q Control		To Open .....	1061
		Settings .....	1049	Stp Synchronization Fail ..	1062



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## Shutdown

### Emergency Stop

Alarm Type	ShutdownShutdownProtection types
Alarmlist message	GPR Emergency Stop
Alarm evaluated	Only if <b>EMERGENCY STOP</b> is configured
Related applications	MINT
Alarm ID	44
Description	<p>This alarm is activated by LBI <b>EMERGENCY STOP</b>. 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.</p> <p><b>Note:</b> Use red emergency button placed on the switchboard door and connect it to a binary input of the controller. Then configure the function <b>EMERGENCY STOP</b> to that binary input. It is recommended to use NC contact of the button.</p> <p><b>Note:</b> The MCB control is not affected by this alarm.</p> <p>This alarm has FPS - <b>FIXED PROTECTIONS STATES 3</b><b>FIXED PROTECTIONS STATES 1</b>.</p>

⬅ back to List of alarms level 2

### E-STOP

Alarm Type	Shutdown
Alarmlist message	E-STOP
Alarm evaluated	All the time
Related applications	MINT
Alarm ID	853
Description	Alarm is activated when dedicated <b>E-STOP</b> 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	Shutdown
Alarmlist message	BESS Anti Islanding
Alarm evaluated	All the time
Related applications	MINT
Alarm ID	1602
Description	<p>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 setup for P-Q method (grid support mode). When the system is configured with the setpoint <b>Starting Sequence BCB Control</b> = "Start with Opened BCB" and the LBI <b>PCS OUTPUT CONTROL MODE U-F/P-Q</b> is active, the BESS in single island</p>



	operation loaded to the AC bus (load) will not be able to energize the bus. In this scenario, the controller will log the SD BESS Anti-Islanding event. The BESS operating in P-Q mode will not be able to energize the bus since its frequency and voltage regulation values are not changing to ideally provide the needs of the load.
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⬅ back to List of alarms level 2

### Sd BCB Feedback Not Closed

<b>Alarm Type</b>	Shutdown
<b>Alarmlist message</b>	BCB Feedback Not Closed
<b>Alarm evaluated</b>	<b>BCB Type</b> = Fuse/Disc.
<b>Related applications</b>	MINT
<b>Alarm ID</b>	3487
<b>Description</b>	This alarm is active when setpoint <b>BCB Type</b> is set to option Fuse/Disc. and at the same time LBI <b>BCB FEEDBACK</b> is not active.

⬅ back to List of alarms level 2

### Sd Cell << Temperature

<b>Alarm Type</b>	Shutdowns
<b>Alarmlist message</b>	Sd Cell << Temperature
<b>Alarm evaluated</b>	Only if Setpoint <b>Cell Min Temperature Protection</b> = Enabled or Protection Force Block 1/2/3 and the state of LBI <b>PROTECTION FORCE DISABLE BLOCK 1 / PROTECTION FORCE DISABLE BLOCK 2 / PROTECTION FORCE DISABLE BLOCK 3</b> is inactive
<b>Related applications</b>	MINT
<b>Alarm ID</b>	3799
<b>Description</b>	This alarm is activated when the value <b>Cell Min Temperature</b> is below the setting of setpoint <b>Cell &lt;&lt;Temperature</b> after elapsed time from the setpoint <b>Cell &lt;&gt;Temperature Delay</b> .

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### Sd Cell << Voltage

<b>Alarm Type</b>	Shutdowns
<b>Alarmlist message</b>	Sd Cell << Voltage
<b>Alarm evaluated</b>	Only if Setpoint <b>Cell Min Voltage Protection</b> = Enabled or Protection Force Block 1/2/3 and the state of LBI <b>PROTECTION FORCE DISABLE BLOCK 1 / PROTECTION FORCE DISABLE BLOCK 2 / PROTECTION FORCE DISABLE BLOCK 3</b> is inactive
<b>Related applications</b>	MINT
<b>Alarm ID</b>	3803
<b>Description</b>	This alarm is activated when the value <b>Cell Min Voltage</b> is below the setting of setpoint <b>Cell &lt;&lt;V</b> after elapsed time from the setpoint <b>Cell &lt;&gt;V Delay</b> .

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### Sd Cell >> Temperature

Alarm Type	Shutdowns
Alarmlist message	Sd Cell >> Temperature
Alarm evaluated	Only if Setpoint <b>Cell Max Temperature Protection</b> = Enabled or Protection Force Block 1/2/3 and the state of LBI <b>PROTECTION FORCE DISABLE BLOCK 1 / PROTECTION FORCE DISABLE BLOCK 2 / PROTECTION FORCE DISABLE BLOCK 3</b> is inactive
Related applications	MINT
Alarm ID	3797
Description	This alarm is activated when the value <b>Cell Max Temperature</b> exceeds the setting of setpoint <b>Cell &gt;&gt;Temperature</b> after elapsed time from the setpoint <b>Cell &lt;&gt;Temperature Delay</b> .

⬅ back to List of alarms level 1 (page 1)

### Sd Cell >> Voltage

Alarm Type	Shutdowns
Alarmlist message	Sd Cell >> Voltage
Alarm evaluated	Only if Setpoint <b>Cell Max Voltage Protection</b> = Enabled or Protection Force Block 1/2/3 and the state of LBI <b>PROTECTION FORCE DISABLE BLOCK 1 / PROTECTION FORCE DISABLE BLOCK 2 / PROTECTION FORCE DISABLE BLOCK 3</b> is inactive
Related applications	MINT
Alarm ID	3801
Description	This alarm is activated when the value <b>Cell Max Voltage</b> exceeds the setting of setpoint <b>Cell &gt;&gt;V</b> after elapsed time from the setpoint <b>Cell &lt;&gt;V Delay</b> .

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### Sd DC Circuit Close Fail

Alarm Type	Warning
Alarmlist message	Sd DC Circuit Close Fail
Alarm evaluated	
Related applications	MINT
Alarm ID	1655
Description	This alarm gets active anytime when the BESS DC circuit is expected to be closed but the LBI <b>PRECHARGE FINISHED</b> gets inactive (DC circuit is opened) unexpectedly.

⬅ back to List of alarms level 1

### Source Not Ready

Alarm Type	Shutdown
Alarmlist message	Sd BESS Not Operable
Alarm evaluated	Only if LBI <b>SOURCE NOT OPERABLE</b> is configured
Related applications	MINT



<b>Alarm ID</b>	1097
<b>Description</b>	This alarm is activated/deactivated by closing/opening of LBI <b>SOURCE NOT OPERABLE</b> . This alarm has FPS - <b>FIXED PROTECTIONS STATES 3</b> .

⬅ back to List of alarms level 2

### ES Configuration Incorrect

<b>Alarm Type</b>	<b>Shutdown</b>
<b>Alarmlist message</b>	Sd ES Configuration Incorrect
<b>Alarm evaluated</b>	Before start of application
<b>Related applications</b>	MINT
<b>Alarm ID</b>	2226
<b>Description</b>	<p>This alarm will be issued if one or more of the related IOs is not configured. User must configure all the necessary IOs and set the safety setpoints before the Energy Storage can be fully utilized. List</p> <p>Logical Binary Inputs</p> <ul style="list-style-type: none"> <li>&gt; ES READY TO START</li> <li>&gt; ES READY TO LOAD</li> <li>&gt; ESCB FEEDBACK</li> <li>&gt; ES CHARGE ENABLE</li> <li>&gt; ES DISCHARGE ENABLE</li> <li>&gt; BCB FEEDBACK</li> <li>&gt; PCS READY TO START</li> <li>&gt; PCS READY TO LOAD</li> </ul> <p>Logical Analog Inputs</p> <ul style="list-style-type: none"> <li>&gt; ES SOC</li> <li>&gt; ES MAX CHARGING CURRENT</li> <li>&gt; ES MAX DISCHARGING CURRENT</li> <li>&gt; ES CURRENT</li> <li>&gt; PCS VOLTAGE MEAS</li> <li>&gt; PCS CURRENT MEAS</li> <li>&gt; ES VOLTAGE MEAS</li> <li>&gt; ES VOLTAGE</li> </ul>

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### Sd ES << Temperature

<b>Alarm Type</b>	Shutdowns
<b>Alarmlist message</b>	Sd ES << Temperature
<b>Alarm evaluated</b>	Only if Setpoint <b>ES Temperature Protection</b> = Enabled or Protection Force Block 1/2/3 and the state of LBI <b>PROTECTION FORCE DISABLE BLOCK 1 / PROTECTION FORCE DISABLE BLOCK 2 / PROTECTION FORCE DISABLE BLOCK 3</b>



	is inactive
<b>Related applications</b>	MINT
<b>Alarm ID</b>	3782
<b>Description</b>	This alarm is activated when the value <b>ES Temperature</b> is below the setting of setpoint <b>ES &lt;&lt; Temperature</b> after elapsed time from the setpoint <b>ES &lt;&gt; Temperature Delay</b> .

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### **Sd ES >> Temperature**

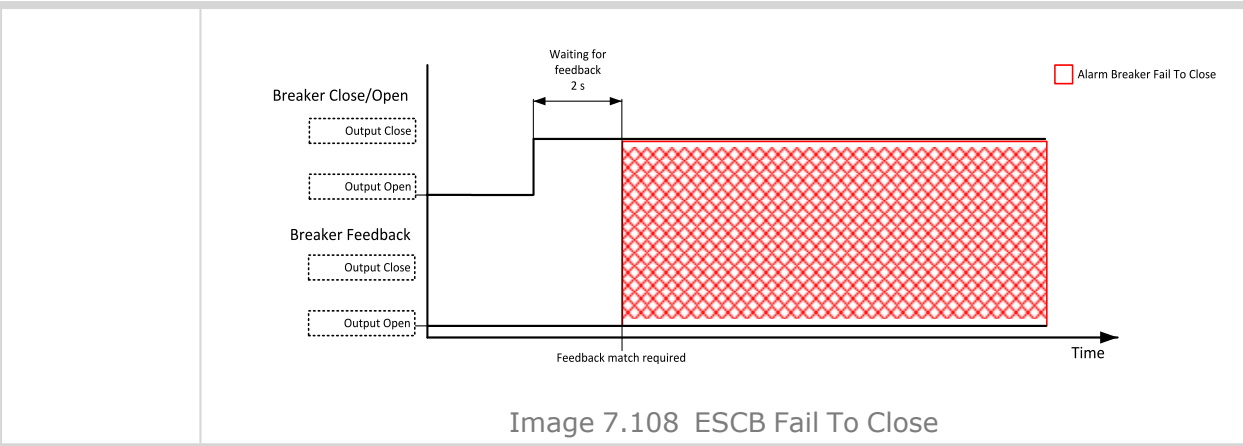
<b>Alarm Type</b>	Shutdowns
<b>Alarmlist message</b>	Sd ES >> Temperature
<b>Alarm evaluated</b>	Only if Setpoint <b>ES Temperature Protection</b> = Enabled or Protection Force Block 1/2/3 and the state of LBI <b>PROTECTION FORCE DISABLE BLOCK 1 / PROTECTION FORCE DISABLE BLOCK 2 / PROTECTION FORCE DISABLE BLOCK 3</b> is inactive
<b>Related applications</b>	MINT
<b>Alarm ID</b>	3784
<b>Description</b>	This alarm is activated when the value <b>ES Temperature</b> exceeds the setting of setpoint <b>ES &gt;&gt; Temperature</b> after elapsed time from the setpoint <b>ES &lt;&gt; Temperature Delay</b> .

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### **Sd ESCB Fail To Close**

<b>Alarm Type</b>	ShutdownHistory Record Only
<b>Alarmlist message</b>	Sd ESCB Fail To Close
<b>Alarm evaluated</b>	Only if <b>ESCB Type</b> is not Fuse/Disc.
<b>Related applications</b>	MINT
<b>Alarm ID</b>	1646
<b>Description</b>	<p>This alarm is activated when there is a problem with circuit breaker position while closing.</p> <p>➤ LBO <b>ESCB CLOSE/OPEN</b> closed but LBI <b>ESCB FEEDBACK</b> did not closed in <b>Waiting For Breaker Feedback</b> seconds.</p>





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### Sd ESCB Fail To Open

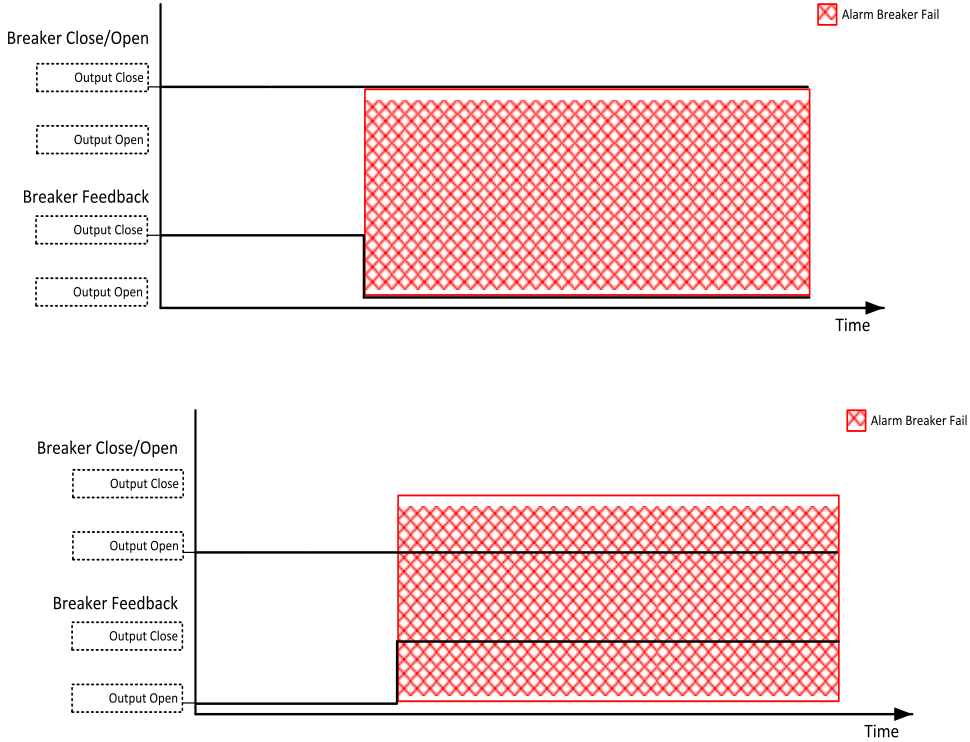
Alarm Type	ShutdownHistory Record Only
Alarmlist message	Sd ESCB Fail To Open
Alarm evaluated	Only if <b>ESCB Type</b> is not Fuse/Disc.
Related applications	MINT
Alarm ID	1645
Description	<p>This alarm is activated when there is a problem with circuit breaker position while opening.</p> <p>➤ LBO <b>ESCB CLOSE/OPEN</b> opened but LBI <b>ESCB FEEDBACK</b> did not opened in 2 seconds.</p> <p style="text-align: center;">Image 7.109 ESCB Fail To Open</p>

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### Sd ESCB Fail

Alarm Type	ShutdownHistory Record Only
Alarmlist message	Sd ESCB Fail
Alarm	Only if <b>ESCB Type</b> is not Fuse/Disc.



evaluated	
Related applications	MINT
Alarm ID	1644
Description	<p>This alarm is activated when there is a problem with position of the circuit breaker.</p> <ul style="list-style-type: none"> <li>&gt; LBI <b>ESCB FEEDBACK</b> does not match expected position given by LBO <b>ESCB CLOSE/OPEN</b>.</li> <li>&gt; There is a mismatch between LBI <b>ESCB FEEDBACK</b> and <b>ESCB FEEDBACK NEGATIVE</b>.</li> </ul>  <p style="text-align: center;">Image 7.110 ESCB Fail</p>

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### Sd ESCB Not Closed

Alarm Type	ShutdownHistory Record Only
Alarmlist message	Sd ESCB Not Closed
Alarm evaluated	Only if <b>ESCB Type</b> is not Breaker
Related applications	MINT
Alarm ID	2229
Description	If Setpoint <b>ESCB Type</b> = Fuse/Disc you need configure LBI <b>ESCB FEEDBACK</b> = 1 otherwise alarm Sd ESCB Not Closed is active.

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### Sd ES >>V

Alarm Type	StpSd
Alarmlist message	StpSd ES >>V
Alarm evaluated	LBI ESCB Feedback = 1 and LBO ES Run Request = 1
Related applications	MINT
Alarm ID	1658
Description	<p>This alarm is activated by <b>ES &gt;&gt;V</b>. The evaluation of this protection starts to be evaluated once the PCS is started.</p> <p><b>Note:</b> This alarm has FPS - Fixed Protections States 5</p>

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### Sd ES <<V

Alarm Type	StpSd
Alarmlist message	StpSd ES <<V
Alarm evaluated	LBI ESCB Feedback = 1 and LBO ES Run Request = 1
Related applications	MINT
Alarm ID	1660
Description	<p>This alarm is activated by <b>ES &lt;&lt;V</b>. The evaluation of this protection starts to be evaluated once the PCS is started.</p> <p><b>Note:</b> This alarm has FPS - Fixed Protections States 5</p>

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### Wrn Fence 1 Alarm

Alarm Type	Warning / Shutdown
Alarmlist message	Fence 1 Alarm
Alarm evaluated	Only if <b>Geo-Fencing</b> != Disabled
Related applications	MINT
Alarm ID	811
Description	<p>This alarm evaluates the GPS position of BESS.</p> <p><b>Note:</b> This alarm has FPS - Fixed Protections States 5</p>

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### Fence 2 Alarm

Alarm Type	Warning / Shutdown
Alarmlist message	Sd Fence 2 Alarm
Alarm evaluated	Only if <b>Geo-Fencing</b> != Disabled
Related applications	MINT
Alarm ID	813
Description	<p>This alarm evaluates the GPS position of BESS.</p> <p><b>Note:</b> This alarm has FPS - Fixed Protections States 5</p>



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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
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
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
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
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
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
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 >V L1-N

Alarm Type	Protection typesHistory Record Only ShutdownProtection types Warning
Alarmlist message	Sd BESS >V L1-N
Alarm evaluated	Only if BESS >V ProtectionBESS <>V Protection (page 1) != Disabled
Related applications	MINT
Alarm ID	98
Description	This alarm is activated by BESS >V ProtectionBESS <>V Protection (page 1). This alarm has FPS - FIXED PROTECTIONS STATES 2.

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### Sd BESS >V L2-N

Alarm Type	Protection typesHistory Record Only ShutdownProtection types Warning
Alarmlist message	Sd BESS >V L2-N
Alarm evaluated	Only if BESS >V ProtectionBESS <>V Protection (page 1) != Disabled
Related applications	MINT
Alarm ID	99
Description	This alarm is activated by BESS >V ProtectionBESS <>V Protection (page 1). This alarm has FPS - FIXED PROTECTIONS STATES 2.

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## Sd BESS >V L3-N

Alarm Type	Protection typesHistory Record Only ShutdownProtection types Warning
Alarmlist message	Sd BESS >V L3-N
Alarm evaluated	Only if BESS >V ProtectionBESS <>V Protection (page 1)!= Disabled
Related applications	MINT
Alarm ID	100
Description	This alarm is activated by BESS >V ProtectionBESS <>V Protection (page 1). This alarm has FPS - FIXED PROTECTIONS STATES 2.

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## SdBESS >V L1-L2

Alarm Type	Protection typesHistory Record Only ShutdownProtection types Warning
Alarmlist message	Sd BESS >V L1-L2
Alarm evaluated	Only if BESS >V ProtectionBESS <>V Protection (page 1)!= Disabled
Related applications	MINT
Alarm ID	107
Description	This alarm is activated by BESS >V ProtectionBESS <>V Protection (page 1). This alarm has FPS - FIXED PROTECTIONS STATES 2.

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## Sd BESS >V L2-L3

Alarm Type	Protection typesHistory Record Only ShutdownProtection types Warning
Alarmlist message	Sd BESS >V L2-L3
Alarm evaluated	Only if BESS >V ProtectionBESS <>V Protection (page 1)!= Disabled
Related applications	MINT
Alarm ID	108
Description	This alarm is activated by BESS >V ProtectionBESS <>V Protection (page 1). This alarm has FPS - FIXED PROTECTIONS STATES 2.

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## Sd BESS >V L3-L1

Alarm Type	Protection typesHistory Record Only ShutdownProtection types Warning
Alarmlist message	Sd BESS >V L3-L1
Alarm evaluated	Only if BESS >V ProtectionBESS <>V Protection (page 1)!= Disabled
Related applications	MINT
Alarm ID	109
Description	This alarm is activated by BESS >V ProtectionBESS <>V Protection (page 1).



	This alarm has FPS - FIXED PROTECTIONS STATES 2.
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### Sd BESS <V L1-N

Alarm Type	Protection typesHistory Record Only ShutdownProtection types Warning
Alarmlist message	Sd BESS <V L1-N
Alarm evaluated	Only if BESS >V ProtectionBESS <>V Protection (page 1)!= Disabled
Related applications	MINT
Alarm ID	95
Description	This alarm is activated by BESS >V ProtectionBESS <>V Protection (page 1). This alarm has FPS - FIXED PROTECTIONS STATES 2.

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### Sd BESS <V L2-N

Alarm Type	Protection typesHistory Record Only ShutdownProtection types Warning
Alarmlist message	Sd BESS <V L2-N
Alarm evaluated	Only if BESS >V ProtectionBESS <>V Protection (page 1)!= Disabled
Related applications	MINT
Alarm ID	96
Description	This alarm is activated by BESS >V ProtectionBESS <>V Protection (page 1). This alarm has FPS - FIXED PROTECTIONS STATES 2.

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### Sd BESS <V L3-N

Alarm Type	Protection typesHistory Record Only ShutdownProtection types Warning
Alarmlist message	Sd BESS <V L3-N
Alarm evaluated	Only if BESS >V ProtectionBESS <>V Protection (page 1)!= Disabled
Related applications	MINT
Alarm ID	97
Description	This alarm is activated by BESS <<V ProtectionBESS <>V Protection (page 1). This alarm has FPS - FIXED PROTECTIONS STATES 2.

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### Sd BESSMains <V L1-L2

Alarm Type	Protection typesHistory Record Only ShutdownProtection types Warning
Alarmlist message	Sd BESS <V L1-L2
Alarm evaluated	Only if BESS >V ProtectionBESS <>V Protection (page 1)!= Disabled
Related applications	MINT



Alarm ID	104
Description	This alarm is activated by BESS <<V ProtectionBESS <>V Protection (page 1). This alarm has FPS - FIXED PROTECTIONS STATES 2.

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### Sd BESSMains <V L2-L3

Alarm Type	Protection typesHistory Record Only ShutdownProtection types Warning
Alarmlist message	Sd BESS <V L2-L3
Alarm evaluated	Only if BESS >V ProtectionBESS <>V Protection (page 1)!= Disabled
Related applications	MINT
Alarm ID	105
Description	This alarm is activated by BESS <<V ProtectionBESS <>V Protection (page 1). This alarm has FPS - FIXED PROTECTIONS STATES 2.

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### Sd BESSMains <V L3-L1

Alarm Type	Protection typesHistory Record Only ShutdownProtection types Warning
Alarmlist message	Sd BESS <V L3-L1
Alarm evaluated	Only if BESS >V ProtectionBESS <>V Protection (page 1)!= Disabled
Related applications	MINT
Alarm ID	106
Description	This alarm is activated by BESS <<V ProtectionBESS <>V Protection (page 1). This alarm has FPS - FIXED PROTECTIONS STATES 2.

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### Sd BESS >f

Alarm Type	Protection typesHistory Record Only ShutdownProtection types Warning
Alarmlist message	Sd BESS >f
Alarm evaluated	Only if BESS >f ProtectionBESS <>f Protection (page 1) != Disabled
Related applications	MINT
Alarm ID	121
Description	This alarm is activated by BESS >f ProtectionBESS <>f Protection (page 1). This alarm has FPS - FIXED PROTECTIONS STATES 2.

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### Sd BESS <f

Alarm Type	Protection typesHistory Record Only ShutdownProtection types Warning
Alarmlist message	Sd BESS <f



Alarm evaluated	Only if BESS >f ProtectionBESS <>f Protection (page 1) != Disabled
Related applications	MINT
Alarm ID	120
Description	This alarm is activated by BESS <f ProtectionBESS <>f Protection (page 1). This alarm has FPS - FIXED PROTECTIONS STATES 2.

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### Sd BESS Voltage Unbalance Ph-N

Alarm Type	Protection typesHistory Record Only ShutdownProtection types
Alarmlist message	Sd BESS V Unbalance Ph-N
Alarm evaluated	Only if BESS >V ProtectionBESS <>V Protection (page 1) != Disabled
Related applications	MINT
Alarm ID	589
Description	This alarm is activated by BESS V Unbalance Protection. This alarm has FPS - FIXED PROTECTIONS STATES 2.

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### Sd BESS V Unbalance Ph-Ph

Alarm Type	Protection typesHistory Record Only ShutdownProtection types
Alarmlist message	Sd BESSMains V Unbalance Ph-Ph
Alarm evaluated	Only if BESS >V ProtectionBESS <>V Protection (page 1) != Disabled
Related applications	MINT
Alarm ID	588
Description	This alarm is activated by BESS V Unbalance Protection. This alarm has FPS - FIXED PROTECTIONS STATES 2.

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### Sd BESS Current Unbalance

Alarm Type	Protection types Shutdown Protection types
Alarmlist message	Sd BESS Current Unbalance
Alarm evaluated	Only if BESS Current Unbalance Protection != Disabled
Related applications	MINT
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 PCS Overload Protection

Alarm Type	Shutdown
Alarmlist message	Sd IDMT PCS Overload Protection



<b>Alarm evaluated</b>	All the Time
<b>Related applications</b>	MINT
<b>Alarm ID</b>	2237
<b>Description</b>	This alarm is activated by Setpoint <b>PCS IDMT &gt;A Protection</b>

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### Sd IDMT Earth Fault Current

<b>Alarm Type</b>	<b>ShutdownProtection types</b>
<b>Alarmlist message</b>	Sd IDMT Earth Fault Current
<b>Alarm evaluated</b>	Only if <b>Earth Fault Current Protection != Disabled</b>
<b>Related applications</b>	MINT
<b>Alarm ID</b>	598
<b>Description</b>	This alarm is activated by <b>Earth Fault Current Protection</b> . This alarm has FPS - <b>FIXED PROTECTIONS STATES 2</b> .

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### Sd IDMT BESS >A

<b>Alarm Type</b>	<b>Protection types ShutdownProtection types</b>
<b>Alarmlist message</b>	Sd IDMT BESS >A
<b>Alarm evaluated</b>	While BESS is loaded, if <b>BESS IDMT &gt;A Protection != Disabled</b>
<b>Related applications</b>	MINT
<b>Alarm ID</b>	597
<b>Description</b>	This alarm is activated by <b>BESS IDMT &gt;A Protection</b> . This alarm has FPS - <b>FIXED PROTECTIONS STATES 2</b> .

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### Sd IDMT Overload

<b>Alarm Type</b>	<b>Protection typesProtection types ShutdownProtection types Protection types</b>
<b>Alarmlist message</b>	SdSd IDMT Overload
<b>Alarm evaluated</b>	While Gen-set is excited, Only if <b>BESS IDMT Overload Protection != Disabled</b>
<b>Related applications</b>	MINT
<b>Alarm ID</b>	147
<b>Description</b>	This alarm is activated by <b>BESS IDMT Overload Protection</b> . This alarm has FPS - <b>FIXED PROTECTIONS STATES 2</b> .

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### Sd NCB Fail

<b>Alarm Type</b>	<b>Shutdown</b>
<b>Alarmlist message</b>	Sd NCB Fail
<b>Alarm evaluated</b>	While Gen-set is excited, Only if <b>NCB FEEDBACK</b> is configured



<b>Related applications</b>	MINT
<b>Alarm ID</b>	148
<b>Description</b>	<p>This alarm is activated when LBI <b>NCB FEEDBACK</b> does not match expected position given by LBO <b>NCB CLOSE/OPEN</b>.</p> <p>This alarm has FPS - <b>FIXED PROTECTIONS STATES 3</b><b>FIXED PROTECTIONS STATES 1</b>.</p>

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### Sd PCS IDMT >A

<b>Alarm Type</b>	Shutdown
<b>Alarmlist message</b>	Sd PCS IDMT >A
<b>Alarm evaluated</b>	All the time
<b>Related applications</b>	MINT
<b>Alarm ID</b>	2236
<b>Description</b>	<p>This alarm is activated by Setpoint <b>BESS IDMT &gt;A Protection</b>.</p> <p>This alarm has FPS - <b>Fixed Protections States 1</b></p>

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### Sd PCS >>V

<b>Alarm Type</b>	Sd
<b>Alarmlist message</b>	Sd PCS >>V
<b>Alarm evaluated</b>	
<b>Related applications</b>	MINT
<b>Alarm ID</b>	2232
<b>Description</b>	<p>This alarm is activated by <b>PCS &gt;&gt;V</b>. The evaluation of this protection starts to be evaluated once the PCS is started.</p> <p><b>Note:</b> This alarm has FPS - <b>Fixed Protections States 5</b></p>

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### Sd PCS Short Circuit

<b>Alarm Type</b>	Sd
<b>Alarmlist message</b>	Sd PCS Short Circuit
<b>Alarm evaluated</b>	
<b>Related applications</b>	MINT
<b>Alarm ID</b>	2235
<b>Description</b>	<p>This alarm is activated by Setpoint <b>PCS Short Circuit Delay</b>.</p> <p>This alarm has <b>Fixed Protections States 1</b></p>

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### Sd PCS <<V

Alarm Type	Sd
Alarmlist message	Sd PCS<<V
Alarm evaluated	
Related applications	MINT
Alarm ID	2234
Description	<p>This alarm is activated by <b>ES &lt;&lt;V</b>. The evaluation of this protection starts to be evaluated once the PCS is started.</p> <p><b>Note:</b> This alarm has FPS - Fixed Protections States 5</p>

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### Sd Short Circuit

Alarm Type	Protection typesShutdownProtection types
Alarmlist message	Sd Short Circuit
Alarm evaluated	Only if <b>Short Circuit Protection != Disabled</b>
Related applications	MINT
Alarm ID	595
Description	<p>This alarm is activated by <b>Short Circuit Protection</b>.</p> <p>This alarm has FPS - <b>FIXED PROTECTIONS STATES 2</b>.</p>

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### Sd SOC Critical High

Alarm Type	Shutdown
Alarmlist message	Sd SOC Critical High
Alarm evaluated	All the time
Related applications	MINT
Alarm ID	1597
Description	<p>This alarm is activated by <b>ES &gt;&gt;SOC Protection</b>.</p> <p>This alarm has FPS - <b>FIXED PROTECTIONS STATES 3</b>.</p>

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### Sd SOC Critical Low

Alarm Type	Shutdown
Alarmlist message	Sd SOC Critical Low
Alarm evaluated	All the time
Related applications	MINT
Alarm ID	1596
Description	<p>This alarm is activated by <b>ES &lt;&lt;SOC Protection</b>.</p> <p>This alarm has FPS - <b>FIXED PROTECTIONS STATES 3</b>.</p>

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## Start Fail

Alarm Type	Shutdown
Alarmlist message	Start Fail
Alarm evaluated	During starting of BESS
Related applications	MINT
Alarm ID	55
Description	This alarm is activated after attempt to start BESS failed. The following group of setpoints are taken into account as timers that elapse activate the alarm: <b>Precharging TO</b> ; <b>ES Ready To Load TO</b> ; <b>PCS Ready To Start TO</b> ; <b>PCS Ready To Load TO</b>

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## SD Wrong BESS Meas Config

Alarm Type	Shutdown
Alarmlist message	Sd Wrong BESS Meas Config
Alarm evaluated	Before the start of the application
Related applications	MINT
Alarm ID	2836
Description	This alarm will be issued if the mandatory LAIs in table from chapter <b>BESS AC values measured over LAIs</b> are not configured.

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## SD Wrong BUS Meas Config

Alarm Type	Shutdown
Alarmlist message	Sd Wrong BUS Meas Config
Alarm evaluated	Before the start of the application
Related applications	MINT
Alarm ID	2835
Description	This alarm will be issued if the mandatory LAIs in table from chapter <b>BUS AC values measured over LAIs</b> are not configured. Another condition to activating this alarm is if the setpoint <b>Starting Sequence BCB Control</b> = Starting BCB Opened and the <b>BCB Type</b> is set to FUSE/Disc.

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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	3673
Description	This alarm will be issued based on certain conditions. The conditions that activate the alarm are as follows:



	<p>&gt;</p> <p>if setpoints and their settings set to <b>Starting Sequence BCB Control</b> = Start with BCB Opened and <b>BCB Type</b>= Fuse/Disc</p> <p>If the BCB is not physically installed, this combination is excluded.</p>
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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	3619
Description	<p>This alarm will be issued based on certain conditions. The conditions that activate the alarm are as follows:</p> <p>if setpoints and their settings set to <b>Precharge Sequence</b>= Internal and <b>ESCB type</b> = Fuse/Disc</p>

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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	3689
Description	<p>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 <a href="#">BESS Output Control Mode U-f/P-Q</a>). 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.</p> <p>This alarm will be issued based on certain conditions. The conditions that activate the alarm are as follows:</p> <ul style="list-style-type: none"> <li>&gt; Setpoint <b>Starting Sequence BCB Control</b> = Start with Opened BCB and LBI <b>PCS Output Control Mode u-f/P-Q</b> is activated. Having this setup before the start will not allow to start the BESS.</li> <li>&gt; Setpoint <b>Starting Sequence BCB Control</b> = Start with Opened BCB and LBI <b>PCS Output Control Mode u-f/P-Q</b> is activated when the BESS is starting. This setup already during starting will make the BESS to stop due activation of the alarm after the BESS reaches Energized state.</li> </ul>

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### SD Unexpected PCS State

Alarm Type	Shutdown
Alarmlist message	SD Unexpected PCS State
Alarm evaluated	once LBI PCS Ready To Load = 1 and BESS has started
Related applications	MINT
Alarm ID	3495
Description	This alarm is indicating that the PCS status about being capable of being loaded has deactivated. The condition that activates the alarm is as follows: if the controller is starting or already started and the LBI <b>PCS READY To LOAD</b> is deactivated.

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### SD Unexpected Source State

Alarm Type	Shutdown
Alarmlist message	SD Unexpected Source State
Alarm evaluated	once LBI ES Ready To Load = 1 and BESS has started
Related applications	MINT
Alarm ID	2816
Description	This alarm is indicating that the Energy Storage status about being capable of being loaded has deactivated. The condition that activates the alarm is as follows: if the controller is starting or already started and the LBI <b>PCS READY To LOADS READY To LOAD</b> is deactivated.

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### SD AC Meas Sensing Fail

Alarm Type	Shutdown
Alarmlist message	SD AC Meas Sensing Fail
Alarm evaluated	BESS AC values read over Modbus to LAIs are configured
Related applications	MINT
Alarm ID	2837
Description	This alarm will be issued if the BESS AC values read over Modbus to LAIs are receiving invalid data longer than set by setpoint <b>AC Meas Sensing Fail To</b> .

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### SD AC BUS Meas Sensing Fail

Alarm Type	Shutdown
Alarmlist message	SD AC BUS Meas Sensing Fail
Alarm evaluated	BESS AC values read over Modbus to LAIs are configured
Related applications	MINT
Alarm ID	2950
Description	This alarm will be issued if the BUS AC values read over Modbus to LAIs are



	receiving invalid data longer than set by setpoint <b>AC Meas Sensing Fail To.</b>
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### SD String 1 Not Ready

Alarm Type	Shutdown
Alarmlist message	Sd String 1 Not Ready
Alarm evaluated	Only if setpoint Multi BMS = Enabled
Related applications	MINT
Alarm ID	3644
Description	The protection evaluates when the LBI <b>STRING HEALTHY 1</b> is configured but is not active thus providing information that there is an issue with the battery string (BMS).

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### SD String 2 Not Ready

Alarm Type	Shutdown
Alarmlist message	Sd String 2 Not Ready
Alarm evaluated	Only if setpoint Multi BMS = Enabled
Related applications	MINT
Alarm ID	3645
Description	The protection evaluates when the LBI <b>STRING HEALTHY 2</b> is configured but is not active thus providing information that there is an issue with the battery string (BMS).

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### SD String 3 Not Ready

Alarm Type	Shutdown
Alarmlist message	Sd String 3 Not Ready
Alarm evaluated	Only if setpoint Multi BMS = Enabled
Related applications	MINT
Alarm ID	3646
Description	The protection evaluates when the LBI <b>STRING HEALTHY 3</b> is configured but is not active thus providing information that there is an issue with the battery string (BMS).

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### SD String 4 Not Ready

Alarm Type	Shutdown
Alarmlist message	Sd String 4 Not Ready
Alarm evaluated	Only if setpoint Multi BMS = Enabled
Related applications	MINT
Alarm ID	3647



<b>Description</b>	The protection evaluates when the LBI <b>STRING HEALTHY 4</b> is configured but is not active thus providing information that there is an issue with the battery string (BMS).
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### SD String 5 Not Ready

<b>Alarm Type</b>	<b>Shutdown</b>
<b>Alarmlist message</b>	Sd String 5 Not Ready
<b>Alarm evaluated</b>	Only if setpoint Multi BMS = Enabled
<b>Related applications</b>	MINT
<b>Alarm ID</b>	3648
<b>Description</b>	The protection evaluates when the LBI <b>STRING HEALTHY 5</b> is configured but is not active thus providing information that there is an issue with the battery string (BMS).

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### SD String 6 Not Ready

<b>Alarm Type</b>	<b>Shutdown</b>
<b>Alarmlist message</b>	Sd String 6 Not Ready
<b>Alarm evaluated</b>	Only if setpoint Multi BMS = Enabled
<b>Related applications</b>	MINT
<b>Alarm ID</b>	3649
<b>Description</b>	The protection evaluates when the LBI <b>STRING HEALTHY 6</b> is configured but is not active thus providing information that there is an issue with the battery string (BMS).

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### SD String 7 Not Ready

<b>Alarm Type</b>	<b>Shutdown</b>
<b>Alarmlist message</b>	Sd String 7 Not Ready
<b>Alarm evaluated</b>	Only if setpoint Multi BMS = Enabled
<b>Related applications</b>	MINT
<b>Alarm ID</b>	3650
<b>Description</b>	The protection evaluates when the LBI <b>STRING HEALTHY 7</b> is configured but is not active thus providing information that there is an issue with the battery string (BMS).

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### SD String 8 Not Ready

<b>Alarm Type</b>	<b>Shutdown</b>
<b>Alarmlist message</b>	Sd String 8 Not Ready
<b>Alarm evaluated</b>	Only if setpoint Multi BMS = Enabled



<b>Related applications</b>	MINT
<b>Alarm ID</b>	3651
<b>Description</b>	The protection evaluates when the LBI <b>STRING HEALTHY 8</b> is configured but is not active thus providing information that there is an issue with the battery string (BMS).

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### SD SBMB 1 Fail

<b>Alarm Type</b>	Shutdown
<b>Alarmlist message</b>	Sd SBMB 1 Fail
<b>Alarm evaluated</b>	Only if setpoint Multi BMS = Enabled
<b>Related applications</b>	MINT
<b>Alarm ID</b>	3626
<b>Description</b>	<p>If the LBI <b>SBMB FEEDBACK 1</b> does not respond to a change of the control output LBO <b>SBMB CLOSE/OPEN 1</b> within time adjusted in setpoint <b>SBMB Breaker Feedback TO</b>, the shutdown alarm is issued during open/close sequence.</p> <p>The shutdown alarm also activates immediately if the LBI <b>SBMB FEEDBACK 1</b> are different compared to LBO <b>SBMB CLOSE/OPEN 1</b> when the controller is not in opening/closing sequence.</p>

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### SD SBMB 2 Fail

<b>Alarm Type</b>	Shutdown
<b>Alarmlist message</b>	Sd SBMB 2 Fail
<b>Alarm evaluated</b>	Only if setpoint Multi BMS = Enabled
<b>Related applications</b>	MINT
<b>Alarm ID</b>	3627
<b>Description</b>	<p>If the LBI <b>SBMB FEEDBACK 2</b> does not respond to a change of the control output LBO <b>SBMB CLOSE/OPEN 2</b> within time adjusted in setpoint <b>SBMB Breaker Feedback TO</b>, the shutdown alarm is issued during open/close sequence.</p> <p>The shutdown alarm also activates immediately if the LBI <b>SBMB FEEDBACK 2</b> are different compared to LBO <b>SBMB CLOSE/OPEN 2</b> when the controller is not in opening/closing sequence.</p>

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### SD SBMB 3 Fail

<b>Alarm Type</b>	Shutdown
<b>Alarmlist message</b>	Sd SBMB 3 Fail
<b>Alarm evaluated</b>	Only if setpoint Multi BMS = Enabled
<b>Related applications</b>	MINT



<b>Alarm ID</b>	3628
<b>Description</b>	<p>If the LBI <b>SBMB FEEDBACK 3</b> does not respond to a change of the control output LBO <b>SBMB CLOSE/OPEN 3</b> within time adjusted in setpoint <b>SBMB Breaker Feedback TO</b>, the shutdown alarm is issued during open/close sequence.</p> <p>The shutdown alarm also activates immediately if the LBI <b>SBMB FEEDBACK 3</b> are different compared to LBO <b>SBMB CLOSE/OPEN 3</b> when the controller is not in opening/closing sequence.</p>

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#### SD SBMB 4 Fail

<b>Alarm Type</b>	Shutdown
<b>Alarmlist message</b>	Sd SBMB 4 Fail
<b>Alarm evaluated</b>	Only if setpoint Multi BMS = Enabled
<b>Related applications</b>	MINT
<b>Alarm ID</b>	3629
<b>Description</b>	<p>If the LBI <b>SBMB FEEDBACK 4</b> does not respond to a change of the control output LBO <b>SBMB CLOSE/OPEN 4</b> within time adjusted in setpoint <b>SBMB Breaker Feedback TO</b>, the shutdown alarm is issued during open/close sequence.</p> <p>The shutdown alarm also activates immediately if the LBI <b>SBMB FEEDBACK 4</b> are different compared to LBO <b>SBMB CLOSE/OPEN 4</b> when the controller is not in opening/closing sequence.</p>

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#### SD SBMB 5 Fail

<b>Alarm Type</b>	Shutdown
<b>Alarmlist message</b>	Sd SBMB 5 Fail
<b>Alarm evaluated</b>	Only if setpoint Multi BMS = Enabled
<b>Related applications</b>	MINT
<b>Alarm ID</b>	3630
<b>Description</b>	<p>If the LBI <b>SBMB FEEDBACK 5</b> does not respond to a change of the control output LBO <b>SBMB CLOSE/OPEN 5</b> within time adjusted in setpoint <b>SBMB Breaker Feedback TO</b>, the shutdown alarm is issued during open/close sequence.</p> <p>The shutdown alarm also activates immediately if the LBI <b>SBMB FEEDBACK 5</b> are different compared to LBO <b>SBMB CLOSE/OPEN 5</b> when the controller is not in opening/closing sequence.</p>

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#### SD SBMB 6 Fail

<b>Alarm Type</b>	Shutdown
<b>Alarmlist message</b>	Sd SBMB 6 Fail



<b>Alarm evaluated</b>	Only if setpoint Multi BMS = Enabled
<b>Related applications</b>	MINT
<b>Alarm ID</b>	3631
<b>Description</b>	<p>If the LBI <b>SBMB FEEDBACK 6</b> does not respond to a change of the control output LBO <b>SBMB CLOSE/OPEN 6</b> within time adjusted in setpoint <b>SBMB Breaker Feedback TO</b>, the shutdown alarm is issued during open/close sequence.</p> <p>The shutdown alarm also activates immediately if the LBI <b>SBMB FEEDBACK 6</b> are different compared to LBO <b>SBMB CLOSE/OPEN 6</b> when the controller is not in opening/closing sequence.</p>

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### SD SBMB 7 Fail

<b>Alarm Type</b>	<b>Shutdown</b>
<b>Alarmlist message</b>	Sd SBMB 7 Fail
<b>Alarm evaluated</b>	Only if setpoint Multi BMS = Enabled
<b>Related applications</b>	MINT
<b>Alarm ID</b>	3632
<b>Description</b>	<p>If the LBI <b>SBMB FEEDBACK 7</b> does not respond to a change of the control output LBO <b>SBMB CLOSE/OPEN 7</b> within time adjusted in setpoint <b>SBMB Breaker Feedback TO</b>, the shutdown alarm is issued during open/close sequence.</p> <p>The shutdown alarm also activates immediately if the LBI <b>SBMB FEEDBACK 7</b> are different compared to LBO <b>SBMB CLOSE/OPEN 7</b> when the controller is not in opening/closing sequence.</p>

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### SD SBMB 8 Fail

<b>Alarm Type</b>	<b>Shutdown</b>
<b>Alarmlist message</b>	Sd SBMB 8 Fail
<b>Alarm evaluated</b>	Only if setpoint Multi BMS = Enabled
<b>Related applications</b>	MINT
<b>Alarm ID</b>	3633
<b>Description</b>	<p>If the LBI <b>SBMB FEEDBACK 8</b> does not respond to a change of the control output LBO <b>SBMB CLOSE/OPEN 8</b> within time adjusted in setpoint <b>SBMB Breaker Feedback TO</b>, the shutdown alarm is issued during open/close sequence.</p> <p>The shutdown alarm also activates immediately if the LBI <b>SBMB FEEDBACK 8</b> are different compared to LBO <b>SBMB CLOSE/OPEN 8</b> when the controller is not in opening/closing sequence.</p>

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## SD MultiBMS Incorrect Configuration

<b>Alarm Type</b>	Shutdown
<b>Alarmlist message</b>	SD MultiBMS Incorrect Configuration
<b>Alarm evaluated</b>	Only if setpoint Multi BMS = Enabled
<b>Related applications</b>	MINT
<b>Alarm ID</b>	3652
<b>Description</b>	<p>Protection indicating that the necessary configuration has not been added. If none of the LAI <b>STRING VOLTAGE 1... STRING VOLTAGE 8</b> or LBI <b>STRING HEALTHY 1... STRING HEALTHY 8</b> or <b>SBMB FEEDBACK 1...SBMB FEEDBACK 8</b> are configured no action will occur and system will function without it. If only LAI <b>STRING VOLTAGE 1</b> is configured but the rest from the BMS is missing a protection will appear SD MultiBMS incorrect configuration.</p> <p>This alarm will also appear if the user has sw key for controlling only 4 BMS and the user tries to configure 5 or more BMS into the configuration.</p> <p>The protection itself only evaluates if a group of necessary functions are configured to a corresponding given number. There is no distinguishment if the user chooses to control two BMS and the choice of configuration are with indication 1 and 8.</p>

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## SD ICC Units Missing

<b>Alarm Type</b>	Shutdowns
<b>Alarmlist message</b>	Sd ICC Units Missing
<b>Alarm evaluated</b>	Only when <b>#Number Of Units On ICC Check</b> = Enabled
<b>Related applications</b>	MINT
<b>Alarm ID</b>	1624
<b>Description</b>	<p>This alarm is activated when actual number of unit on CAN2 is lower than value adjusted in setpoint <b>#Number Of Units On ICC</b> and <b>#Number Of Units On ICC Check</b> is Enabled and <b>#ICC Units Missing Protection</b> is adjusted to Shutdown or BOC.</p>

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## Slow Stop Offload System Protection

### Bus Meas Error

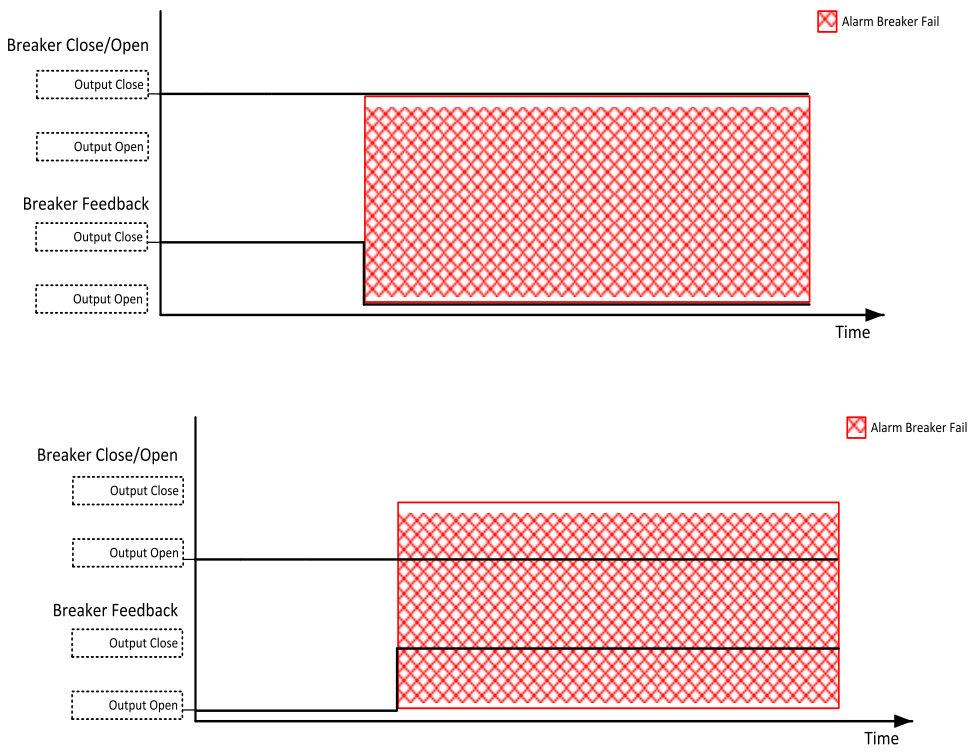
Alarm Type	Slow Stop /Warning Protection types
Alarmlist message	Bus Meas Error
Alarm evaluated	<b>Bus Meas Error</b> != Disabled
Related applications	MINT
Alarm ID	143
Description	<p>This protection is activated in case that voltage mismatch on Bus side is detected for longer than the setting set by setpoint <b>Bus Meas Error Delay</b>. The mismatch is detected according to the conditions below:</p> <ul style="list-style-type: none"> <li>➤ Own BCB was closed</li> <li>➤ <b>MCB FEEDBACK</b> was detected (physically or via CAN 2) → Breaker State = MultParOp, <b>MAINS/BUS HEALTHY</b>MAINS HEALTHY is active and <b>Controller Mode</b> = AUTO</li> <li>➤ Any other controller in <b>Control Group</b> closed BCB</li> </ul> <p><i><b>Note:</b> Alarm is activated after 20 s, but BCB closing is blocked immediately.</i></p> <ul style="list-style-type: none"> <li>➤ BTB connected another Control Group with MCB Feedback or controller with closed BCB</li> <li>➤ Own MCB and BCB (in case of BCB application) was closed and LBO <b>Mains/Bus Healthy</b>MAINS Healthy is active</li> <li>➤ Any other controller in <b>Control Group</b> closed BCB</li> <li>➤ BTB connected another Control Group with MCB Feedback or controller with closed BCB</li> <li>➤ Own BTB was closed and LBO <b>Mains/Bus Healthy</b>MAINS Healthy is active → mismatch detected on Bus Left</li> <li>➤ Own BTB was closed and LBO <b>BESS Healthy</b> is active → mismatch detected on Bus Right</li> <li>➤ Any other controller in Group Link L closed BCB → mismatch detected on Bus Left</li> <li>➤ Any other controller in Group Link R closed BCB → mismatch detected on Bus Right</li> <li>➤ BTB connected another Control Group with MCB Feedback or controller with closed BCB</li> </ul> <p>This alarm has FPS - <b>FIXED PROTECTIONS STATES 5</b>.</p>

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### Stp BCB Fail

Alarm Type	Slow Stop / Warning History Record Only
Alarmlist message	Stp BCB Fail



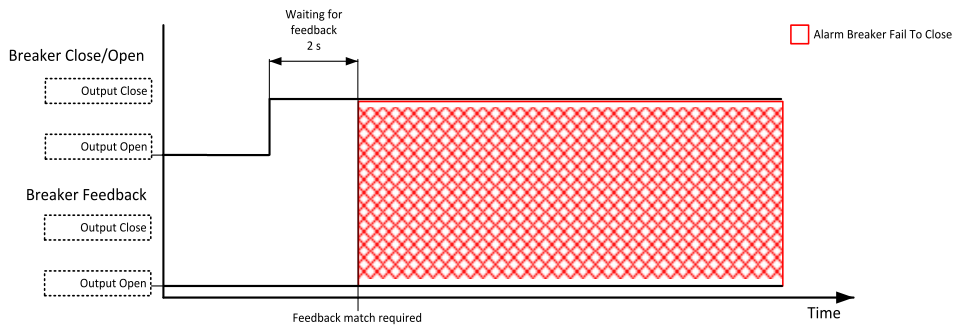
<b>Alarm evaluated</b>	Only if <b>BCB Control Mode</b> != External
<b>Related applications</b>	MINT
<b>Alarm ID</b>	91
<b>Description</b>	<p>This alarm is activated when there is a problem with position of the circuit breaker.</p> <ul style="list-style-type: none"> <li>&gt; LBI <b>BCB FEEDBACK</b> does not match expected position given by LBO <b>BCB CLOSE/OPEN</b>.</li> <li>&gt; There is a mismatch between LBI <b>BCB FEEDBACK</b> and <b>BCB FEEDBACK NEGATIVE</b>.</li> </ul>  <p style="text-align: center;">Image 7.111 BCB Fail</p> <p>This alarm has FPS - <b>FIXED PROTECTIONS STATES 3</b><b>FIXED PROTECTIONS STATES 1</b>.</p>

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### Sd BCB Fail To Close

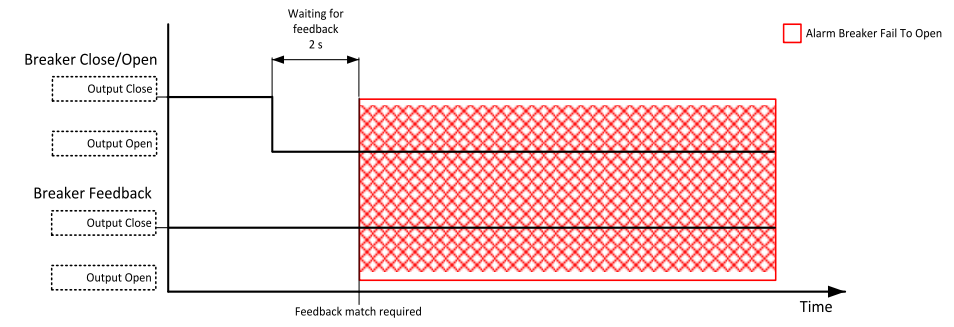
<b>Alarm Type</b>	Slow Stop Warning History Record Only
<b>Alarmlist message</b>	Sd BCB Fail To Close
<b>Alarm evaluated</b>	Only if <b>BCB Control Mode</b> != External
<b>Related applications</b>	MINT
<b>Alarm ID</b>	1555



<p><b>Description</b></p>	<p>This alarm is activated when there is a problem with circuit breaker position while closing.</p> <p>➤ LBO <b>BCB CLOSE/OPEN</b> closed but LBI <b>BCB FEEDBACK</b> did not closed during the time defined by Waiting For Breaker Feedback.</p>  <p>Image 7.112 BCB Fail To Close</p> <p>.This alarm has FPS-FIXED PROTECTIONS STATES 3</p>
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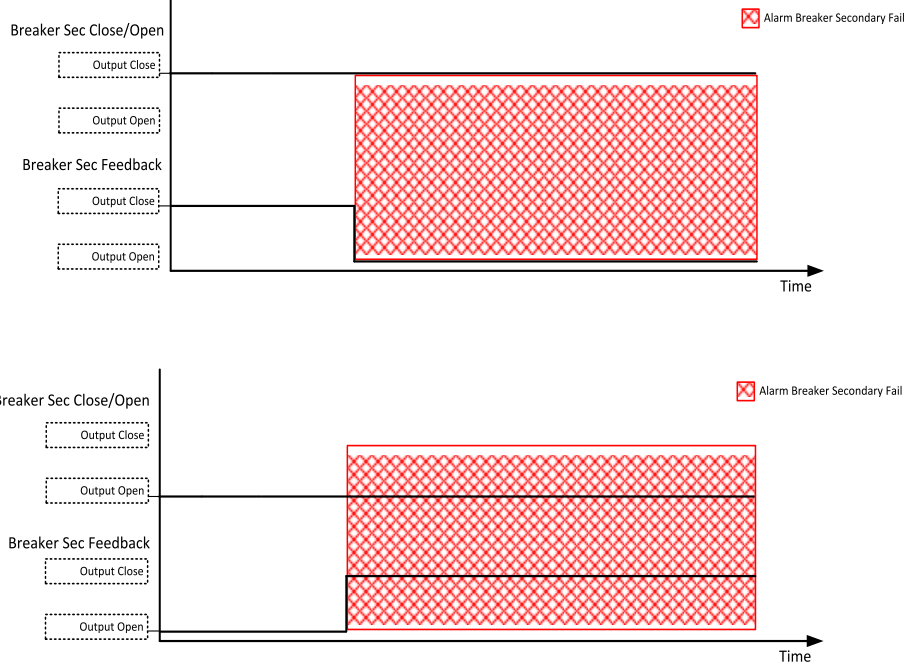
### Sd BCB Fail To Open

<p><b>Alarm Type</b></p>	<p>Slow StopWarning History Record Only</p>
<p><b>Alarmlist message</b></p>	<p>Sd BCB Fail To Open</p>
<p><b>Alarm evaluated</b></p>	<p>Only if <b>BCB Control Mode</b> != External</p>
<p><b>Related applications</b></p>	<p>MINT</p>
<p><b>Alarm ID</b></p>	<p>1554</p>
<p><b>Description</b></p>	<p>This alarm is activated when there is a problem with circuit breaker position while opening.</p> <p>➤ LBO <b>BCB CLOSE/OPEN</b> opened but LBI <b>BCB FEEDBACK</b> did not opened in 2 seconds.</p>  <p>Image 7.113 BCB Fail To Open</p> <p>.This alarm has FPS-FIXED PROTECTIONS STATES 3</p>

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## Stp BCB Secondary Fail

Alarm Type	Slow StopWarning History Record Only
Alarmlist message	Stp BCB Secondary Fail
Alarm evaluated	Only if LBI <b>BCB SECONDARY FEEDBACK</b> or LBI <b>BCB SECONDARY FEEDBACK NEGATIVE</b> or <b>BCB CLOSE/OPEN SECONDARY</b> is configured
Related applications	MINT
Alarm ID	451
Description	<p>This alarm is activated when there is a problem with position of the circuit breaker.</p> <ul style="list-style-type: none"> <li>&gt; LBI <b>BCB SECONDARY FEEDBACK</b> does not match expected position given by LBO <b>BCB CLOSE/OPEN SECONDARY</b>.</li> <li>&gt; There is a mismatch between LBI <b>BCB SECONDARY FEEDBACK</b> and <b>BCB SECONDARY FEEDBACK NEGATIVE</b>.</li> </ul>  <p style="text-align: center;">Image 7.114 BCB Secondary Fail</p> <p>This alarm has FPS - FIXED PROTECTIONS STATES 3FIXED PROTECTIONS STATES 1.</p>

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## Stp BCB Secondary Fail To Close

Alarm Type	Slow StopWarning History Record Only
Alarmlist message	Stp BCB Secondary Fail To Close
Alarm evaluated	Only if LBI <b>BCB SECONDARY FEEDBACK</b> or LBI <b>BCB SECONDARY FEEDBACK NEGATIVE</b> or <b>BCB CLOSE/OPEN SECONDARY</b> is configured



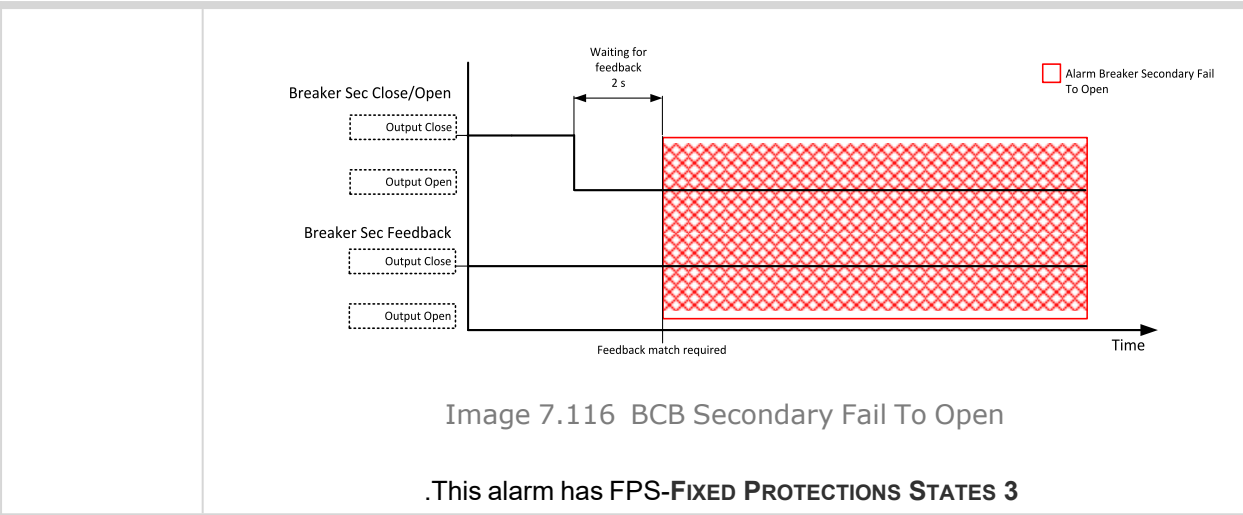
<b>Related applications</b>	MINT
<b>Alarm ID</b>	1557
<b>Description</b>	<p>This alarm is activated when there is a problem with circuit breaker position while closing.</p> <p>➤ LBO <b>BCB CLOSE/OPEN SECONDARY</b> closed but LBI <b>BCB SECONDARY FEEDBACK</b> did not closed during the time defined by Waiting For Breaker Feedback.</p> <p style="text-align: center;">Image 7.115 BCB Secondary Fail To Close</p> <p style="text-align: center;">. This alarm has FPS-FIXED PROTECTIONS STATES 3</p>

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### Stp BCB Secondary Fail To Open

<b>Alarm Type</b>	Slow StopWarning History Record Only
<b>Alarmlist message</b>	Stp BCB Secondary Fail To Open
<b>Alarm evaluated</b>	Only if LBI <b>BCB SECONDARY FEEDBACK</b> or LBI <b>BCB SECONDARY FEEDBACK NEGATIVE</b> or <b>BCB CLOSE/OPEN SECONDARY</b> is configured
<b>Related applications</b>	MINT
<b>Alarm ID</b>	1556
<b>Description</b>	<p>This alarm is activated when there is a problem with circuit breaker position while opening.</p> <p>➤ LBO <b>BCB CLOSE/OPEN SECONDARY</b> opened but LBI <b>BCB SECONDARY FEEDBACK</b> did not opened in 2 seconds.</p>





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Stp Synchronization Fail

Alarm Type	Slow Stop/Warning History Record Only
Alarmlist message	Stp Synchronization Fail
Alarm evaluated	During synchronization
Related applications	MINT
Alarm ID	94
Description	<p>This alarm is activated if the synchronization fails, e.g. <b>Synchronization Timeout</b> elapses.</p> <p>This alarm has FPS - FIXED PROTECTIONS STATES 3FIXED PROTECTIONS STATES 1.</p>

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9.2.4 Other alarms



## List of other alarms

Bus >V L1-N .....	1065	DISTIN 02 .....	1077	DISTIN 42 .....	1087
Bus >V L2-N .....	1065	DISTIN 03 .....	1077	DISTIN 43 .....	1087
Bus >V L3-N .....	1065	DISTIN 04 .....	1077	DISTIN 44 .....	1087
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Bus >V L2-L3 .....	1066	DISTIN 06 .....	1078	DISTIN 46 .....	1088
Bus >V L3-L1 .....	1066	DISTIN 07 .....	1078	DISTIN 47 .....	1088
Bus >>V L1-N .....	1067	DISTIN 08 .....	1078	DISTIN 48 .....	1088
Bus >>V L2-N .....	1067	DISTIN 09 .....	1079	DISTIN 49 .....	1089
Bus >>V L3-N .....	1067	DISTIN 10 .....	1079	DISTIN 50 .....	1089
Bus >>V L1-L2 .....	1068	DISTIN 11 .....	1079	DISTIN 51 .....	1089
Bus >>V L2-L3 .....	1068	DISTIN 12 .....	1079	DISTIN 52 .....	1089
Bus >>V L3-L1 .....	1068	DISTIN 13 .....	1080	DISTIN 53 .....	1090
Bus <V L1-N .....	1069	DISTIN 14 .....	1080	DISTIN 54 .....	1090
Bus <V L2-N .....	1069	DISTIN 15 .....	1080	DISTIN 55 .....	1090
Bus <V L3-N .....	1069	DISTIN 16 .....	1080	DISTIN 56 .....	1090
Bus <V L1-L2 .....	1070	DISTIN 17 .....	1081	DISTIN 57 .....	1091
Bus <V L2-L3 .....	1070	DISTIN 18 .....	1081	DISTIN 58 .....	1091
Bus <V L3-L1 .....	1070	DISTIN 19 .....	1081	DISTIN 59 .....	1091
Bus <<V L1-N .....	1071	DISTIN 20 .....	1081	DISTIN 60 .....	1091
Bus <<V L2-N .....	1071	DISTIN 21 .....	1082	DISTIN 61 .....	1092
Bus <<V L3-N .....	1071	DISTIN 22 .....	1082	DISTIN 62 .....	1092
Bus <<V L1-L2 .....	1072	DISTIN 23 .....	1082	DISTIN 63 .....	1092
Bus <<V L2-L3 .....	1072	DISTIN 24 .....	1082	DISTIN 64 .....	1092
Bus <<V L3-L1 .....	1072	DISTIN 25 .....	1083	DISTOUT .....	1093
Bus >f .....	1073	DISTIN 26 .....	1083	ECU 1 Comm Fail .....	1093
Bus <f .....	1073	DISTIN 27 .....	1083	ECU 2 Comm Fail .....	1093
Mains/Bus V Unbalance		DISTIN 28 .....	1083	ECU 3 Comm Fail .....	1093
Ph-N .....	1073	DISTIN 29 .....	1084	ECU 4 Comm Fail .....	1094
Mains/BusV Unbalance		DISTIN 30 .....	1084	ECU 5 Comm Fail .....	1094
Ph-Ph .....	1074	DISTIN 31 .....	1084	ECU 6 Comm Fail .....	1094
Maintenance 1 Interval ....	1074	DISTIN 32 .....	1084	ECU 7 Comm Fail .....	1094
Maintenance Timer 1		DISTIN 33 .....	1085	ECU 8 Comm Fail .....	1095
RunHours .....	1074	DISTIN 34 .....	1085	ECU 9 Comm Fail .....	1095
Maintenance 2 Interval ....	1074	DISTIN 35 .....	1085	SHAIN 1 .....	1095
Maintenance 2 RunHours	1075	DISTIN 36 .....	1085	SHAIN 2 .....	1095
Maintenance 3 Interval ....	1075	DISTIN 37 .....	1086	Wrn SHAIN Collision .....	1096
Maintenance 3 RunHours	1075	DISTIN 38 .....	1086	SHBIN 1 .....	1096
Maintenance 4 Interval ....	1076	DISTIN 39 .....	1086	SHBIN 2 .....	1096
Maintenance 4 RunHours	1076	DISTIN 40 .....	1086	SHBIN 3 .....	1096
DISTIN 01 .....	1077	DISTIN 41 .....	1087	SHBIN 4 .....	1097



SHBIN 5 ..... 1097

SHBIN 6 ..... 1097

Wrn SHBIN Collision ..... 1097

MP VRT Protection Trip ... 1098

Wrn Read Back Err Module

Index N ..... 1098

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## Bus >V L1-N

<b>Alarm Type</b>	<b>Protection types</b> <b>History Record Only</b> <b>Warning</b>
<b>Alarmlist message</b>	Bus >V L1-N
<b>Alarm evaluated</b>	All the time
<b>Related applications</b>	MINT
<b>Alarm ID</b>	125
<b>Description</b>	Protection is always active. Alarm is activated when relative value of <b>Mains/Bus Voltage L1-N</b> related to <b>Mains/Bus Nominal Voltage Ph-N</b> rises over <b>BESS &gt;V</b> for period longer than <b>BESS &gt;V Delay</b> .  This alarm has FPS - <b>FIXED PROTECTIONS STATES 4</b> .

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## Bus >V L2-N

<b>Alarm Type</b>	<b>Protection types</b> <b>History Record Only</b> <b>Warning</b>
<b>Alarmlist message</b>	Mains/Bus >V L2-N
<b>Alarm evaluated</b>	All the time
<b>Related applications</b>	MINT
<b>Alarm ID</b>	126
<b>Description</b>	Protection is always active. Alarm is activated when relative value of <b>Mains/Bus Voltage L2-N</b> related to <b>Mains/Bus Nominal Voltage Ph-N</b> rises over <b>BESS &gt;V</b> for period longer than <b>BESS &gt;V Delay</b> .  This alarm has FPS - <b>FIXED PROTECTIONS STATES 4</b> .

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## Bus >V L3-N

<b>Alarm Type</b>	<b>Protection types</b> <b>History Record Only</b> <b>Warning</b>
<b>Alarmlist message</b>	Mains/Bus >V L3-N
<b>Alarm evaluated</b>	All the time
<b>Related applications</b>	MINT
<b>Alarm ID</b>	127
<b>Description</b>	Protection is always active. Alarm is activated when relative value of <b>Mains/Bus Voltage L3-N</b> related to <b>Mains/Bus Nominal Voltage Ph-N</b> rises over <b>BESS &gt;V</b> for period longer than <b>BESS &gt;V Delay</b> .  This alarm has FPS - <b>FIXED PROTECTIONS STATES 4</b> .

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## Bus >V L1-L2

<b>Alarm Type</b>	<b>Protection types</b> <b>History Record Only</b> <b>Warning</b>
<b>Alarmlist message</b>	AC Mains/BusConverter >V L1-L2
<b>Alarm evaluated</b>	All the time
<b>Related applications</b>	MINT
<b>Alarm ID</b>	131
<b>Description</b>	<p>Protection is always active. Alarm is activated when relative value of <b>Mains/Bus Voltage L1-L2</b> related to <b>Bus Nominal Voltage Ph-Ph</b> rises over <b>BESS &gt;V</b> for period longer than <b>BESS &gt;V Delay</b>.</p> <p>This alarm has FPS - <b>FIXED PROTECTIONS STATES 4</b>.</p>

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## Bus >V L2-L3

<b>Alarm Type</b>	<b>Protection types</b> <b>History Record Only</b> <b>Warning</b>
<b>Alarmlist message</b>	AC Mains/BusConverter >V L2-L3
<b>Alarm evaluated</b>	All the time
<b>Related applications</b>	MINT
<b>Alarm ID</b>	132
<b>Description</b>	<p>Protection is always active. Alarm is activated when relative value of <b>Mains/Bus Voltage L2-L3</b> related to <b>Bus Nominal Voltage Ph-Ph</b> rises over <b>BESS &gt;V</b> for period longer than <b>BESS &gt;V Delay</b>.</p> <p>This alarm has FPS - <b>FIXED PROTECTIONS STATES 4</b>.</p>

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## Bus >V L3-L1

<b>Alarm Type</b>	<b>Protection types</b> <b>History Record Only</b> <b>Warning</b>
<b>Alarmlist message</b>	AC Mains/BusConverter >V L3-L1
<b>Alarm evaluated</b>	All the time
<b>Related applications</b>	MINT
<b>Alarm ID</b>	133
<b>Description</b>	<p>Protection is always active. Alarm is activated when relative value of <b>Mains/Bus Voltage L3-L1</b> related to <b>Bus Nominal Voltage Ph-Ph</b> rises over <b>BESS &gt;V</b> for period longer than <b>BESS &gt;V Delay</b>.</p> <p>This alarm has FPS - <b>FIXED PROTECTIONS STATES 4</b>.</p>

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## Bus >>V L1-N

<b>Alarm Type</b>	<b>Protection types</b> <b>History Record Only</b> <b>Warning</b>
<b>Alarmlist message</b>	Mains/Bus >>V L1-N
<b>Alarm evaluated</b>	All the time
<b>Related applications</b>	MINT
<b>Alarm ID</b>	1080
<b>Description</b>	<p>Protection is always active. Alarm is activated when relative value of <b>Mains/Bus Voltage L1-N</b> related to <b>Mains/Bus Nominal Voltage Ph-N</b> rises over <b>BESS &gt;&gt;V</b> for period longer than <b>BESS &gt;&gt;V Delay</b>.</p> <p>This alarm has FPS - <b>FIXED PROTECTIONS STATES 4</b>.</p>

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## Bus >>V L2-N

<b>Alarm Type</b>	<b>Protection types</b> <b>History Record Only</b> <b>Warning</b>
<b>Alarmlist message</b>	Mains/Bus >>V L2-NMP Mains >>V L2-NHst Bus Left >>V L2-N
<b>Alarm evaluated</b>	All the time
<b>Related applications</b>	MINT
<b>Alarm ID</b>	1082
<b>Description</b>	<p>Protection is always active. Alarm is activated when relative value of <b>Mains/Bus Voltage L2-N</b> related to <b>Mains/Bus Nominal Voltage Ph-N</b> rises over <b>BESS &gt;&gt;V</b> for period longer than <b>BESS &gt;&gt;V Delay</b>.</p> <p>This alarm has FPS - <b>FIXED PROTECTIONS STATES 4</b>.</p>

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## Bus >>V L3-N

<b>Alarm Type</b>	<b>Protection types</b> <b>History Record Only</b> <b>Warning</b>
<b>Alarmlist message</b>	M Mains/Bus >>V L3-N
<b>Alarm evaluated</b>	All the time
<b>Related applications</b>	MINT
<b>Alarm ID</b>	1084
<b>Description</b>	<p>Protection is always active. Alarm is activated when relative value of <b>Mains/Bus Voltage L3-N</b> related to <b>Mains/Bus Nominal Voltage Ph-N</b> rises over <b>BESS &gt;&gt;V</b> for period longer than <b>BESS &gt;&gt;V</b>.</p> <p>This alarm has FPS - <b>FIXED PROTECTIONS STATES 4</b>.</p>

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## Bus >>V L1-L2

<b>Alarm Type</b>	<b>Protection types</b> <b>History Record Only</b> <b>Warning</b>
<b>Alarmlist message</b>	AC Mains/BusConverter >>V L1-L2
<b>Alarm evaluated</b>	All the time
<b>Related applications</b>	MINT
<b>Alarm ID</b>	1086
<b>Description</b>	Protection is always active. Alarm is activated when relative value of <b>Mains/Bus Voltage L1-L2</b> related to <b>Bus Nominal Voltage Ph-Ph</b> rises over <b>BESS &gt;&gt;V</b> for period longer than <b>BESS &gt;&gt;V Delay</b> .  This alarm has FPS - <b>FIXED PROTECTIONS STATES 4</b> .

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## Bus >>V L2-L3

<b>Alarm Type</b>	<b>Protection types</b> <b>History Record Only</b> <b>Warning</b>
<b>Alarmlist message</b>	AC Mains/BusConverter >>V L2-L3
<b>Alarm evaluated</b>	All the time
<b>Related applications</b>	MINT
<b>Alarm ID</b>	1088
<b>Description</b>	Protection is always active. Alarm is activated when relative value of <b>Mains/Bus Voltage L2-L3</b> related to <b>Bus Nominal Voltage Ph-Ph</b> rises over <b>BESS &gt;&gt;V</b> for period longer than <b>BESS &gt;&gt;V Delay</b> .  This alarm has FPS - <b>FIXED PROTECTIONS STATES 4</b> .

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## Bus >>V L3-L1

<b>Alarm Type</b>	<b>Protection types</b> <b>History Record Only</b> <b>Warning</b>
<b>Alarmlist message</b>	AC Mains/BusConverter >>V L3-L1
<b>Alarm evaluated</b>	All the time
<b>Related applications</b>	MINT
<b>Alarm ID</b>	1090
<b>Description</b>	Protection is always active. Alarm is activated when relative value of <b>Mains/Bus Voltage L3-L1</b> related to <b>Bus Nominal Voltage Ph-Ph</b> rises over <b>BESS &gt;&gt;V</b> for period longer than <b>BESS &gt;&gt;V Delay</b> .  This alarm has FPS - <b>FIXED PROTECTIONS STATES 4</b> .

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## Bus <V L1-N

<b>Alarm Type</b>	<b>Protection types</b> <b>History Record Only</b> <b>Warning</b>
<b>Alarmlist message</b>	Bus <V L1-N
<b>Alarm evaluated</b>	All the time
<b>Related applications</b>	MINT
<b>Alarm ID</b>	122
<b>Description</b>	Protection is always active. Alarm is activated when relative value of <b>Mains/Bus Voltage L1-N</b> related to <b>Mains/Bus Nominal Voltage Ph-N</b> drops below <b>BESS &lt;V</b> for period longer than <b>BESS &lt;V Delay</b> .  This alarm has FPS - <b>FIXED PROTECTIONS STATES 4</b> .

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## Bus <V L2-N

<b>Alarm Type</b>	<b>Protection types</b> <b>History Record Only</b> <b>Warning</b>
<b>Alarmlist message</b>	Bus <V L2-N
<b>Alarm evaluated</b>	All the time
<b>Related applications</b>	MINT
<b>Alarm ID</b>	123
<b>Description</b>	Protection is always active. Alarm is activated when relative value of <b>Mains/Bus Voltage L2-N</b> related to <b>Mains/Bus Nominal Voltage Ph-N</b> drops below <b>BESS &lt;V</b> for period longer than <b>BESS &lt;V Delay</b> .  This alarm has FPS - <b>FIXED PROTECTIONS STATES 4</b> .

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## Bus <V L3-N

<b>Alarm Type</b>	<b>Protection types</b> <b>History Record Only</b> <b>Warning</b>
<b>Alarmlist message</b>	Bus <V L3-N
<b>Alarm evaluated</b>	All the time
<b>Related applications</b>	MINT
<b>Alarm ID</b>	124
<b>Description</b>	Protection is always active. Alarm is activated when relative value of <b>Mains/Bus Voltage L3-N</b> related to <b>Mains/Bus Nominal Voltage Ph-N</b> drops below <b>BESS &lt;V</b> for period longer than <b>BESS &lt;V Delay</b> .  This alarm has FPS - <b>FIXED PROTECTIONS STATES 4</b> .

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## Bus <V L1-L2

<b>Alarm Type</b>	<b>Protection types</b> <b>History Record Only</b> <b>Warning</b>
<b>Alarmlist message</b>	Bus <V L1-L2
<b>Alarm evaluated</b>	All the time
<b>Related applications</b>	MINT
<b>Alarm ID</b>	128
<b>Description</b>	<p>Protection is always active. Alarm is activated when relative value of <b>Mains/Bus Voltage L1-L2</b> related to <b>Bus Nominal Voltage Ph-Ph</b> drops below <b>BESS &lt;V</b> for period longer than <b>BESS &lt;V Delay</b>.</p> <p>This alarm has FPS - <b>FIXED PROTECTIONS STATES 4</b>.</p>

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## Bus <V L2-L3

<b>Alarm Type</b>	<b>Protection types</b> <b>History Record Only</b> <b>Warning</b>
<b>Alarmlist message</b>	Bus <V L2-L3
<b>Alarm evaluated</b>	All the time
<b>Related applications</b>	MINT
<b>Alarm ID</b>	129
<b>Description</b>	<p>Protection is always active. Alarm is activated when relative value of <b>Mains/Bus Voltage L2-L3</b> related to <b>Bus Nominal Voltage Ph-Ph</b> drops below <b>BESS &lt;V</b> for period longer than <b>BESS &lt;V Delay</b>.</p> <p>This alarm has FPS - <b>FIXED PROTECTIONS STATES 4</b>.</p>

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## Bus <V L3-L1

<b>Alarm Type</b>	<b>Protection types</b> <b>History Record Only</b> <b>Warning</b>
<b>Alarmlist message</b>	Bus <V L3-L1
<b>Alarm evaluated</b>	All the time
<b>Related applications</b>	MINT
<b>Alarm ID</b>	130
<b>Description</b>	<p>Protection is always active. Alarm is activated when relative value of <b>Mains/Bus Voltage L3-L1</b> related to <b>Bus Nominal Voltage Ph-Ph</b> drops below <b>BESS &lt;V</b> for period longer than <b>BESS &lt;V Delay</b>.</p> <p>This alarm has FPS - <b>FIXED PROTECTIONS STATES 4</b>.</p>

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## Bus <<V L1-N

<b>Alarm Type</b>	<b>Protection types</b> <b>History Record Only</b> <b>Warning</b>
<b>Alarmlist message</b>	Bus <<V L1-N
<b>Alarm evaluated</b>	All the time
<b>Related applications</b>	MINT
<b>Alarm ID</b>	1081
<b>Description</b>	Protection is always active. Alarm is activated when relative value of <b>Mains/Bus Voltage L1-N</b> related to <b>Mains/Bus Nominal Voltage Ph-N</b> drops below <b>BESS &lt;V</b> for period longer than <b>BESS &lt;V Delay</b> .  This alarm has FPS - <b>FIXED PROTECTIONS STATES 4</b> .

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## Bus <<V L2-N

<b>Alarm Type</b>	<b>Protection types</b> <b>History Record Only</b> <b>Warning</b>
<b>Alarmlist message</b>	Bus <<V L2-N
<b>Alarm evaluated</b>	All the time
<b>Related applications</b>	MINT
<b>Alarm ID</b>	1083
<b>Description</b>	Protection is always active. Alarm is activated when relative value of <b>Mains/Bus Voltage L2-N</b> related to <b>Mains/Bus Nominal Voltage Ph-N</b> drops below <b>BESS &lt;V</b> for period longer than <b>BESS &lt;V Delay</b> .  This alarm has FPS - <b>FIXED PROTECTIONS STATES 4</b> .

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## Bus <<V L3-N

<b>Alarm Type</b>	<b>Protection types</b> <b>History Record Only</b> <b>Warning</b>
<b>Alarmlist message</b>	Bus <<V L3-N
<b>Alarm evaluated</b>	All the time
<b>Related applications</b>	MINT
<b>Alarm ID</b>	1085
<b>Description</b>	Protection is always active. Alarm is activated when relative value of <b>Mains/Bus Voltage L3-N</b> related to <b>Mains/Bus Nominal Voltage Ph-N</b> drops below <b>BESS &lt;V</b> for period longer than <b>BESS &lt;V Delay</b> .  This alarm has FPS - <b>FIXED PROTECTIONS STATES 4</b> .

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## Bus <<V L1-L2

<b>Alarm Type</b>	<b>Protection types</b> <b>History Record Only</b> <b>Warning</b>
<b>Alarmlist message</b>	Bus <<V L1-L2
<b>Alarm evaluated</b>	All the time
<b>Related applications</b>	MINT
<b>Alarm ID</b>	1087
<b>Description</b>	Protection is always active. Alarm is activated when relative value of <b>Mains/Bus Voltage L1-L2</b> related to <b>Bus Nominal Voltage Ph-Ph</b> drops below <b>BESS &lt;V</b> for period longer than <b>BESS &lt;V Delay</b> .  This alarm has FPS - <b>FIXED PROTECTIONS STATES 4</b> .

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## Bus <<V L2-L3

<b>Alarm Type</b>	<b>Protection types</b> <b>History Record Only</b> <b>Warning</b>
<b>Alarmlist message</b>	Bus <<V L2-L3
<b>Alarm evaluated</b>	All the time
<b>Related applications</b>	MINT
<b>Alarm ID</b>	1089
<b>Description</b>	Protection is always active. Alarm is activated when relative value of <b>Mains/Bus Voltage L2-L3</b> related to <b>Bus Nominal Voltage Ph-Ph</b> drops below <b>BESS &lt;V</b> for period longer than <b>BESS &lt;V Delay</b> .  This alarm has FPS - <b>FIXED PROTECTIONS STATES 4</b> .

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## Bus <<V L3-L1

<b>Alarm Type</b>	<b>Protection types</b> <b>History Record Only</b> <b>Warning</b>
<b>Alarmlist message</b>	Bus <<V L3-L1
<b>Alarm evaluated</b>	All the time
<b>Related applications</b>	MINT
<b>Alarm ID</b>	1091
<b>Description</b>	Protection is always active. Alarm is activated when relative value of <b>Mains/Bus Voltage L3-L1</b> related to <b>Bus Nominal Voltage Ph-Ph</b> drops below <b>BESS &lt;V</b> for period longer than <b>BESS &lt;V Delay</b> .  This alarm has FPS - <b>FIXED PROTECTIONS STATES 4</b> .

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## Bus >f

<b>Alarm Type</b>	<b>Protection types</b> <b>History Record Only</b> <b>Warning</b>
<b>Alarmlist message</b>	Bus >V L1-N >f
<b>Alarm evaluated</b>	All the time
<b>Related applications</b>	MINT
<b>Alarm ID</b>	135
<b>Description</b>	Protection is always active. Alarm is activated when <b>Mains/Bus Frequency</b> rises over <b>BESS &gt;f</b> for period longer than <b>BESS &gt;f Delay</b> . This alarm has FPS - <b>FIXED PROTECTIONS STATES 5</b> .

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## Bus <f

<b>Alarm Type</b>	<b>Protection types</b> <b>History Record Only</b> <b>Warning</b>
<b>Alarmlist message</b>	Bus <f
<b>Alarm evaluated</b>	All the time
<b>Related applications</b>	MINT
<b>Alarm ID</b>	134
<b>Description</b>	Protection is always active. Alarm is activated when <b>Mains/Bus Frequency</b> drops below <b>BESS &lt;f</b> for period longer than <b>BESS &lt;f Delay</b> . This alarm has FPS - <b>FIXED PROTECTIONS STATES 5</b> .

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## Mains/Bus V Unbalance Ph-N

<b>Alarm Type</b>	<b>Protection types</b> <b>History Record Only History Record Only</b> <b>Warning</b>
<b>Alarmlist message</b>	Mains/Bus V Unbalance Ph-N
<b>Alarm evaluated</b>	All the time
<b>Related applications</b>	MINT
<b>Alarm ID</b>	593
<b>Description</b>	Protection is always active. Alarm is activated when relative difference between bus voltages rises over <b>BESS V Unbalance</b> for period longer than <b>BESS V Unbalance Delay</b> . This alarm has FPS - <b>FIXED PROTECTIONS STATES 4, FIXED PROTECTIONS STATES 2</b> .

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## Mains/BusV Unbalance Ph-Ph

<b>Alarm Type</b>	<b>Protection types</b> <b>History Record Only History Record Only</b> <b>Warning</b>
<b>Alarmlist message</b>	BOR ACMains/BusConverter V Unbalance Ph-Ph
<b>Alarm evaluated</b>	All the time
<b>Related applications</b>	MINT
<b>Alarm ID</b>	592
<b>Description</b>	Protection is always active. Alarm is activated when relative difference between bus voltages rises over <b>BESS V Unbalance</b> for period longer than <b>BESS V Unbalance Delay</b> .  This alarm has FPS - <b>FIXED PROTECTIONS STATES 4, FIXED PROTECTIONS STATES 2</b> .

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## Maintenance 1 Interval

<b>Alarm Type</b>	Based on configuration ( <b>Warning/Slow Stop</b> )
<b>Alarmlist message</b>	Wrn/Stp Maintenance 1 Interval
<b>Alarm evaluated</b>	Only if <b>Maintenance Timer 1 Interval</b> != Disabled
<b>Related applications</b>	MINT
<b>Alarm ID</b>	1072
<b>Description</b>	This alarm is activated when setpoint <b>Maintenance Timer 1 Interval</b> elapses i.e. the value <b>Maintenance Timer 1 Interval</b> = 0 and lasts until the setpoint is set to value > 0 or "Disabled".

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## Maintenance Timer 1 RunHours

<b>Alarm Type</b>	Based on configuration ( <b>Warning/Slow Stop</b> )
<b>Alarmlist message</b>	Wrn/Stp Maintenance 1 Protection
<b>Alarm evaluated</b>	Only if <b>Maintenance Timer 1 RunHours</b> != Disabled
<b>Related applications</b>	MINT
<b>Alarm ID</b>	585
<b>Description</b>	This alarm is activated when setpoint <b>Maintenance Timer 1 RunHours</b> elapses i.e. the value <b>Maintenance Timer 1 RunHours</b> = 0 and lasts until the setpoint is set to value > 0 or "Disabled".

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## Maintenance 2 Interval

<b>Alarm Type</b>	Based on configuration ( <b>Warning/Slow Stop</b> )
<b>Alarmlist message</b>	Wrn/Stp Maintenance 1 Interval
<b>Alarm evaluated</b>	Only if <b>Maintenance Timer 2 Interval</b> != Disabled



<b>Related applications</b>	MINT
<b>Alarm ID</b>	1073
<b>Description</b>	This alarm is activated when setpoint <b>Maintenance Timer 2 Interval</b> elapses i.e. the value <b>Maintenance Timer 2 Interval</b> = 0 and lasts until the setpoint is set to value > 0 or "Disabled".

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### Maintenance 2 RunHours

<b>Alarm Type</b>	Based on configuration ( <b>Warning/Slow Stop</b> )
<b>Alarmlist message</b>	Wrn/Stp Maintenance 2 Protection
<b>Alarm evaluated</b>	Only if <b>Maintenance Timer 2 RunHours</b> != Disabled
<b>Related applications</b>	MINT
<b>Alarm ID</b>	586
<b>Description</b>	This warning is activated when setpoint <b>Maintenance Timer 2 RunHours</b> elapses i.e. the value <b>Maintenance Timer 2 RunHours</b> = 0 and lasts until the setpoint is set to value > 0 or "Disabled".

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### Maintenance 3 Interval

<b>Alarm Type</b>	Based on configuration ( <b>Warning/Slow Stop</b> )
<b>Alarmlist message</b>	Wrn/Stp Maintenance 1 Interval
<b>Alarm evaluated</b>	Only if <b>Maintenance Timer 3 Interval</b> != Disabled
<b>Related applications</b>	MINT
<b>Alarm ID</b>	1074
<b>Description</b>	This alarm is activated when setpoint <b>Maintenance Timer 3 Interval</b> elapses i.e. the value <b>Maintenance Timer 3 Interval</b> = 0 and lasts until the setpoint is set to value > 0 or "Disabled".

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### Maintenance 3 RunHours

<b>Alarm Type</b>	Based on configuration ( <b>Warning/Slow Stop</b> )
<b>Alarmlist message</b>	Wrn/Stp Maintenance 3 Protection
<b>Alarm evaluated</b>	Only if <b>Maintenance Timer 3 RunHours</b> != Disabled
<b>Related applications</b>	MINT
<b>Alarm ID</b>	587
<b>Description</b>	This warning is activated when setpoint <b>Maintenance Timer 3 RunHours</b> elapses i.e. the value <b>Maintenance Timer 3 RunHours</b> = 0 and lasts until the setpoint is set to value > 0 or "Disabled".

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## Maintenance 4 Interval

<b>Alarm Type</b>	Based on configuration ( <b>Warning/Slow Stop</b> )
<b>Alarmlist message</b>	Wrn/Stp Maintenance 1 Interval
<b>Alarm evaluated</b>	Only if <b>Maintenance Timer 4 Interval</b> != Disabled
<b>Related applications</b>	MINT
<b>Alarm ID</b>	1519
<b>Description</b>	This alarm is activated when setpoint <b>Maintenance Timer 4 Interval</b> elapses i.e. the value <b>Maintenance Timer 4 Interval</b> = 0 and lasts until the setpoint is set to value > 0 or "Disabled".

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## Maintenance 4 RunHours

<b>Alarm Type</b>	Based on configuration ( <b>Warning/Slow Stop</b> )
<b>Alarmlist message</b>	Wrn/Stp Maintenance 4 Protection
<b>Alarm evaluated</b>	Only if <b>Maintenance Timer 4 RunHours</b> or != Disabled
<b>Related applications</b>	MINT
<b>Alarm ID</b>	1518
<b>Description</b>	This warning is activated when setpoint <b>Maintenance Timer 4 RunHours</b> elapses i.e. the value <b>Maintenance Timer 4 RunHours</b> = 0 and lasts until the setpoint is set to value > 0 or "Disabled".

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## DISTIN 01

<b>Alarm Type</b>	Based on configuration
<b>Alarmlist message</b>	Wrn/Sd DISTIN 01
<b>Alarm evaluated</b>	Only if DIST-IN 01 is configured
<b>Related applications</b>	MINT
<b>Alarm ID</b>	1156
<b>Description</b>	This alarm is activated when DIST-IN data are not received from controller with <b>ICC Address = 1</b> .

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## DISTIN 02

<b>Alarm Type</b>	Based on configuration
<b>Alarmlist message</b>	Wrn/Sd DISTIN 02
<b>Alarm evaluated</b>	Only if DIST-IN 02 is configured
<b>Related applications</b>	MINT
<b>Alarm ID</b>	1157
<b>Description</b>	This alarm is activated when DIST-IN data are not received from controller with <b>ICC Address = 2</b> .

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## DISTIN 03

<b>Alarm Type</b>	Based on configuration
<b>Alarmlist message</b>	Wrn/Sd DISTIN 03
<b>Alarm evaluated</b>	Only if DIST-IN 03 is configured
<b>Related applications</b>	MINT
<b>Alarm ID</b>	1158
<b>Description</b>	This alarm is activated when DIST-IN data are not received from controller with <b>ICC Address = 3</b> .

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## DISTIN 04

<b>Alarm Type</b>	Based on configuration
<b>Alarmlist message</b>	Wrn/Sd DISTIN 04
<b>Alarm evaluated</b>	Only if DIST-IN 04 is configured
<b>Related applications</b>	MINT
<b>Alarm ID</b>	1159
<b>Description</b>	This alarm is activated when DIST-IN data are not received from controller with <b>ICC Address = 4</b> .

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## DISTIN 05

<b>Alarm Type</b>	Based on configuration
<b>Alarmlist message</b>	Wrn/Sd DISTIN 05
<b>Alarm evaluated</b>	Only if DIST-IN 05 is configured
<b>Related applications</b>	MINT
<b>Alarm ID</b>	1160
<b>Description</b>	This alarm is activated when DIST-IN data are not received from controller with <b>ICC Address = 5.</b>

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## DISTIN 06

<b>Alarm Type</b>	Based on configuration
<b>Alarmlist message</b>	Wrn/Sd DISTIN 06
<b>Alarm evaluated</b>	Only if DIST-IN 06 is configured
<b>Related applications</b>	MINT
<b>Alarm ID</b>	1161
<b>Description</b>	This alarm is activated when DIST-IN data are not received from controller with <b>ICC Address = 6.</b>

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## DISTIN 07

<b>Alarm Type</b>	Based on configuration
<b>Alarmlist message</b>	Wrn/Sd DISTIN 07
<b>Alarm evaluated</b>	Only if DIST-IN 07 is configured
<b>Related applications</b>	MINT
<b>Alarm ID</b>	1162
<b>Description</b>	This alarm is activated when DIST-IN data are not received from controller with <b>ICC Address = 7.</b>

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## DISTIN 08

<b>Alarm Type</b>	Based on configuration
<b>Alarmlist message</b>	Wrn/Sd DISTIN 08
<b>Alarm evaluated</b>	Only if DIST-IN 08 is configured
<b>Related applications</b>	MINT
<b>Alarm ID</b>	1163
<b>Description</b>	This alarm is activated when DIST-IN data are not received from controller with <b>ICC Address = 8.</b>

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## DISTIN 09

<b>Alarm Type</b>	Based on configuration
<b>Alarmlist message</b>	Wrn/Sd DISTIN 09
<b>Alarm evaluated</b>	Only if DIST-IN 09 is configured
<b>Related applications</b>	MINT
<b>Alarm ID</b>	1164
<b>Description</b>	This alarm is activated when DIST-IN data are not received from controller with <b>ICC Address = 9.</b>

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## DISTIN 10

<b>Alarm Type</b>	Based on configuration
<b>Alarmlist message</b>	Wrn/Sd DISTIN 10
<b>Alarm evaluated</b>	Only if DIST-IN 10 is configured
<b>Related applications</b>	MINT
<b>Alarm ID</b>	1165
<b>Description</b>	This alarm is activated when DIST-IN data are not received from controller with <b>ICC Address = 10.</b>

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## DISTIN 11

<b>Alarm Type</b>	Based on configuration
<b>Alarmlist message</b>	Wrn/Sd DISTIN 11
<b>Alarm evaluated</b>	Only if DIST-IN 11 is configured
<b>Related applications</b>	MINT
<b>Alarm ID</b>	1166
<b>Description</b>	This alarm is activated when DIST-IN data are not received from controller with <b>ICC Address = 11.</b>

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## DISTIN 12

<b>Alarm Type</b>	Based on configuration
<b>Alarmlist message</b>	Wrn/Sd DISTIN 12
<b>Alarm evaluated</b>	Only if DIST-IN 12 is configured
<b>Related applications</b>	MINT
<b>Alarm ID</b>	1167
<b>Description</b>	This alarm is activated when DIST-IN data are not received from controller with <b>ICC Address = 12.</b>

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## DISTIN 13

<b>Alarm Type</b>	Based on configuration
<b>Alarmlist message</b>	Wrn/Sd DISTIN 13
<b>Alarm evaluated</b>	Only if DIST-IN 13 is configured
<b>Related applications</b>	MINT
<b>Alarm ID</b>	1168
<b>Description</b>	This alarm is activated when DIST-IN data are not received from controller with <b>ICC Address = 13</b> .

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## DISTIN 14

<b>Alarm Type</b>	Based on configuration
<b>Alarmlist message</b>	Wrn/Sd DISTIN 14
<b>Alarm evaluated</b>	Only if DIST-IN 14 is configured
<b>Related applications</b>	MINT
<b>Alarm ID</b>	1169
<b>Description</b>	This alarm is activated when DIST-IN data are not received from controller with <b>ICC Address = 14</b> .

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## DISTIN 15

<b>Alarm Type</b>	Based on configuration
<b>Alarmlist message</b>	Wrn/Sd DISTIN 15
<b>Alarm evaluated</b>	Only if DIST-IN 15 is configured
<b>Related applications</b>	MINT
<b>Alarm ID</b>	1170
<b>Description</b>	This alarm is activated when DIST-IN data are not received from controller with <b>ICC Address = 15</b> .

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## DISTIN 16

<b>Alarm Type</b>	Based on configuration
<b>Alarmlist message</b>	Wrn/Sd DISTIN 16
<b>Alarm evaluated</b>	Only if DIST-IN 16 is configured
<b>Related applications</b>	MINT
<b>Alarm ID</b>	1171
<b>Description</b>	This alarm is activated when DIST-IN data are not received from controller with <b>ICC Address = 16</b> .

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## DISTIN 17

<b>Alarm Type</b>	Based on configuration
<b>Alarmlist message</b>	Wrn/Sd DISTIN 17
<b>Alarm evaluated</b>	Only if DIST-IN 17 is configured
<b>Related applications</b>	MINT
<b>Alarm ID</b>	1172
<b>Description</b>	This alarm is activated when DIST-IN data are not received from controller with <b>ICC Address = 17.</b>

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## DISTIN 18

<b>Alarm Type</b>	Based on configuration
<b>Alarmlist message</b>	Wrn/Sd DISTIN 18
<b>Alarm evaluated</b>	Only if DIST-IN 18 is configured
<b>Related applications</b>	MINT
<b>Alarm ID</b>	1173
<b>Description</b>	This alarm is activated when DIST-IN data are not received from controller with <b>ICC Address = 18.</b>

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## DISTIN 19

<b>Alarm Type</b>	Based on configuration
<b>Alarmlist message</b>	Wrn/Sd DISTIN 19
<b>Alarm evaluated</b>	Only if DIST-IN 19 is configured
<b>Related applications</b>	MINT
<b>Alarm ID</b>	1174
<b>Description</b>	This alarm is activated when DIST-IN data are not received from controller with <b>ICC Address = 19.</b>

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## DISTIN 20

<b>Alarm Type</b>	Based on configuration
<b>Alarmlist message</b>	Wrn/Sd DISTIN 20
<b>Alarm evaluated</b>	Only if DIST-IN 20 is configured
<b>Related applications</b>	MINT
<b>Alarm ID</b>	1175
<b>Description</b>	This alarm is activated when DIST-IN data are not received from controller with <b>ICC Address = 20.</b>

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## DISTIN 21

<b>Alarm Type</b>	Based on configuration
<b>Alarmlist message</b>	Wrn/Sd DISTIN 21
<b>Alarm evaluated</b>	Only if DIST-IN 21 is configured
<b>Related applications</b>	MINT
<b>Alarm ID</b>	1176
<b>Description</b>	This alarm is activated when DIST-IN data are not received from controller with <b>ICC Address = 21</b> .

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## DISTIN 22

<b>Alarm Type</b>	Based on configuration
<b>Alarmlist message</b>	Wrn/Sd DISTIN 22
<b>Alarm evaluated</b>	Only if DIST-IN 22 is configured
<b>Related applications</b>	MINT
<b>Alarm ID</b>	1177
<b>Description</b>	This alarm is activated when DIST-IN data are not received from controller with <b>ICC Address = 22</b> .

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## DISTIN 23

<b>Alarm Type</b>	Based on configuration
<b>Alarmlist message</b>	Wrn/Sd DISTIN 23
<b>Alarm evaluated</b>	Only if DIST-IN 23 is configured
<b>Related applications</b>	MINT
<b>Alarm ID</b>	1178
<b>Description</b>	This alarm is activated when DIST-IN data are not received from controller with <b>ICC Address = 23</b> .

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## DISTIN 24

<b>Alarm Type</b>	Based on configuration
<b>Alarmlist message</b>	Wrn/Sd DISTIN 24
<b>Alarm evaluated</b>	Only if DIST-IN 24 is configured
<b>Related applications</b>	MINT
<b>Alarm ID</b>	1179
<b>Description</b>	This alarm is activated when DIST-IN data are not received from controller with <b>ICC Address = 24</b> .

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## DISTIN 25

<b>Alarm Type</b>	Based on configuration
<b>Alarmlist message</b>	Wrn/Sd DISTIN 25
<b>Alarm evaluated</b>	Only if DIST-IN 25 is configured
<b>Related applications</b>	MINT
<b>Alarm ID</b>	1180
<b>Description</b>	This alarm is activated when DIST-IN data are not received from controller with <b>ICC Address = 25</b> .

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## DISTIN 26

<b>Alarm Type</b>	Based on configuration
<b>Alarmlist message</b>	Wrn/Sd DISTIN 26
<b>Alarm evaluated</b>	Only if DIST-IN 26 is configured
<b>Related applications</b>	MINT
<b>Alarm ID</b>	1181
<b>Description</b>	This alarm is activated when DIST-IN data are not received from controller with <b>ICC Address = 26</b> .

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## DISTIN 27

<b>Alarm Type</b>	Based on configuration
<b>Alarmlist message</b>	Wrn/Sd DISTIN 27
<b>Alarm evaluated</b>	Only if DIST-IN 27 is configured
<b>Related applications</b>	MINT
<b>Alarm ID</b>	1182
<b>Description</b>	This alarm is activated when DIST-IN data are not received from controller with <b>ICC Address = 27</b> .

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## DISTIN 28

<b>Alarm Type</b>	Based on configuration
<b>Alarmlist message</b>	Wrn/Sd DISTIN 28
<b>Alarm evaluated</b>	Only if DIST-IN 28 is configured
<b>Related applications</b>	MINT
<b>Alarm ID</b>	1183
<b>Description</b>	This alarm is activated when DIST-IN data are not received from controller with <b>ICC Address = 28</b> .

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## DISTIN 29

<b>Alarm Type</b>	Based on configuration
<b>Alarmlist message</b>	Wrn/Sd DISTIN 29
<b>Alarm evaluated</b>	Only if DIST-IN 29 is configured
<b>Related applications</b>	MINT
<b>Alarm ID</b>	1184
<b>Description</b>	This alarm is activated when DIST-IN data are not received from controller with <b>ICC Address = 29</b> .

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## DISTIN 30

<b>Alarm Type</b>	Based on configuration
<b>Alarmlist message</b>	Wrn/Sd DISTIN 30
<b>Alarm evaluated</b>	Only if DIST-IN 30 is configured
<b>Related applications</b>	MINT
<b>Alarm ID</b>	1185
<b>Description</b>	This alarm is activated when DIST-IN data are not received from controller with <b>ICC Address = 30</b> .

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## DISTIN 31

<b>Alarm Type</b>	Based on configuration
<b>Alarmlist message</b>	Wrn/Sd DISTIN 31
<b>Alarm evaluated</b>	Only if DIST-IN 31 is configured
<b>Related applications</b>	MINT
<b>Alarm ID</b>	1186
<b>Description</b>	This alarm is activated when DIST-IN data are not received from controller with <b>ICC Address = 31</b> .

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## DISTIN 32

<b>Alarm Type</b>	Based on configuration
<b>Alarmlist message</b>	Wrn/Sd DISTIN 32
<b>Alarm evaluated</b>	Only if DIST-IN 32 is configured
<b>Related applications</b>	MINT
<b>Alarm ID</b>	1187
<b>Description</b>	This alarm is activated when DIST-IN data are not received from controller with <b>ICC Address = 32</b> .

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## DISTIN 33

<b>Alarm Type</b>	Based on configuration
<b>Alarmlist message</b>	Wrn/Sd DISTIN 33
<b>Alarm evaluated</b>	Only if DIST-IN 33 is configured
<b>Related applications</b>	MINT
<b>Alarm ID</b>	1344
<b>Description</b>	This alarm is activated when DIST-IN data are not received from controller with <b>ICC Address = 33</b> .

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## DISTIN 34

<b>Alarm Type</b>	Based on configuration
<b>Alarmlist message</b>	Wrn/Sd DISTIN 34
<b>Alarm evaluated</b>	Only if DIST-IN 34 is configured
<b>Related applications</b>	MINT
<b>Alarm ID</b>	1345
<b>Description</b>	This alarm is activated when DIST-IN data are not received from controller with <b>ICC Address = 34</b> .

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## DISTIN 35

<b>Alarm Type</b>	Based on configuration
<b>Alarmlist message</b>	Wrn/Sd DISTIN 35
<b>Alarm evaluated</b>	Only if DIST-IN 35 is configured
<b>Related applications</b>	MINT
<b>Alarm ID</b>	1346
<b>Description</b>	This alarm is activated when DIST-IN data are not received from controller with <b>ICC Address = 35</b> .

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## DISTIN 36

<b>Alarm Type</b>	Based on configuration
<b>Alarmlist message</b>	Wrn/Sd DISTIN 36
<b>Alarm evaluated</b>	Only if DIST-IN 36 is configured
<b>Related applications</b>	MINT
<b>Alarm ID</b>	1347
<b>Description</b>	This alarm is activated when DIST-IN data are not received from controller with <b>ICC Address = 36</b> .

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## DISTIN 37

<b>Alarm Type</b>	Based on configuration
<b>Alarmlist message</b>	Wrn/Sd DISTIN 37
<b>Alarm evaluated</b>	Only if DIST-IN 37 is configured
<b>Related applications</b>	MINT
<b>Alarm ID</b>	1348
<b>Description</b>	This alarm is activated when DIST-IN data are not received from controller with <b>ICC Address = 37</b> .

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## DISTIN 38

<b>Alarm Type</b>	Based on configuration
<b>Alarmlist message</b>	Wrn/Sd DISTIN 38
<b>Alarm evaluated</b>	Only if DIST-IN 38 is configured
<b>Related applications</b>	MINT
<b>Alarm ID</b>	1349
<b>Description</b>	This alarm is activated when DIST-IN data are not received from controller with <b>ICC Address = 38</b> .

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## DISTIN 39

<b>Alarm Type</b>	Based on configuration
<b>Alarmlist message</b>	Wrn/Sd DISTIN 39
<b>Alarm evaluated</b>	Only if DIST-IN 39 is configured
<b>Related applications</b>	MINT
<b>Alarm ID</b>	1350
<b>Description</b>	This alarm is activated when DIST-IN data are not received from controller with <b>ICC Address = 39</b> .

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## DISTIN 40

<b>Alarm Type</b>	Based on configuration
<b>Alarmlist message</b>	Wrn/Sd DISTIN 40
<b>Alarm evaluated</b>	Only if DIST-IN 40 is configured
<b>Related applications</b>	MINT
<b>Alarm ID</b>	1351
<b>Description</b>	This alarm is activated when DIST-IN data are not received from controller with <b>ICC Address = 40</b> .

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## DISTIN 41

<b>Alarm Type</b>	Based on configuration
<b>Alarmlist message</b>	Wrn/Sd DISTIN 41
<b>Alarm evaluated</b>	Only if DIST-IN 41 is configured
<b>Related applications</b>	MINT
<b>Alarm ID</b>	1352
<b>Description</b>	This alarm is activated when DIST-IN data are not received from controller with <b>ICC Address = 41</b> .

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## DISTIN 42

<b>Alarm Type</b>	Based on configuration
<b>Alarmlist message</b>	Wrn/Sd DISTIN 42
<b>Alarm evaluated</b>	Only if DIST-IN 42 is configured
<b>Related applications</b>	MINT
<b>Alarm ID</b>	1353
<b>Description</b>	This alarm is activated when DIST-IN data are not received from controller with <b>ICC Address = 42</b> .

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## DISTIN 43

<b>Alarm Type</b>	Based on configuration
<b>Alarmlist message</b>	Wrn/Sd DISTIN 43
<b>Alarm evaluated</b>	Only if DIST-IN 43 is configured
<b>Related applications</b>	MINT
<b>Alarm ID</b>	1354
<b>Description</b>	This alarm is activated when DIST-IN data are not received from controller with <b>ICC Address = 43</b> .

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## DISTIN 44

<b>Alarm Type</b>	Based on configuration
<b>Alarmlist message</b>	Wrn/Sd DISTIN 44
<b>Alarm evaluated</b>	Only if DIST-IN 44 is configured
<b>Related applications</b>	MINT
<b>Alarm ID</b>	1355
<b>Description</b>	This alarm is activated when DIST-IN data are not received from controller with <b>ICC Address = 44</b> .

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## DISTIN 45

<b>Alarm Type</b>	Based on configuration
<b>Alarmlist message</b>	Wrn/Sd DISTIN 45
<b>Alarm evaluated</b>	Only if DIST-IN 45 is configured
<b>Related applications</b>	MINT
<b>Alarm ID</b>	1356
<b>Description</b>	This alarm is activated when DIST-IN data are not received from controller with <b>ICC Address = 45</b> .

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## DISTIN 46

<b>Alarm Type</b>	Based on configuration
<b>Alarmlist message</b>	Wrn/Sd DISTIN 46
<b>Alarm evaluated</b>	Only if DIST-IN 46 is configured
<b>Related applications</b>	MINT
<b>Alarm ID</b>	1357
<b>Description</b>	This alarm is activated when DIST-IN data are not received from controller with <b>ICC Address = 46</b> .

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## DISTIN 47

<b>Alarm Type</b>	Based on configuration
<b>Alarmlist message</b>	Wrn/Sd DISTIN 47
<b>Alarm evaluated</b>	Only if DIST-IN 47 is configured
<b>Related applications</b>	MINT
<b>Alarm ID</b>	1358
<b>Description</b>	This alarm is activated when DIST-IN data are not received from controller with <b>ICC Address = 47</b> .

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## DISTIN 48

<b>Alarm Type</b>	Based on configuration
<b>Alarmlist message</b>	Wrn/Sd DISTIN 48
<b>Alarm evaluated</b>	Only if DIST-IN 48 is configured
<b>Related applications</b>	MINT
<b>Alarm ID</b>	1359
<b>Description</b>	This alarm is activated when DIST-IN data are not received from controller with <b>ICC Address = 48</b> .

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## DISTIN 49

<b>Alarm Type</b>	Based on configuration
<b>Alarmlist message</b>	Wrn/Sd DISTIN 49
<b>Alarm evaluated</b>	Only if DIST-IN 49 is configured
<b>Related applications</b>	MINT
<b>Alarm ID</b>	1360
<b>Description</b>	This alarm is activated when DIST-IN data are not received from controller with <b>ICC Address = 49</b> .

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## DISTIN 50

<b>Alarm Type</b>	Based on configuration
<b>Alarmlist message</b>	Wrn/Sd DISTIN 50
<b>Alarm evaluated</b>	Only if DIST-IN 50 is configured
<b>Related applications</b>	MINT
<b>Alarm ID</b>	1361
<b>Description</b>	This alarm is activated when DIST-IN data are not received from controller with <b>ICC Address = 50</b> .

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## DISTIN 51

<b>Alarm Type</b>	Based on configuration
<b>Alarmlist message</b>	Wrn/Sd DISTIN 51
<b>Alarm evaluated</b>	Only if DIST-IN 51 is configured
<b>Related applications</b>	MINT
<b>Alarm ID</b>	1362
<b>Description</b>	This alarm is activated when DIST-IN data are not received from controller with <b>ICC Address = 51</b> .

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## DISTIN 52

<b>Alarm Type</b>	Based on configuration
<b>Alarmlist message</b>	Wrn/Sd DISTIN 52
<b>Alarm evaluated</b>	Only if DIST-IN 52 is configured
<b>Related applications</b>	MINT
<b>Alarm ID</b>	1363
<b>Description</b>	This alarm is activated when DIST-IN data are not received from controller with <b>ICC Address = 52</b> .

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## DISTIN 53

<b>Alarm Type</b>	Based on configuration
<b>Alarmlist message</b>	Wrn/Sd DISTIN 53
<b>Alarm evaluated</b>	Only if DIST-IN 53 is configured
<b>Related applications</b>	MINT
<b>Alarm ID</b>	1364
<b>Description</b>	This alarm is activated when DIST-IN data are not received from controller with <b>ICC Address = 53</b> .

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## DISTIN 54

<b>Alarm Type</b>	Based on configuration
<b>Alarmlist message</b>	Wrn/Sd DISTIN 54
<b>Alarm evaluated</b>	Only if DIST-IN 54 is configured
<b>Related applications</b>	MINT
<b>Alarm ID</b>	1365
<b>Description</b>	This alarm is activated when DIST-IN data are not received from controller with <b>ICC Address = 54</b> .

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## DISTIN 55

<b>Alarm Type</b>	Based on configuration
<b>Alarmlist message</b>	Wrn/Sd DISTIN 55
<b>Alarm evaluated</b>	Only if DIST-IN 55 is configured
<b>Related applications</b>	MINT
<b>Alarm ID</b>	1366
<b>Description</b>	This alarm is activated when DIST-IN data are not received from controller with <b>ICC Address = 55</b> .

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## DISTIN 56

<b>Alarm Type</b>	Based on configuration
<b>Alarmlist message</b>	Wrn/Sd DISTIN 56
<b>Alarm evaluated</b>	Only if DIST-IN 56 is configured
<b>Related applications</b>	MINT
<b>Alarm ID</b>	1367
<b>Description</b>	This alarm is activated when DIST-IN data are not received from controller with <b>ICC Address = 56</b> .

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## DISTIN 57

<b>Alarm Type</b>	Based on configuration
<b>Alarmlist message</b>	Wrn/Sd DISTIN 57
<b>Alarm evaluated</b>	Only if DIST-IN 57 is configured
<b>Related applications</b>	MINT
<b>Alarm ID</b>	1368
<b>Description</b>	This alarm is activated when DIST-IN data are not received from controller with <b>ICC Address = 57</b> .

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## DISTIN 58

<b>Alarm Type</b>	Based on configuration
<b>Alarmlist message</b>	Wrn/Sd DISTIN 58
<b>Alarm evaluated</b>	Only if DIST-IN 58 is configured
<b>Related applications</b>	MINT
<b>Alarm ID</b>	1369
<b>Description</b>	This alarm is activated when DIST-IN data are not received from controller with <b>ICC Address = 58</b> .

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## DISTIN 59

<b>Alarm Type</b>	Based on configuration
<b>Alarmlist message</b>	Wrn/Sd DISTIN 59
<b>Alarm evaluated</b>	Only if DIST-IN 59 is configured
<b>Related applications</b>	MINT
<b>Alarm ID</b>	1370
<b>Description</b>	This alarm is activated when DIST-IN data are not received from controller with <b>ICC Address = 59</b> .

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## DISTIN 60

<b>Alarm Type</b>	Based on configuration
<b>Alarmlist message</b>	Wrn/Sd DISTIN 60
<b>Alarm evaluated</b>	Only if DIST-IN 60 is configured
<b>Related applications</b>	MINT
<b>Alarm ID</b>	1371
<b>Description</b>	This alarm is activated when DIST-IN data are not received from controller with <b>ICC Address = 60</b> .

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## DISTIN 61

<b>Alarm Type</b>	Based on configuration
<b>Alarmlist message</b>	Wrn/Sd DISTIN 61
<b>Alarm evaluated</b>	Only if DIST-IN 61 is configured
<b>Related applications</b>	MINT
<b>Alarm ID</b>	1372
<b>Description</b>	This alarm is activated when DIST-IN data are not received from controller with <b>ICC Address = 61</b> .

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## DISTIN 62

<b>Alarm Type</b>	Based on configuration
<b>Alarmlist message</b>	Wrn/Sd DISTIN 62
<b>Alarm evaluated</b>	Only if DIST-IN 62 is configured
<b>Related applications</b>	MINT
<b>Alarm ID</b>	1373
<b>Description</b>	This alarm is activated when DIST-IN data are not received from controller with <b>ICC Address = 62</b> .

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## DISTIN 63

<b>Alarm Type</b>	Based on configuration
<b>Alarmlist message</b>	Wrn/Sd DISTIN 63
<b>Alarm evaluated</b>	Only if DIST-IN 63 is configured
<b>Related applications</b>	MINT
<b>Alarm ID</b>	1374
<b>Description</b>	This alarm is activated when DIST-IN data are not received from controller with <b>ICC Address = 63</b> .

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## DISTIN 64

<b>Alarm Type</b>	Based on configuration
<b>Alarmlist message</b>	Wrn/Sd DISTIN 64
<b>Alarm evaluated</b>	Only if DIST-IN 64 is configured
<b>Related applications</b>	MINT
<b>Alarm ID</b>	1375
<b>Description</b>	This alarm is activated when DIST-IN data are not received from controller with <b>ICC Address = 64</b> .

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## DISTOUT

<b>Alarm Type</b>	Based on configuration
<b>Alarmlist message</b>	Wrn/Sd DISTOUT
<b>Alarm evaluated</b>	Only if DIST-OUT is configured
<b>Related applications</b>	MINT
<b>Description</b>	This alarm is activated when failure of virtual module DIST-OUT is detected.

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### ECU 1 Comm Fail

<b>Alarm Type</b>	Based on configuration
<b>Alarmlist message</b>	Name of ECU in ECU slot 1
<b>Alarm evaluated</b>	1. ECU with protection configured in ECU slot 1
<b>Related applications</b>	MINT
<b>Alarm ID</b>	945
<b>Description</b>	This alarm is activated when there is no communication received from ECU configured in ECU slot 1. This alarm has FPS - <b>FIXED PROTECTIONS STATES 3.</b>

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### ECU 2 Comm Fail

<b>Alarm Type</b>	Based on configuration
<b>Alarmlist message</b>	Name of ECU in ECU slot 2
<b>Alarm evaluated</b>	1. ECU with protection configured in ECU slot 2
<b>Related applications</b>	MINT
<b>Alarm ID</b>	946
<b>Description</b>	This alarm is activated when there is no communication received from ECU configured in ECU slot 2. This alarm has FPS - <b>FIXED PROTECTIONS STATES 3.</b>

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### ECU 3 Comm Fail

<b>Alarm Type</b>	Based on configuration
<b>Alarmlist message</b>	Name of ECU in ECU slot 3
<b>Alarm evaluated</b>	1. ECU with protection configured in ECU slot 3
<b>Related applications</b>	MINT
<b>Alarm ID</b>	947
<b>Description</b>	This alarm is activated when there is no communication received from ECU configured in ECU slot 3. This alarm has FPS - <b>FIXED PROTECTIONS STATES 3.</b>

 [back to List of other alarms](#)



## ECU 4 Comm Fail

<b>Alarm Type</b>	Based on configuration
<b>Alarmlist message</b>	Name of ECU in ECU slot 4
<b>Alarm evaluated</b>	1. ECU with protection configured in ECU slot 4
<b>Related applications</b>	MINT
<b>Alarm ID</b>	948
<b>Description</b>	This alarm is activated when there is no communication received from ECU configured in ECU slot 4. This alarm has FPS - <b>FIXED PROTECTIONS STATES 3.</b>

 [back to List of other alarms](#)

## ECU 5 Comm Fail

<b>Alarm Type</b>	Based on configuration
<b>Alarmlist message</b>	Name of ECU in ECU slot 5
<b>Alarm evaluated</b>	1. ECU with protection configured in ECU slot 5
<b>Related applications</b>	MINT
<b>Alarm ID</b>	949
<b>Description</b>	This alarm is activated when there is no communication received from ECU configured in ECU slot 5. This alarm has FPS - <b>FIXED PROTECTIONS STATES 3.</b>

 [back to List of other alarms](#)

## ECU 6 Comm Fail

<b>Alarm Type</b>	Based on configuration
<b>Alarmlist message</b>	Name of ECU in ECU slot 6
<b>Alarm evaluated</b>	1. ECU with protection configured in ECU slot 6
<b>Related applications</b>	MINT
<b>Alarm ID</b>	950
<b>Description</b>	This alarm is activated when there is no communication received from ECU configured in ECU slot 6. This alarm has FPS - <b>FIXED PROTECTIONS STATES 3.</b>

 [back to List of other alarms](#)

## ECU 7 Comm Fail

<b>Alarm Type</b>	Based on configuration
<b>Alarmlist message</b>	Name of ECU in ECU slot 7
<b>Alarm evaluated</b>	1. ECU with protection configured in ECU slot 7
<b>Related applications</b>	MINT
<b>Alarm ID</b>	951
<b>Description</b>	This alarm is activated when there is no communication received from ECU



	configured in ECU slot 7. This alarm has FPS - <b>FIXED PROTECTIONS STATES 3.</b>
--	--

🔍 back to List of other alarms

### ECU 8 Comm Fail

<b>Alarm Type</b>	Based on configuration
<b>Alarmlist message</b>	Name of ECU in ECU slot 8
<b>Alarm evaluated</b>	1. ECU with protection configured in ECU slot 8
<b>Related applications</b>	MINT
<b>Alarm ID</b>	952
<b>Description</b>	This alarm is activated when there is no communication received from ECU configured in ECU slot 8. This alarm has FPS - <b>FIXED PROTECTIONS STATES 3.</b>

🔍 back to List of other alarms

### ECU 9 Comm Fail

<b>Alarm Type</b>	Based on configuration
<b>Alarmlist message</b>	Name of ECU in ECU slot 9
<b>Alarm evaluated</b>	1. ECU with protection configured in ECU slot 9
<b>Related applications</b>	MINT
<b>Alarm ID</b>	953
<b>Description</b>	This alarm is activated when there is no communication received from ECU configured in ECU slot 9. This alarm has FPS - <b>FIXED PROTECTIONS STATES 3.</b>

🔍 back to List of other alarms

### SHAIN 1

<b>Alarm Type</b>	Based on configuration
<b>Alarmlist message</b>	Wrn/Sd SHAIN 1
<b>Alarm evaluated</b>	Only if SHAIN 1 is configured
<b>Related applications</b>	MINT
<b>Alarm ID</b>	36
<b>Description</b>	This alarm is activated when shared analog inputs are not received from SHAIN module 1.

🔍 back to List of alarms level 1

### SHAIN 2

<b>Alarm Type</b>	Based on configuration
<b>Alarmlist message</b>	Wrn/Sd SHAIN 2
<b>Alarm evaluated</b>	Only if SHAIN 2 is configured



<b>Related applications</b>	MINT
<b>Alarm ID</b>	233
<b>Description</b>	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

<b>Alarm Type</b>	Warning
<b>Alarmlist message</b>	Wrn SHAIN Collision
<b>Alarm evaluated</b>	Only if SHIN 1 or SHAIN 2 module is configured
<b>Related applications</b>	MINT
<b>Alarm ID</b>	38
<b>Description</b>	This alarm is activated when controller receives shared analog inputs of any SHAIN module from more than just one controller.  This alarm has FPS - <b>FIXED PROTECTIONS STATES 1</b>

🔍 back to List of alarms level 1

### SHBIN 1

<b>Alarm Type</b>	Based on configuration
<b>Alarmlist message</b>	Wrn/Sd SHBIN 1
<b>Alarm evaluated</b>	Only if SHBIN 1 is configured
<b>Related applications</b>	MINT
<b>Alarm ID</b>	32
<b>Description</b>	This alarm is activated when shared binary inputs are not received from SHBIN module 1.

🔍 back to List of alarms level 1

### SHBIN 2

<b>Alarm Type</b>	Based on configuration
<b>Alarmlist message</b>	Wrn/Sd SHBIN 2
<b>Alarm evaluated</b>	Only if SHBIN 2 is configured
<b>Related applications</b>	MINT
<b>Alarm ID</b>	33
<b>Description</b>	This alarm is activated when shared binary inputs are not received from SHBIN module 2.

🔍 back to List of alarms level 1

### SHBIN 3

<b>Alarm Type</b>	Based on configuration
<b>Alarmlist message</b>	Wrn/Sd SHBIN 3



<b>Alarm evaluated</b>	Only if SHBIN 3 is configured
<b>Related applications</b>	MINT
<b>Alarm ID</b>	34
<b>Description</b>	This alarm is activated when shared binary inputs are not received from SHBIN module 3.

⬅ back to List of alarms level 1

#### SHBIN 4

<b>Alarm Type</b>	Based on configuration
<b>Alarmlist message</b>	Wrn/Sd SHBIN 4
<b>Alarm evaluated</b>	Only if SHBIN 4 is configured
<b>Related applications</b>	MINT
<b>Alarm ID</b>	35
<b>Description</b>	This alarm is activated when shared binary inputs are not received from SHBIN module 4.

⬅ back to List of alarms level 1

#### SHBIN 5

<b>Alarm Type</b>	Based on configuration
<b>Alarmlist message</b>	Wrn/Sd SHBIN 5
<b>Alarm evaluated</b>	Only if SHBIN 5 is configured
<b>Related applications</b>	MINT
<b>Alarm ID</b>	216
<b>Description</b>	This alarm is activated when shared binary inputs are not received from SHBIN module 5.

⬅ back to List of alarms level 1

#### SHBIN 6

<b>Alarm Type</b>	Based on configuration
<b>Alarmlist message</b>	Wrn/Sd SHBIN 6
<b>Alarm evaluated</b>	Only if SHBIN 6 is configured
<b>Related applications</b>	MINT
<b>Alarm ID</b>	217
<b>Description</b>	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

<b>Alarm Type</b>	<b>Warning</b>
<b>Alarmlist message</b>	Wrn SHBIN Collision



<b>Alarm evaluated</b>	Only if at least one of SHBIN 1 to SHBIN 6 modules is configured
<b>Related applications</b>	MINT
<b>Alarm ID</b>	37
<b>Description</b>	<p>This alarm is activated when controller receives shared binary inputs of any SHBIN module from more than just one controller.</p> <p>This alarm has FPS - <b>FIXED PROTECTIONS STATES 1</b></p>

🔍 back to List of alarms level 1

## MP VRT Protection Trip

<b>Alarm Type</b>	Based on Dynamic Support Protection Type
<b>Alarmlist message</b>	Wrn/MP VRT Protection Trip
<b>Alarm evaluated</b>	Only when Dynamic Support = Enabled and and <b>Breaker state</b> = ParalOper
<b>Related applications</b>	MINT
<b>Alarm ID</b>	1043
<b>Description</b>	<p>This alarm indicates active Dynamic Support protection.</p> <p>This alarm has FPS - <b>FIXED PROTECTIONS STATES 5</b></p>

🔍 back to List of other alarms

## Wrn Read Back Err Module Index N

<b>Alarm Type</b>	Based on configuration <b>Warning (page 1)</b>
<b>Alarmlist message</b>	Read Back Err Module Index N
<b>Alarm evaluated</b>	Only if I/O module with index N and enabled Output State Check is configured, and Protection Upon Module Failure is not set to None
<b>Related applications</b>	(missing or bad snippet)
<b>Alarm ID</b>	N/A
<b>Description</b>	<p>This alarm is activated when Output State Check detects fault on one or more binary outputs of the Intel® IO8/8 extension module. The index address (N) represents the module address, which is defined by the rotary address switch on the module and in the controller configuration.</p> <p>The type of alarm issued is determined by the Protection Upon Module Failure settings. More details about which specific output is affected can be found in the controller history.</p> <p>Possible faults based on Binary Output Type:</p> <ul style="list-style-type: none"> <li>➤ High Side <ul style="list-style-type: none"> <li>➤➤ Zero voltage while binary output is closed (short circuit)</li> <li>➤➤ Zero voltage while binary output is closed (disconnected VHS)</li> <li>➤➤ Voltage on binary output while it is opened</li> </ul> </li> <li>➤ Low Side <ul style="list-style-type: none"> <li>➤➤ Voltage on binary output while it is closed (short circuit)</li> <li>➤➤ Zero voltage on binary output while it is opened</li> </ul> </li> </ul>



[back to List of other alarms](#) [back to List of alarms level 1](#)

## 9.3 Modules

9.3.1 CAN modules ..... 1099

### 9.3.1 CAN modules

Supported combinations of modules .....	1099
Module's protections .....	1100
Theory of binary inputs and outputs .....	1100
Extension modules .....	1104

### 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 Intelio 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, Intelio AIO9/1).

Each generic module has 8 "terminals" (inputs/outputs) and the IntelioNeo 530 BESS 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 IntelioNeo 530 BESS.

CAN Module	Max number of indexes	AI generic	AO generic	BI generic	BO generic
Intelio AIN8	10	1	0	0	0
Intelio IO 8/8	12	0	1	1	1
Intelio IO 16/0	8	0	1	2	0
IGL-RA15	4	0	0	0	2
IGS-PTM	4	1	1	1	1
Intelio AIO9/1	5	2	1	0	0
Intelio AIN8TC	10	1	0	0	0
I-AOUT8	4	0	1	0	0
IS-AIN8	10	1	0	0	0



**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 Intel IO8/8 has available AOUT only if it is configured with index number below 9 and Intel AIO9/1 has available AOUT only if it is configured with index number below 5.

**Note:** Module Intel IO8/8 with older FW than 1.3.1.2 has available AOUT only if it is configured with index number below 5.

## Module's protections

Each configured CAN module can have its own protection and protection state. For setup: connect the controller via IntelliConfig → 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 Intel AIN8 10 = Warning upon module failure of the Intel AIN8 module with index 10.

## Theory of binary inputs and outputs

Binary inputs .....	1100
Binary outputs .....	1102

Type of the binary inputs/outputs of some configured modules using BINs or BOUTs can be changed via IntelliConfig. For setup: connect the controller via IntelliConfig → Control → Controller Configuration → Modules → Module Settings → **Binary Inputs Type / Binary Outputs Type**.

See the following chapters for more details.

### Binary inputs

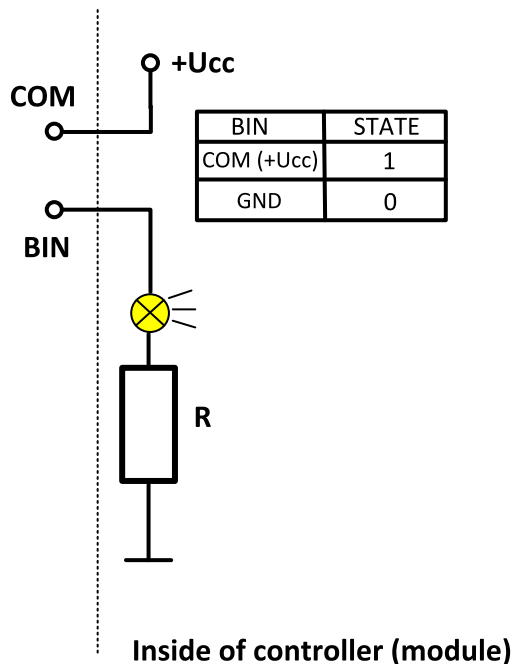
#### Pull Down

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



**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".

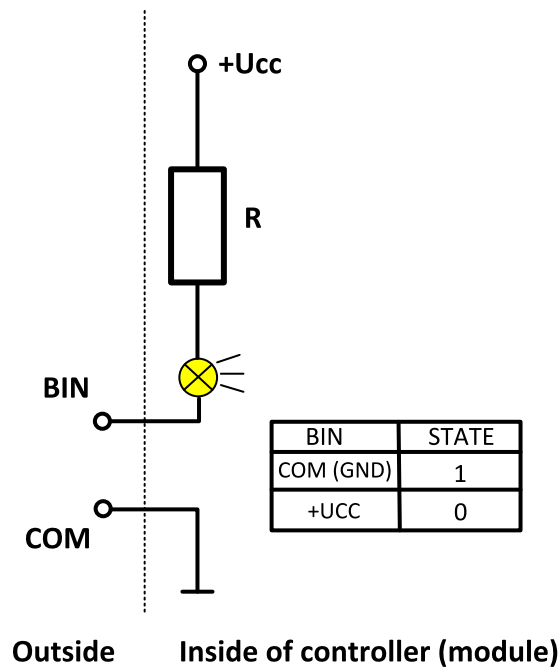
### Pull Up

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



**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

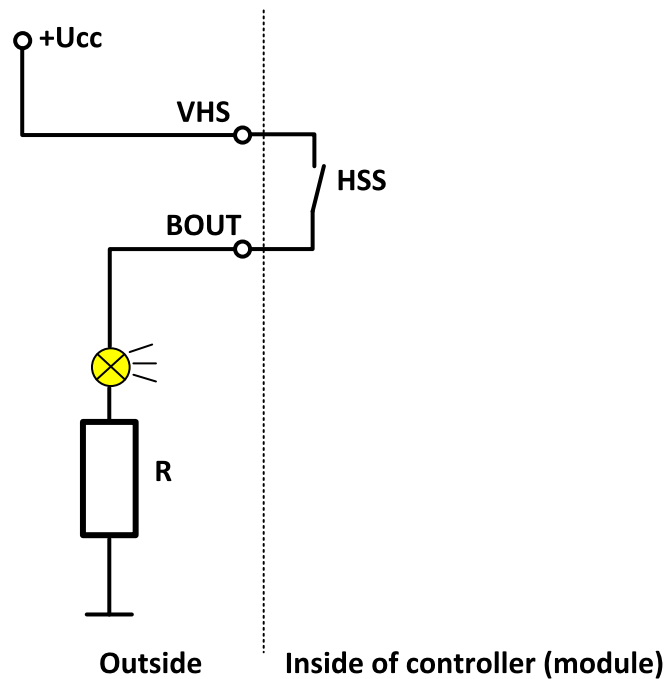
#### High side switch - HSS

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.



### Binary output: High side switch HSS



### Low side switch - LSS

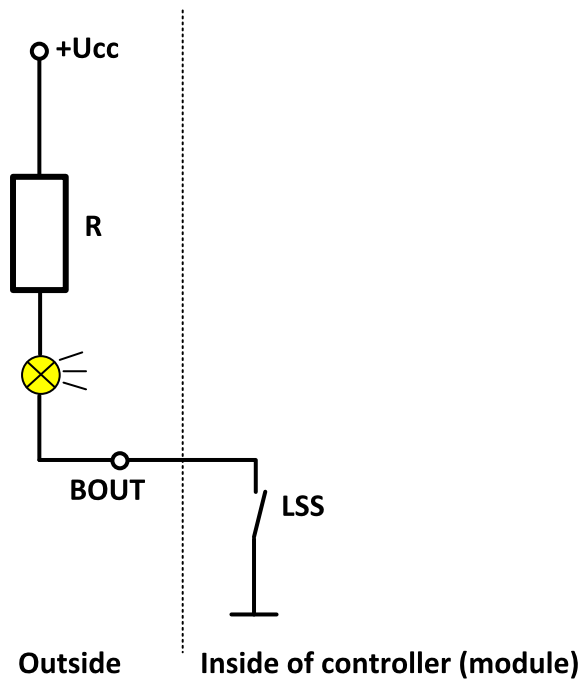
The low side logic is used when load is permanently connected to the voltage (+Ucc). In case module will be turned off or the connection will be lost the external devices will be activated. It can be used as inverse logic for the detection of the lost connection.

- 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 IntelliNeo 530 BESS 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.



### Binary output: Low side switch LSS



🔍 back to Theory of binary inputs and outputs

## Extension modules

Inteli AIN8 .....	1104
Inteli IO8/8 .....	1110
IGL-RA15 .....	1117
IGS-PTM .....	1122
Inteli AIO9/1 .....	1127
Inteli AIN8TC .....	1132
I-AOUT8 .....	1136
IS-AIN8 .....	1140

### Inteli AIN8

Inteli AIN8 module is extension module equipped with analog inputs and Impulse/RPM input. The module is connected to controller by **CAN1** 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 7.118 IntelI AIN8

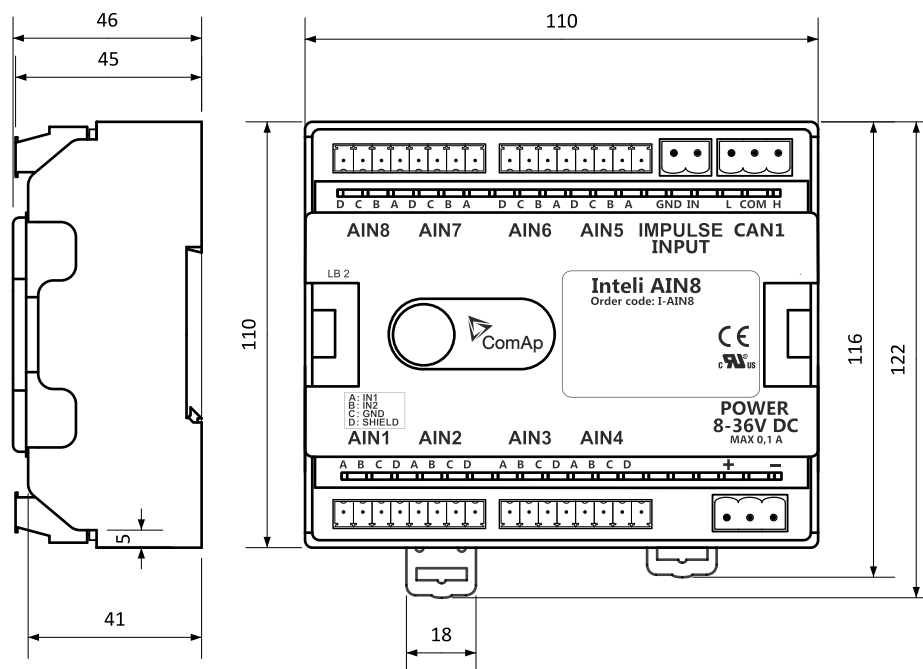
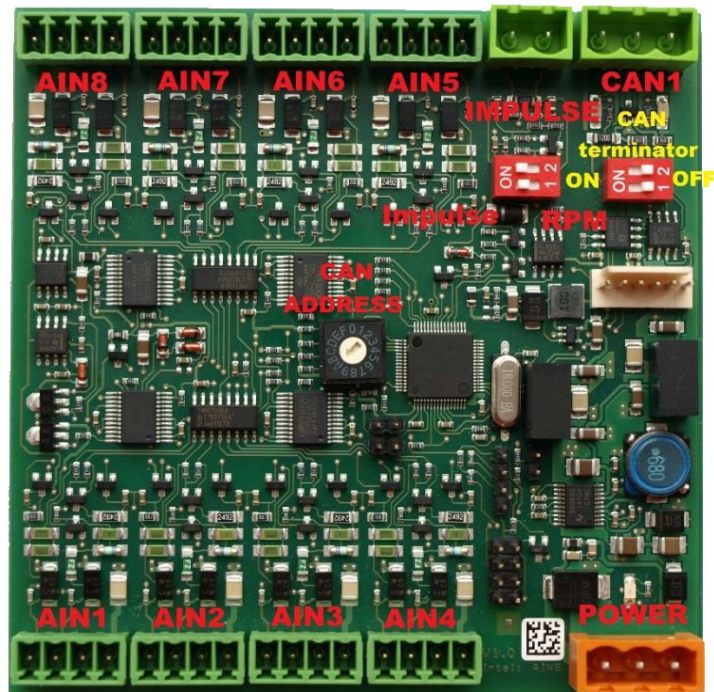


Image 7.119 IntelI AIN8 dimensions

**Note:** All dimensions are in mm.



## Terminals



Analog input	8 analog Inputs
CAN1	<b>CAN1</b> 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.

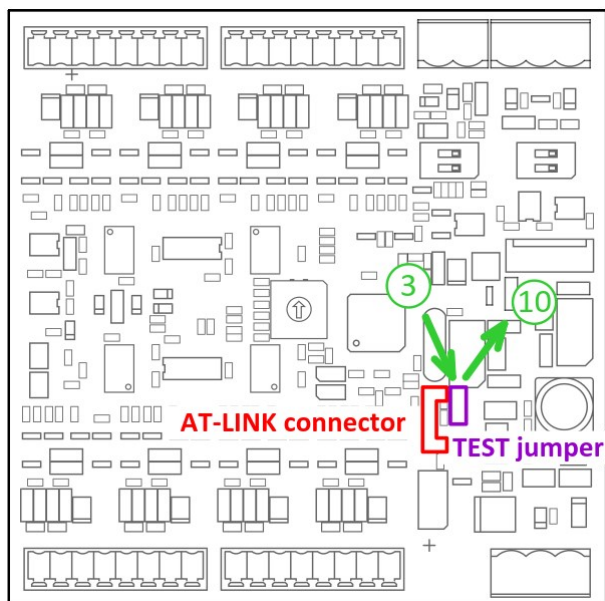


**Note:** In case of setting the CAN address to zero, the appropriate group of signals is deactivated.

## 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

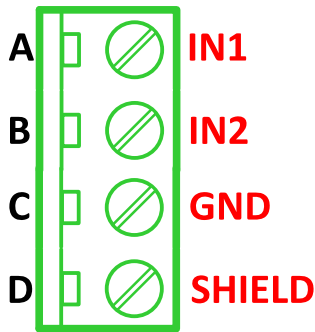
LED indication

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).

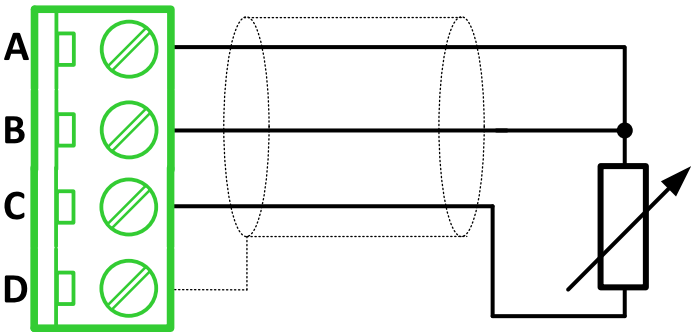
Wiring

The following diagrams show the correct connection of sensors.

Terminator



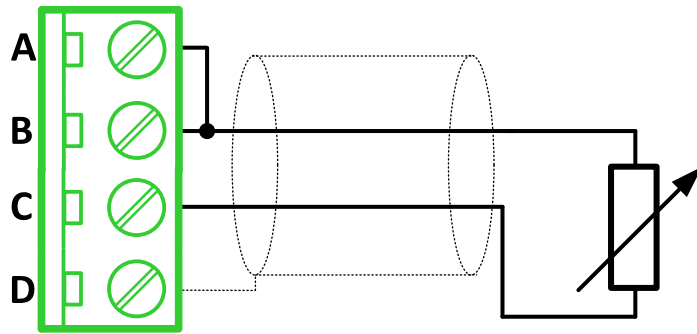
Resistance sensor - 3 wires



**Note:** Ranges: Pt100, Pt1000, Ni100, Ni1000, 0 – 2400 Ω, 0 – 10 kΩ

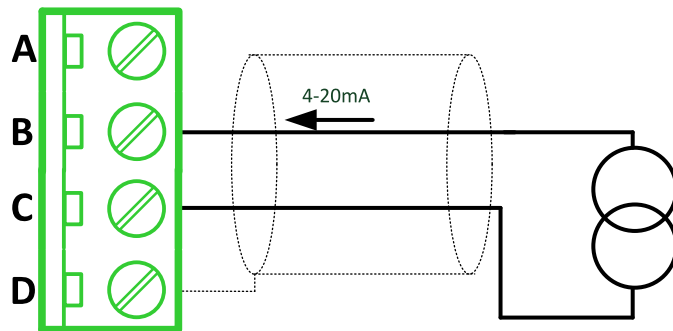


### Resistance sensor - 2 wires



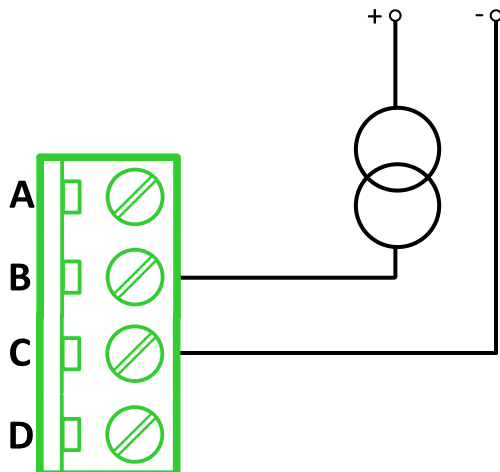
**Note:** Ranges: Pt100, Pt1000, Ni100, Ni1000, 0 – 2400  $\Omega$ , 0 – 10 k $\Omega$

### Current sensor - active



**Note:** Ranges:  $\pm 20$  mA, 4 – 20 mA

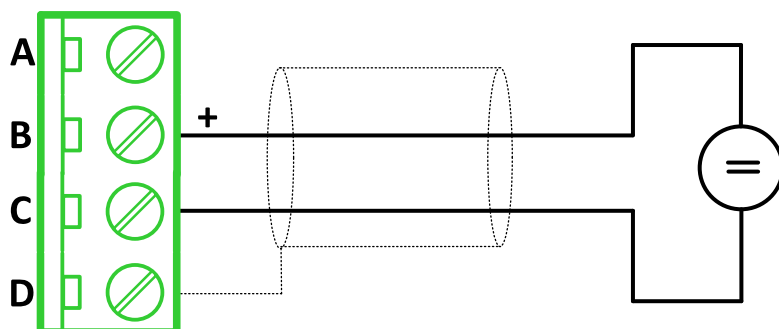
### Current sensor - passive



**Note:** Ranges: 0 – 20 mA, 4 – 20 mA



## Voltage sensor



**Note:** Ranges:  $\pm 1$  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	<b>CAN1</b>
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: $\pm 0,25$ % of actual value + $\pm 25$ mV
Current	Range: $\pm 20$ mA Accuracy: $\pm 0,25$ % of actual value + $\pm 50$ $\mu$ A
Resistive	Range: 0- 10 k $\Omega$ Accuracy: $\pm 0,5$ % of actual value + $\pm 2$ $\Omega$

[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 **CAN1** 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 7.120 Intel IO8/8

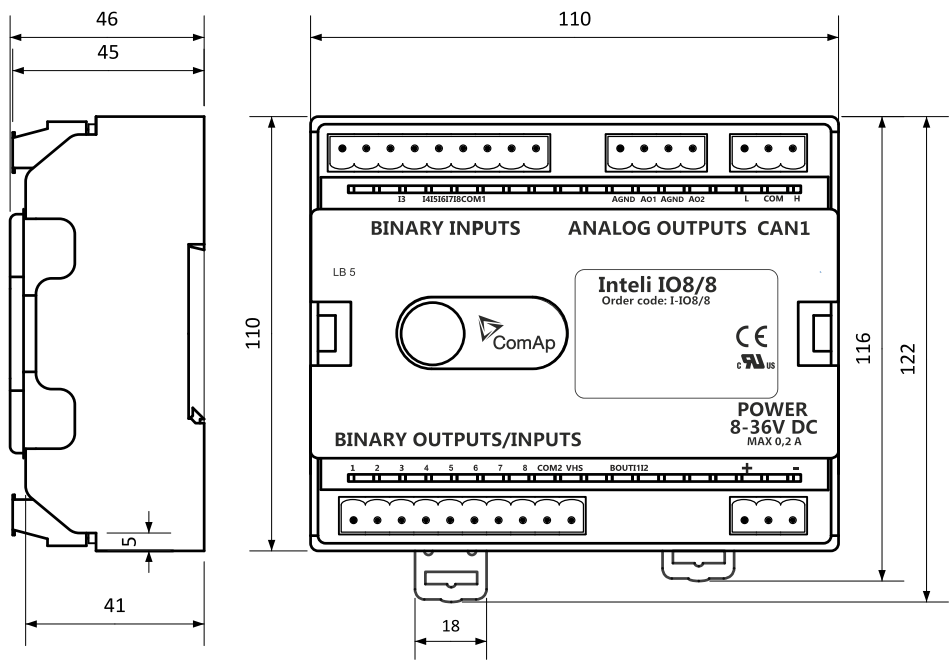
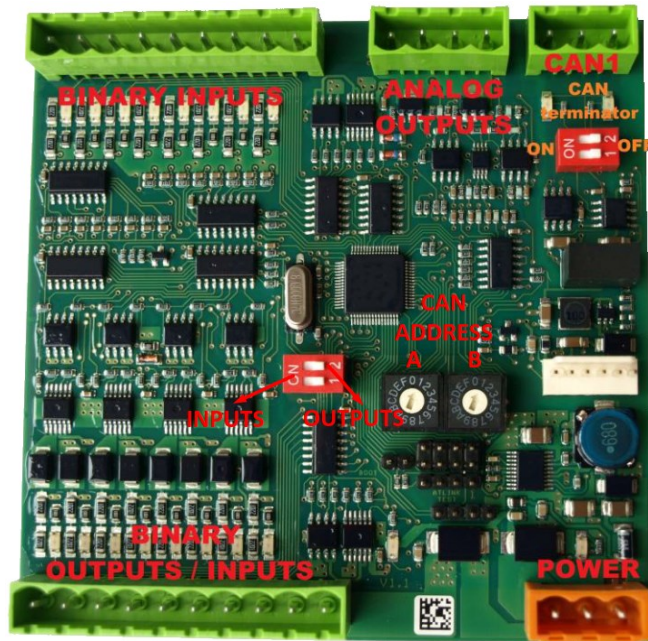


Image 7.121 Intel IO8/8 dimensions

**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	<b>CAN1</b> 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 ( Intel IO8/8 to Intel 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 Intel 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 Intel 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.

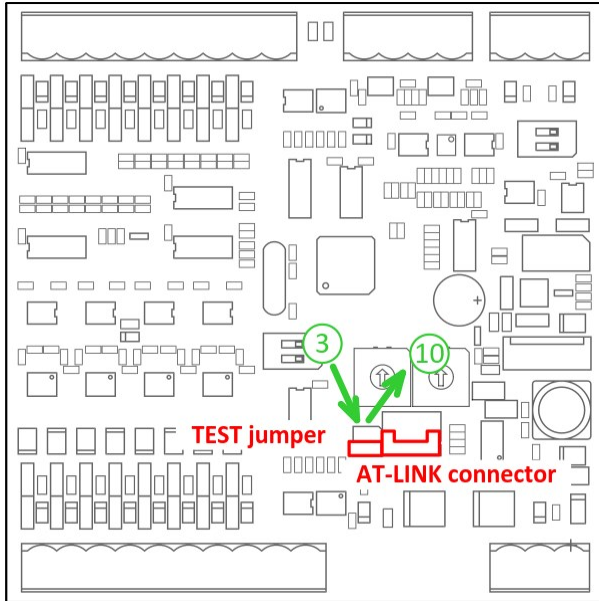
### Programming firmware

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

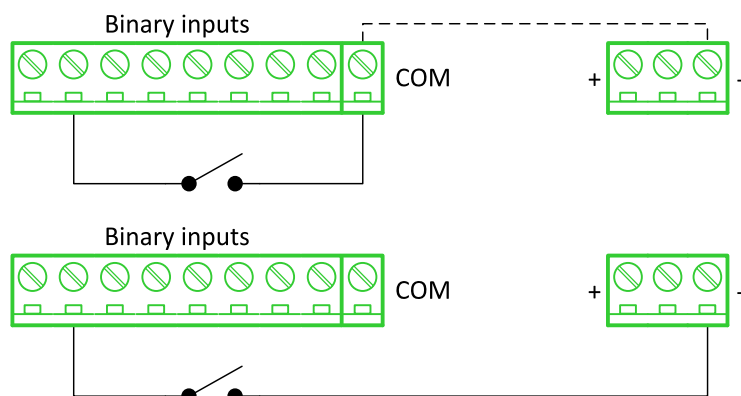


LED status	Description
Dark	Fw in module does not work correctly.
Flashing	Module does not communicate with controller (in case non-zero CAN address).
Lights	Power supply is in the range and the communication between Inteli IO8/8 and controller works properly. Or power supply is in range and zero CAN 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.

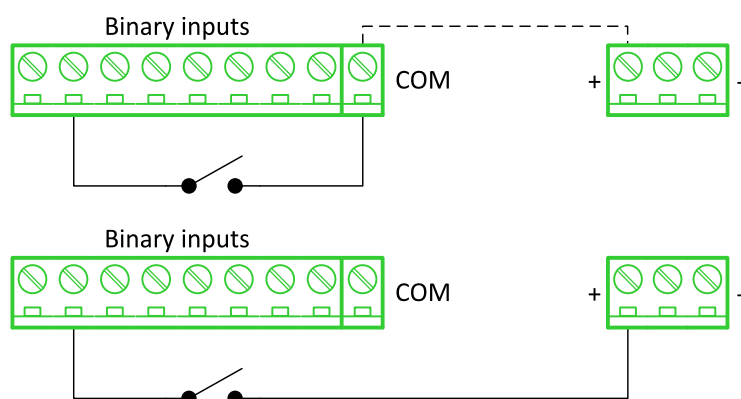
### Binary inputs - pull up



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

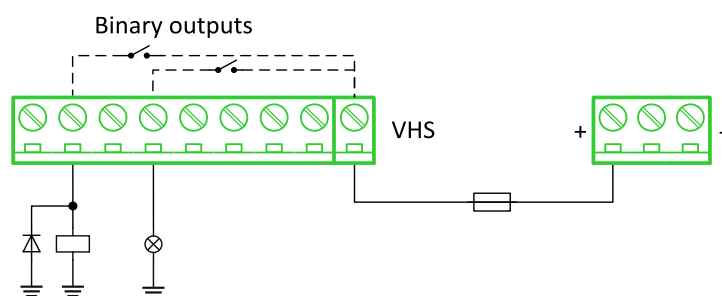


There are two options of wiring. On upper picture you can see case when binary input is connected between BIN2 and COM (COM is connected internally to the Ucc (+) - dashed line).

On lower picture is case of wiring between BIN2 and Ucc (+). Both ways are correct.

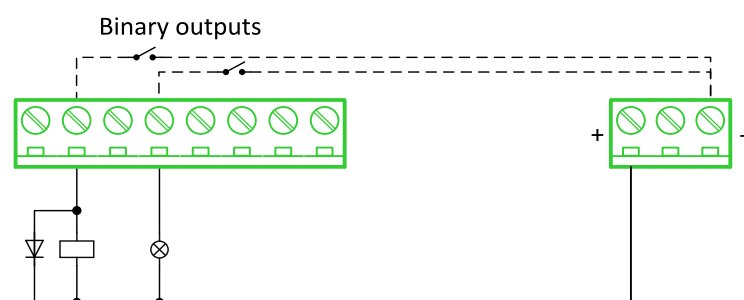


## Binary outputs - high side



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.

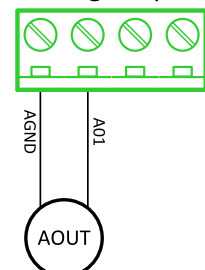
## Binary outputs - low side



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

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	CAN1
Protection	IP20
Storage temperature	- 40 °C to + 80 °C



<b>Operating temperature</b>	- 30 °C to + 70 °C
<b>Dimensions (WxHxD)</b>	110x110x46 mm (4,3"x4,3"x1,8")
<b>Weight</b>	240 grams

### Analog outputs

<b>Number of channels</b>	2
<b>Voltage</b>	Range 0-10 V Accuracy: $\pm 20$ mV + $\pm 0,5$ % of actual value I <sub>max</sub> 5 mA
<b>Current</b>	Range: 0-20 mA Accuracy: $\pm 100$ $\mu$ A + $\pm 0,5$ % of actual value R <sub>max</sub> 500 $\Omega$
<b>PWM</b>	Level 5 V Frequency - adjustable 200÷2400 Hz I <sub>max</sub> 20 mA

### Binary inputs

<b>Number of channels</b>	8 for Intel® IO8/8, 16 for Intel® IO16/0
<b>Input resistance</b>	4400 $\Omega$
<b>Input range</b>	0 to 36 V DC
<b>Switching voltage level for open contact indication</b>	0 to 2 V DC
<b>Max voltage level for close contact indication</b>	6 to 36 V DC

### Binary outputs

<b>Number of channels</b>	8 for Intel® IO8/8, 0 for Intel® IO16/0
<b>Max current</b>	500 mA
<b>Max switching voltage</b>	36 V DC

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## IGL-RA15

Remote annunciator (IGL-RA15) is designed as an extension signaling unit. The module is connected to controller by **CAN1** 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 7.122 IGL-RA15

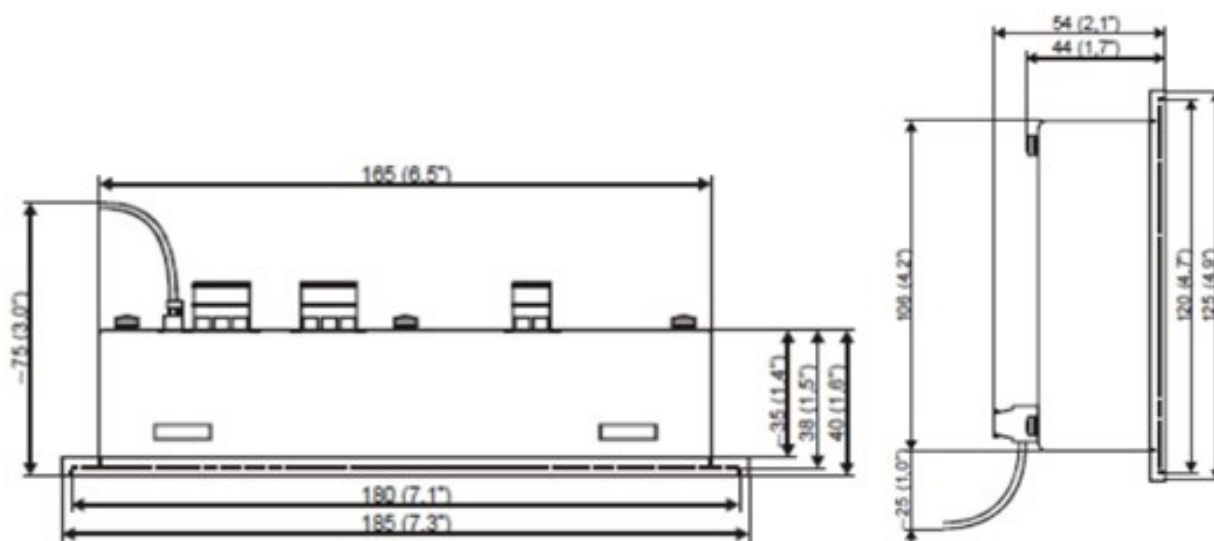


Image 7.123 IGL-RA15 dimensions

## Terminals

Horn	Horn
CAN	<b>CAN1</b> 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 **CAN1** 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 **CAN1** 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 be adjusted 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 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 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**

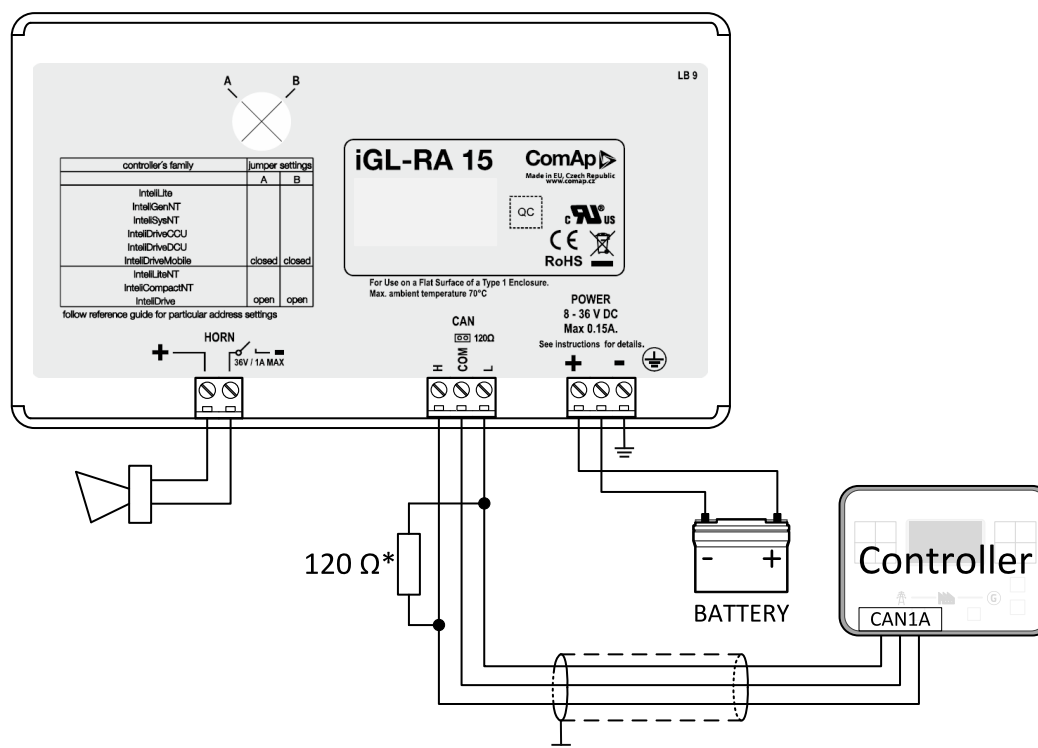
#### The horn can be silenced:

- 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 (+1A max horn output) depends on supply voltage
Protection	IP65
Interface to controller	<b>CAN1</b>
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 <sup>2</sup>
Maximal attenuation (at 1 MHz)	2 dB/100m
<b>Recommended Industrial Automation &amp; Process Control Cables</b>	
<b>BELDEN</b> ( <a href="http://www.belden.com">www.belden.com</a> )	<ul style="list-style-type: none"> <li>➤ 3082A DeviceBus for Allen-Bradley DeviceNet</li> <li>➤ 3083A DeviceBus for Allen-Bradley DeviceNet</li> <li>➤ 3086A DeviceBus for Honeywell SDS</li> <li>➤ 3087A DeviceBus for Honeywell SDS</li> <li>➤ 3084A DeviceBus for Allen-Bradley DeviceNet</li> <li>➤ 3085A DeviceBus for Allen-Bradley DeviceNet</li> <li>➤ 3105A Paired EIA Industrial RS485 cable</li> </ul>
<b>LAPP CABLE</b> ( <a href="http://www.lappcable.com">www.lappcable.com</a> )	<ul style="list-style-type: none"> <li>➤ Unitronic BUS DeviceNet Trunk Cable</li> <li>➤ Unitronic BUS DeviceNet Drop Cable</li> <li>➤ Unitronic BUS CAN</li> <li>➤ Unitronic-FD BUS P CAN UL/CSA</li> </ul>



**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 **CAN1** bus. It is possible to connect up to 4 IGS-PTM external units to one controller.



Image 7.124 IGS-PTM

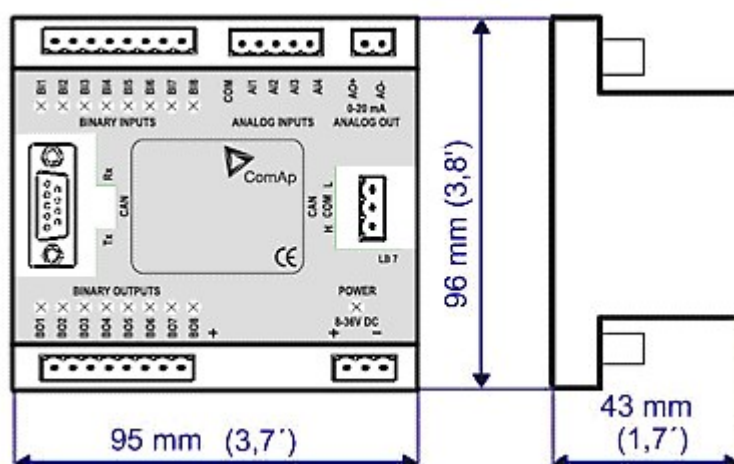
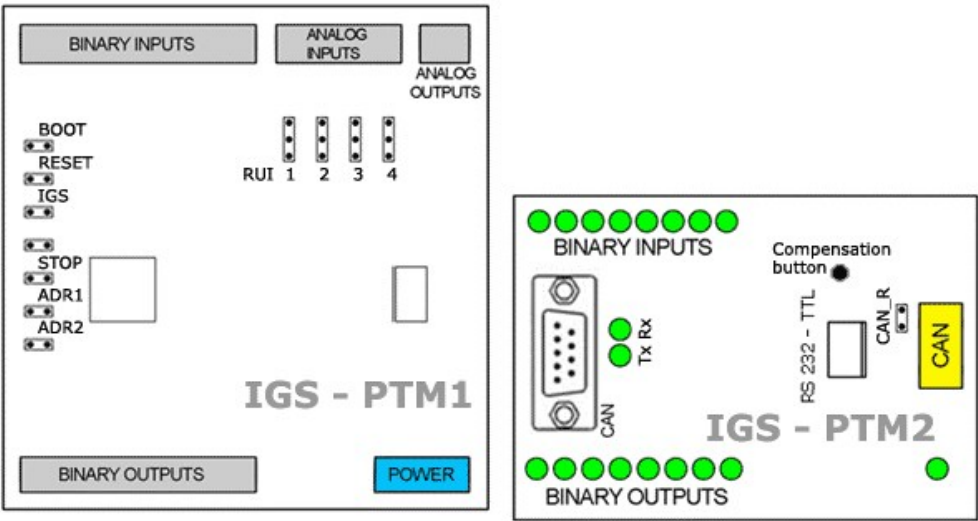


Image 7.125 IGS-PTM dimensions



Terminals



Binary inputs	8 binary inputs
Analog inputs	4 analog inputs
Analog outputs	1 analog output
Binary outputs	8 binary outputs
CAN	<b>CAN1</b> 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, IntelliLite

### Address configuration

If IntelliLite 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.

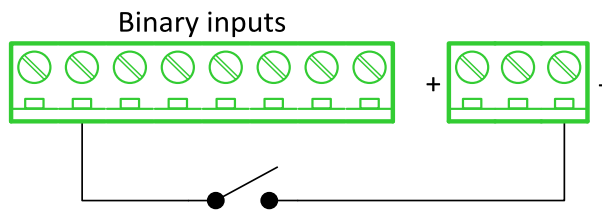
### LED at power connector - status LED

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.

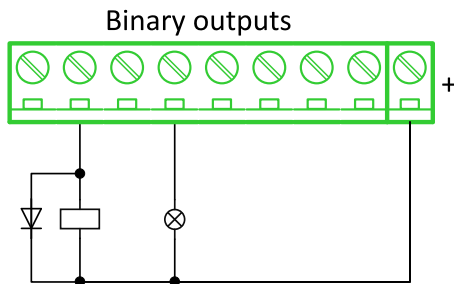


## Wiring

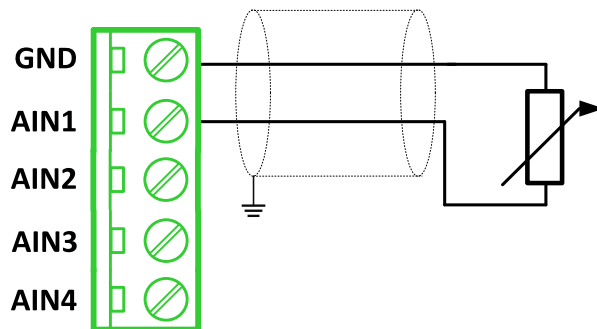
### Binary inputs



### Binary outputs



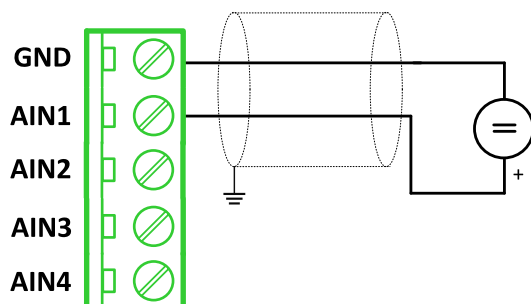
### Resistance sensor



**Note:** Range: 0- 2400  $\Omega$

**IMPORTANT:** Physical analog input range is 0-250  $\Omega$ . In sensor configuration in PC tool it is necessary to chose 0-2400  $\Omega$  sensor HW type to ensure proper function of analog input.

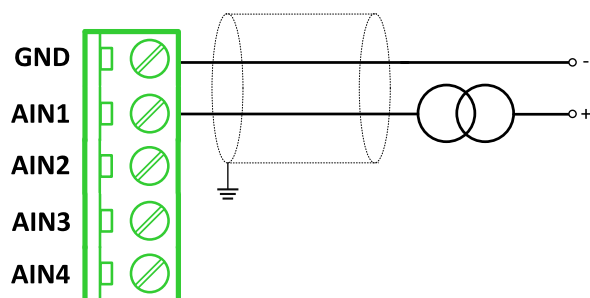
### Voltage sensor



**Note:** Range 0-100 mV



### Current sensor - passive

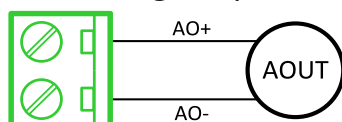


**Note:** Range:  $\pm 0-20 \text{ mA}$

**IMPORTANT:** Physical analog input range is 0-20mA. In sensor configuration in PC tool it is necessary to choose  $\pm 20\text{mA}$  active sensor HW type to ensure proper function of analog input.

### Analog outputs

#### Analog output



**Note:** Range: 0 to 20 mA  $\pm 0,33 \text{ mA}$

### Technical data

#### General data

Power supply	8 to 36 V DC
Current consumption	100 mA at 24V $\div$ 500 mA
Interface to controller	<b>CAN1</b>
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 % $\pm$ 1 mV out of measured value
Current	Range: 0-20 mA Accuracy: 2.5 % $\pm$ 0,5 ohm out of measured value
Resistive	Range: 0- 250 $\Omega$ Accuracy: 1 % $\pm$ 2 ohm out of measured value



## Analog outputs

Number of channels	1
Current	Range: 0 to 20 mA $\pm$ 0,33 mA Resolution 10 bit

## Binary inputs

Number of channels	8
Input resistance	4700 $\Omega$
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 % $\pm$ 1 mV out of measured value
Current	Range: 0-20 mA Accuracy: 2.5 % $\pm$ 0,5 ohm out of measured value
Resistive	Range: 0- 250 $\Omega$ Accuracy: 1 % $\pm$ 2 ohm out of measured value

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### 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 **CAN1** 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 7.126 Intel AIO9/1

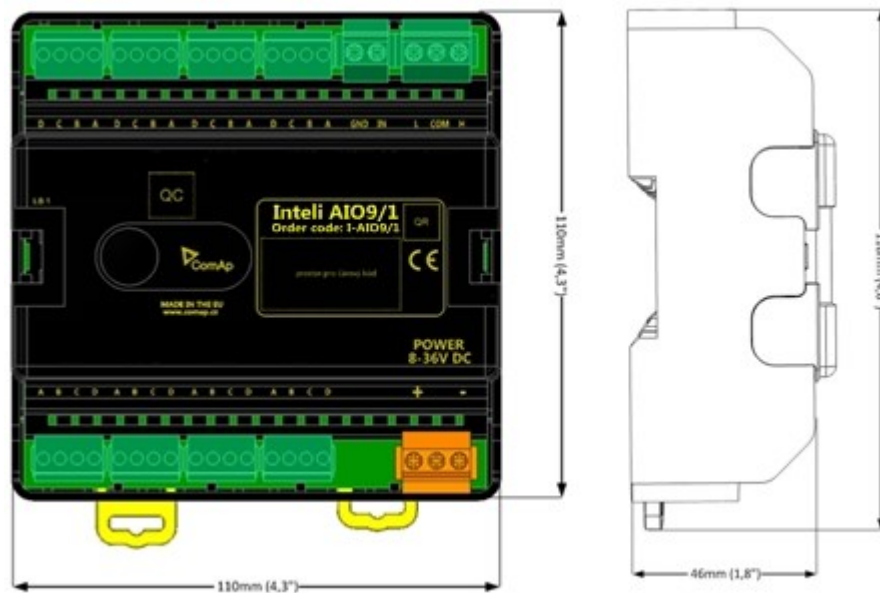
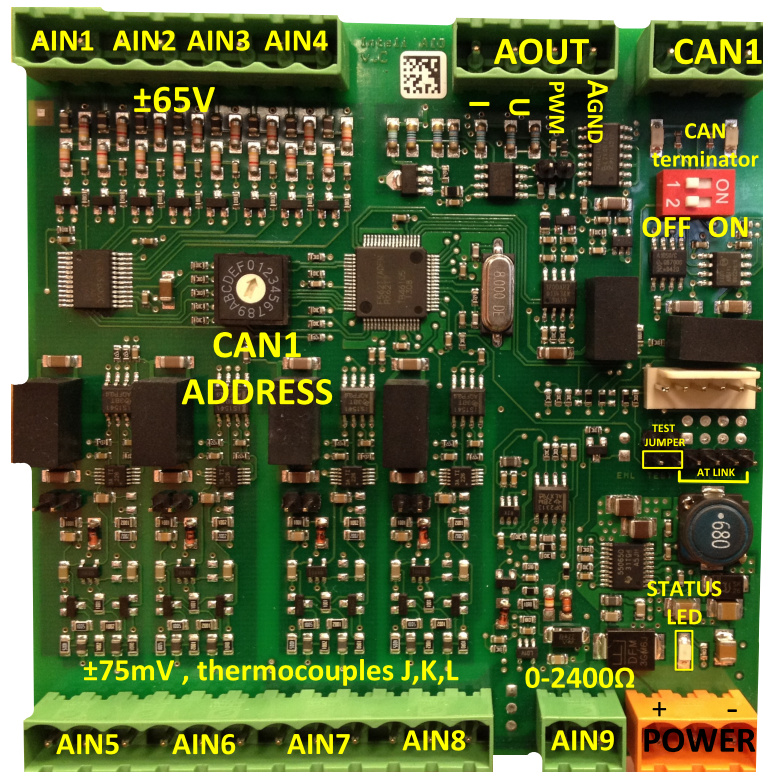


Image 7.127 Intel AIO9/1 dimensions



## Terminals



<b>ANALOG INPUT</b>	9 channels
<b>ANALOG OUTPUTS</b>	1 channel
<b>CAN</b>	CAN1 line
<b>POWER</b>	Power supply
<b>CAN LED Tx, Rx</b>	Indication transmitted or received data
<b>Status LED</b>	LED indication of correct function
<b>CAN terminator</b>	Terminating CAN resistor (active in position "ON")
<b>TEST jumper</b>	Upgrade of SW
<b>AT-LINK</b>	Connector for AT-LINK (Upgrade of SW)

## Analog inputs

- 4 channels AIN1 – AIN4 can be configured as:
  - Sensor  $\pm 65\text{V}$  (determined for measurement of battery voltage)
- 4 channels AIN5 – AIN8 can be configured as:
  - Thermocouples – type J,K or L (in  $^{\circ}\text{C}$  or  $^{\circ}\text{F}$ )
  - Sensor  $\pm 75\text{mV}$  DC – (for connecting current shunts)
- 1 channel AIN9 can be configured as:
  - RTD (Pt1000, Ni1000)
  - Common resistance 0-2400 $\Omega$



## 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.

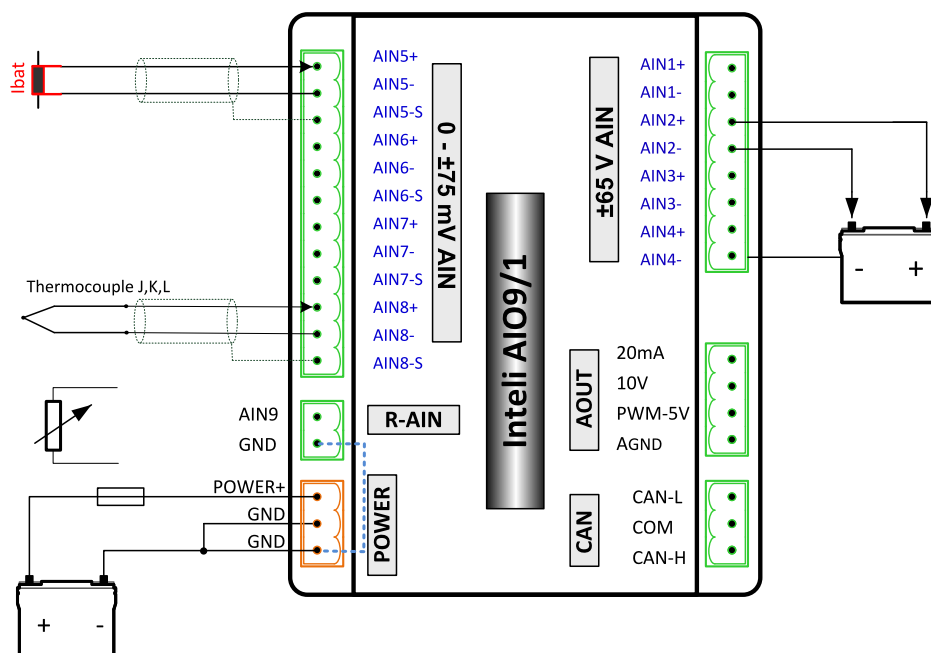
## LED indication

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  $\Omega$ .

Analog input 9 is determined for measuring resistance only.

## Technical data

## General data

<b>Dimension (W × H × D)</b>	110 × 110 × 46 mm (4.3" × 4.3" × 1.8")
<b>Weight</b>	248 grams
<b>Interface to controller</b>	CAN1 – galvanic separated from power supply and measurement,

### Analog inputs (not electric separated)

9 channels		
AIN1-AIN4 – Voltage inputs	Range	0-65 V $\pm$ 0.25 % of actual value + $\pm$ 120 mV Measurement is not galvanic separated from power supply, but IN- is not interconnected with GND – there is floating measurement.
	Accuracy of	$\pm$ 0,1 % of actual value + $\pm$ 100 $\mu$ V ( $\pm$ 3 $^{\circ}$ C)



<b>AIN5-AIN8 – Voltage inputs</b>	<b>measurement</b>	
	<b>Range</b>	± 75 mV (nominal) (measurement up to ±80 mV)
	<b>Accuracy of measurement</b>	± 0.1 % of actual value + ± 75 µV Galvanic separated from power supply
<b>AIN9 resistance input</b>	<b>Range</b>	0- 2400 Ω
	<b>Accuracy of measurement</b>	± 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

<b>Galvanic separation</b>	CAN bus is galvanic separated from the measurement and power supply
----------------------------	---

<b>Power supply</b>	8 to 36 V DC
<b>Protection</b>	IP20
<b>Current consumption</b>	150 mA at 24 V ÷ 400 mA at 8 V
<b>Storage temperature</b>	- 40 °C to + 80 °C
<b>Operating temperature</b>	- 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 **CAN1** 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 7.128 Intel AIN8TC

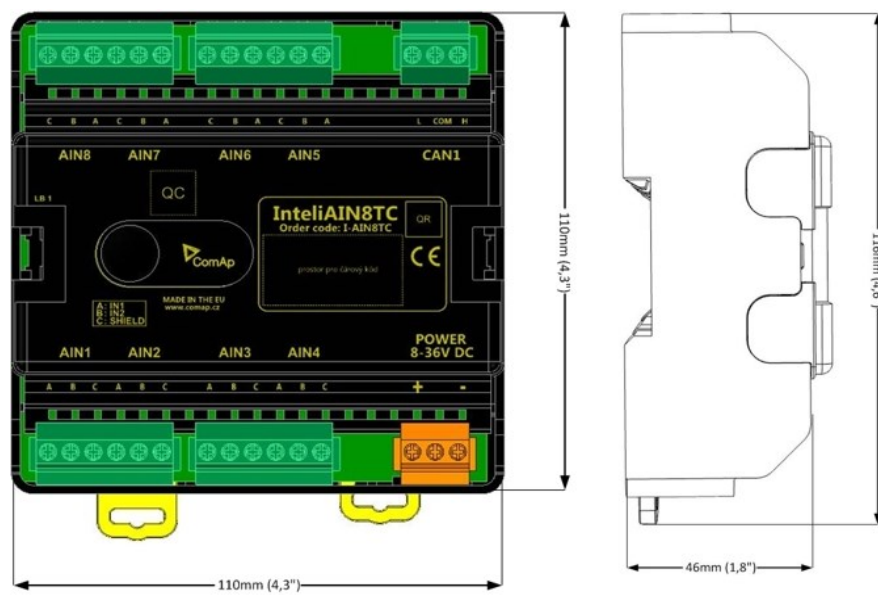
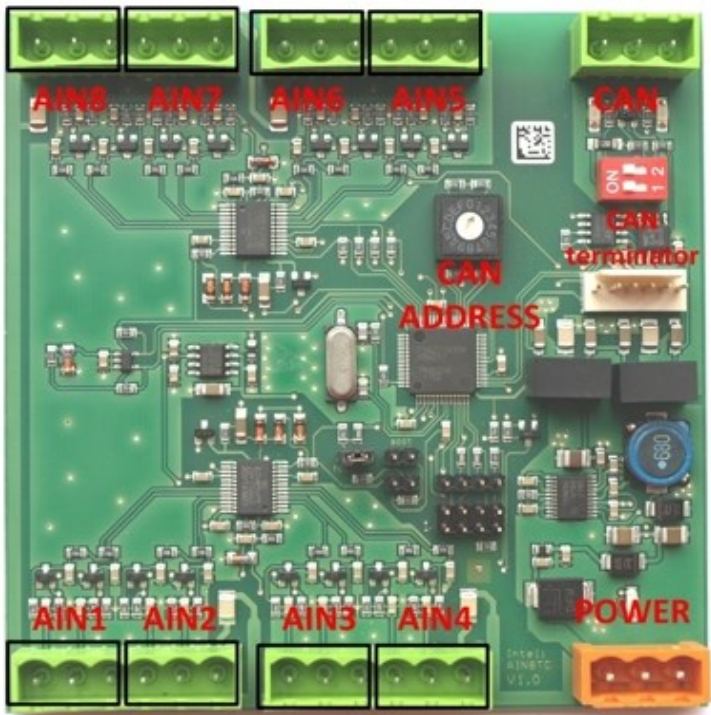


Image 7.129 Intel AIN8TC dimensions



**Terminals**



Analog input	8 analog Inputs
CAN	<b>CAN1</b> 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.

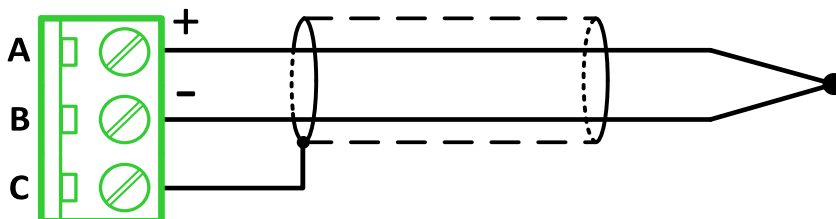
### LED indication

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

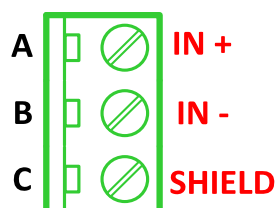
The following diagrams show the correct connection of sensors.

#### 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	<b>CAN1</b>
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

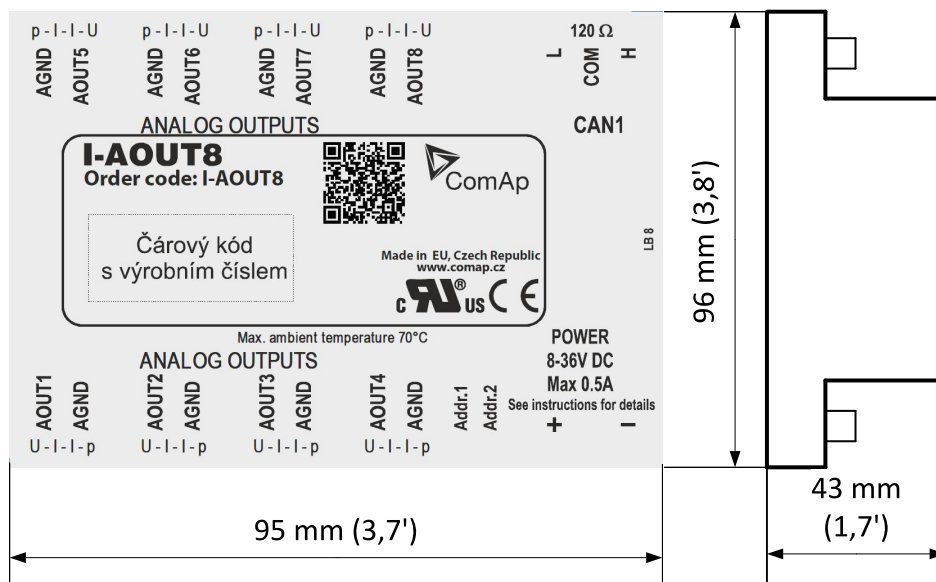
## I-AOUT8

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)

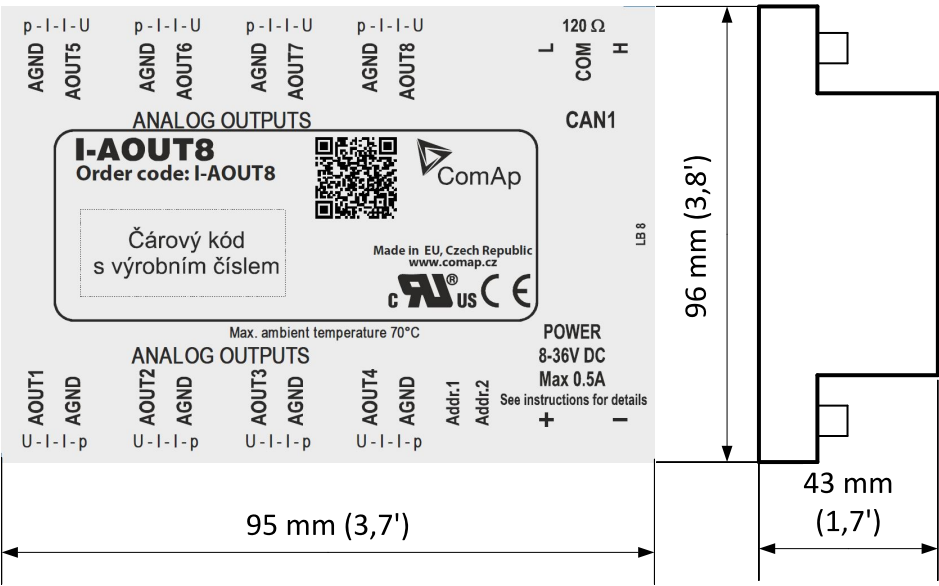
The module is connected to controller by **CAN1** bus. It is possible to connect up to 4 I-AOUT8 external units to one controller. The corresponding module Address 1 to 4 (default 1) must be set on module (by Adr.1 and Adr.2 jumpers) and in controller configuration. CAN1 terminating 120 ohm resistor jumper is connected as default. AGND terminals are on the same potential.





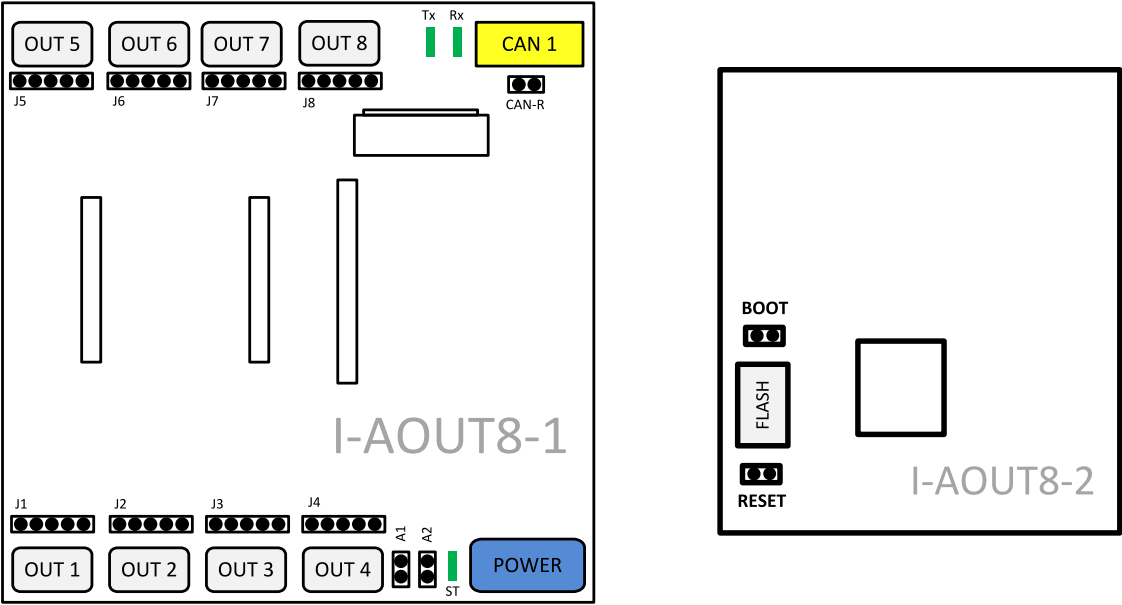


Dimensions



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 1 data
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 7.4 Setting CAN address

### Output mode

Follow the p – 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 7.5 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

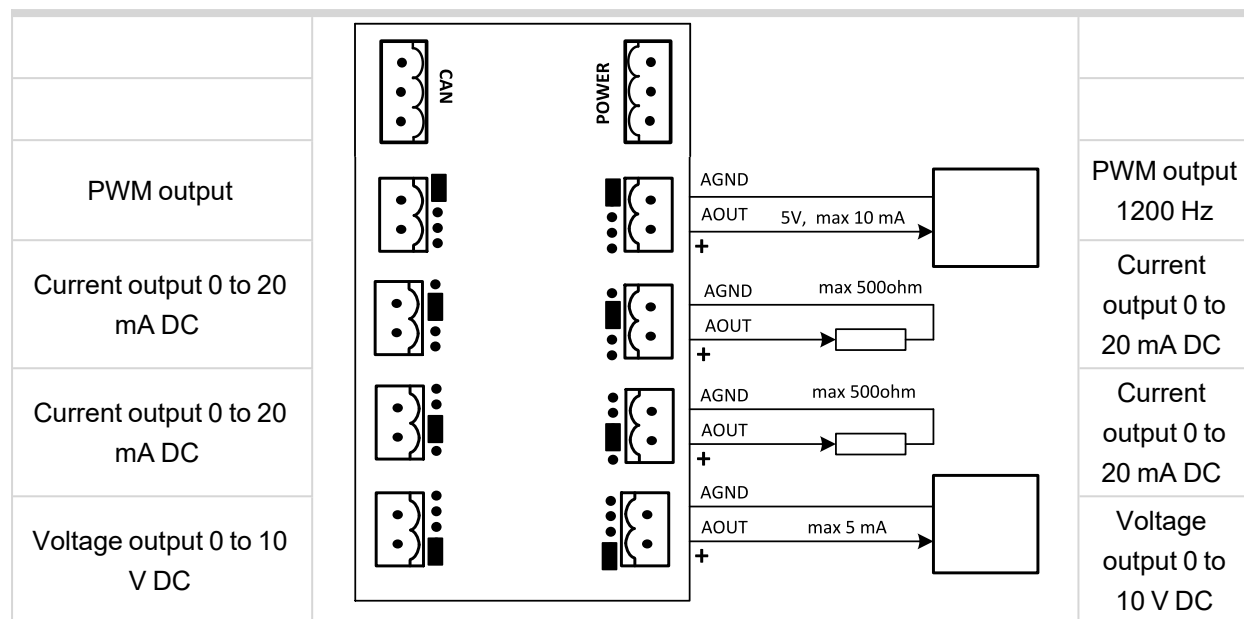


Image 7.130 Possible output modes

## Technical data

<b>Dimension (W × H × D)</b>	95 × 96 × 43 mm (3.7' × 3.8' × 1.7')
<b>Interface to controller</b>	CAN
<b>Output</b>	8 analog, no galvanic separation

<b>Type of analog output</b>
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

<b>Power supply</b>	8 to 36 V DC
<b>Analog output refreshment</b>	320 ms
<b>Current consumption</b>	max 300 mA (100 mA at 24 V)
<b>RS232 interface</b>	TTL, firmware upgrade via AT-link.
<b>Storage temperature</b>	-40 °C to +80 °C
<b>Operating temperature</b>	- 30 °C to + 70 °C
<b>Heat radiation</b>	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

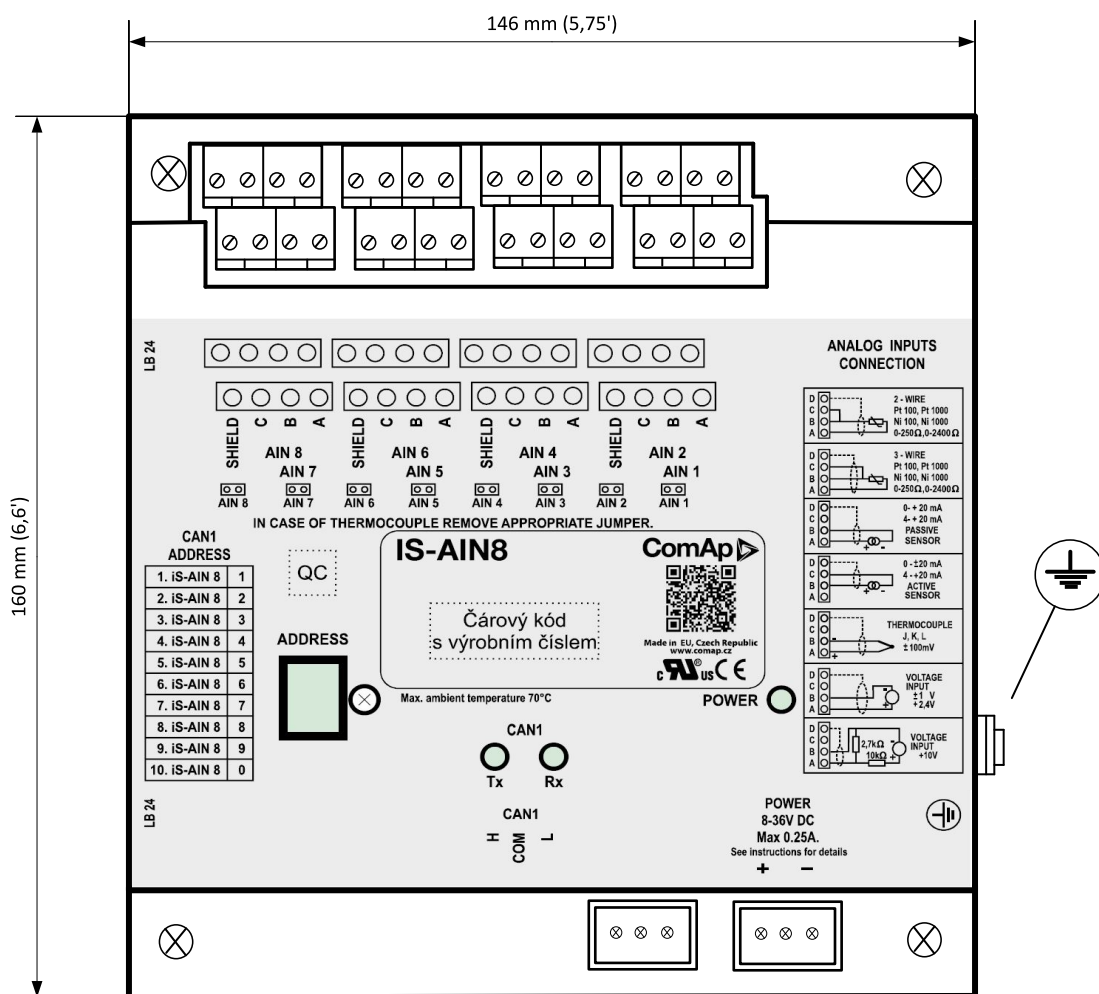
All inputs can be configured to any logical function or protection. It is possible to connect up to 10 IS-AIN external units to one controller. IS-AIN8 is connected to controller **CAN1** bus.

This module is compatible with MTU ECU-7 at communication speed 125 kbps when uploaded with firmware 1.2.0 and higher.

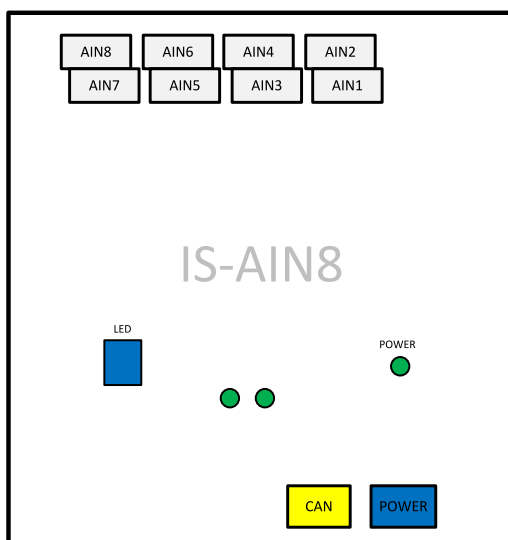
The detection of communication speed is indicated by fast flashing of status LED. Once the speed is detected the module remains set for the speed even when the communication is lost. Renewal of communication speed detection is done by reset of the module.







## 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				
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 7.6 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

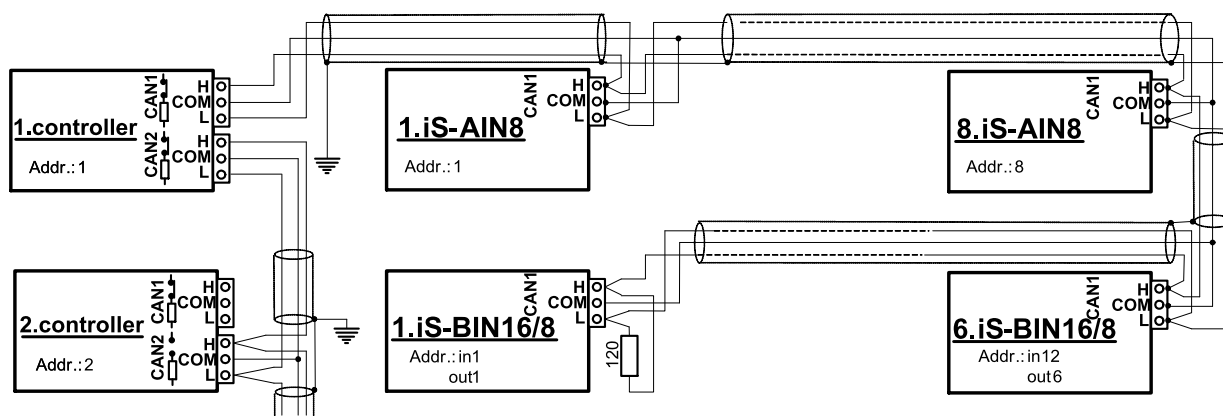
Power LED		Address LDD	
Lighting	Blink	Lighting	Blink
Power supply and CAN address are with no problems	CAN1 address is adjusted different in IS-AIN8 and in controller	Displaying current CAN1 address	Displaying current SW version

Table 7.7 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 7.8 Tx/Rx LED status

### Wiring





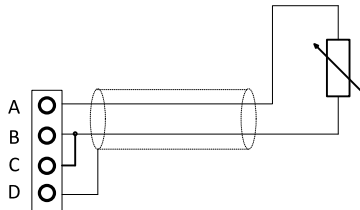
**Note:** CAN bus line has to be terminated by 120  $\Omega$  resistors on the both ends.

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.

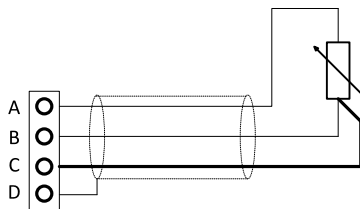
Recommended CAN bus data cables see in Chapter Technical data.

IG-MU and IG-IB units are connected to CONTROLLER CAN2 bus.

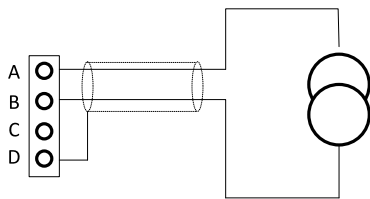
Select sensor characteristic from the list or define user sensor characteristic in PC configuration tool.



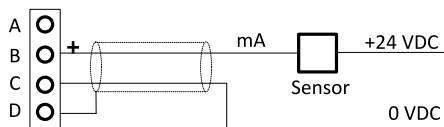
- > Resistor sensor input – two wire connection.
- > Range 0 to 2400  $\Omega$ .
- > Pt100, Pt1000, Ni100, Ni1000
- > D terminal is shielding



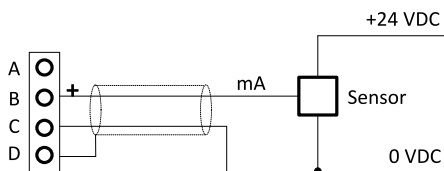
- > Resistor sensor input – three wire connection.
- > Range 0 to 2400  $\Omega$ .
- > Pt100, Pt1000, Ni100, Ni1000 – recommended.
- > D terminal is shielding



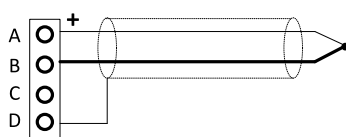
- > Passive current sensor (current source is in IS-AIN8)
- > Range 0 to +20 mA or 4 to +0 mA
- > D terminal is shielding



- > Active current sensor (current source is in sensor)
- > Range -20mA to +20 mA or 4 to +20 mA

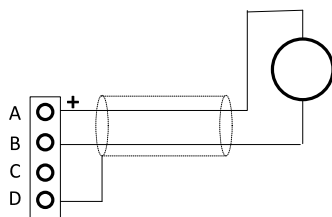


- > D terminal is shielding

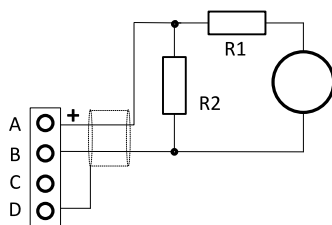


- > Thermocouple J, K, L D terminal is shielding
- > From IS-AIN8 hardware version 5.1 can be B terminal grounded to frame



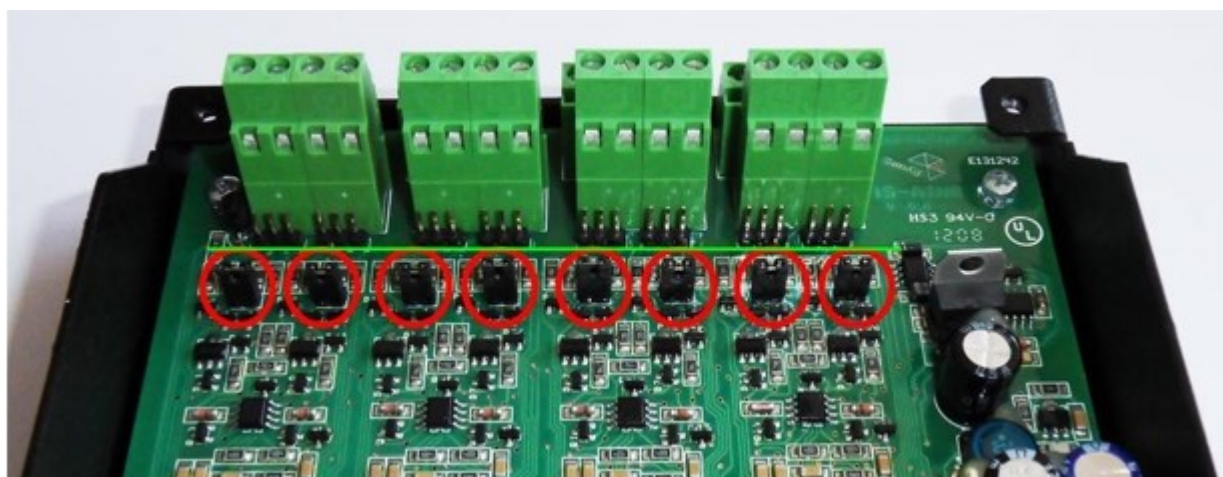


- > Voltage input
- > Range 0 to + 2500 mV.
- > Voltage range is 0 to  $\pm 1000$  mV.
- > D terminal is shielding



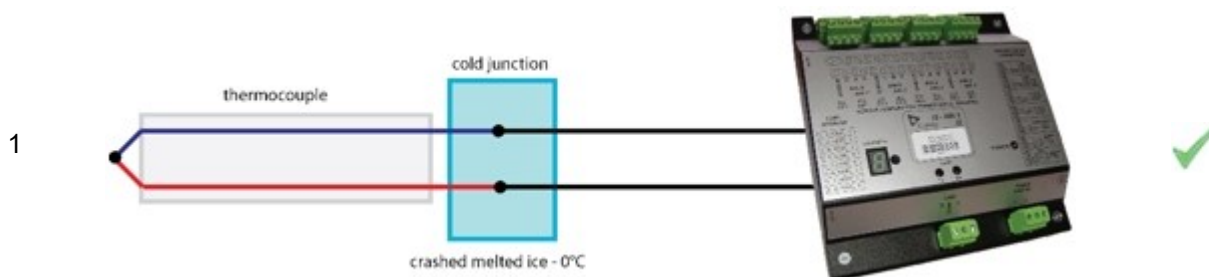
- > For 10 V input voltage range connects external resistors R1, R2 and select sensor characteristic 10 V
- > R1=10 k $\Omega$ , R2=2.7 k $\Omega$ .
- > D terminal is shielding

**Note:** If the thermocouples are connected to IS-AIN8, appropriate jumpers must be removed (see rear sticker). (jumpers are placed under the cover)

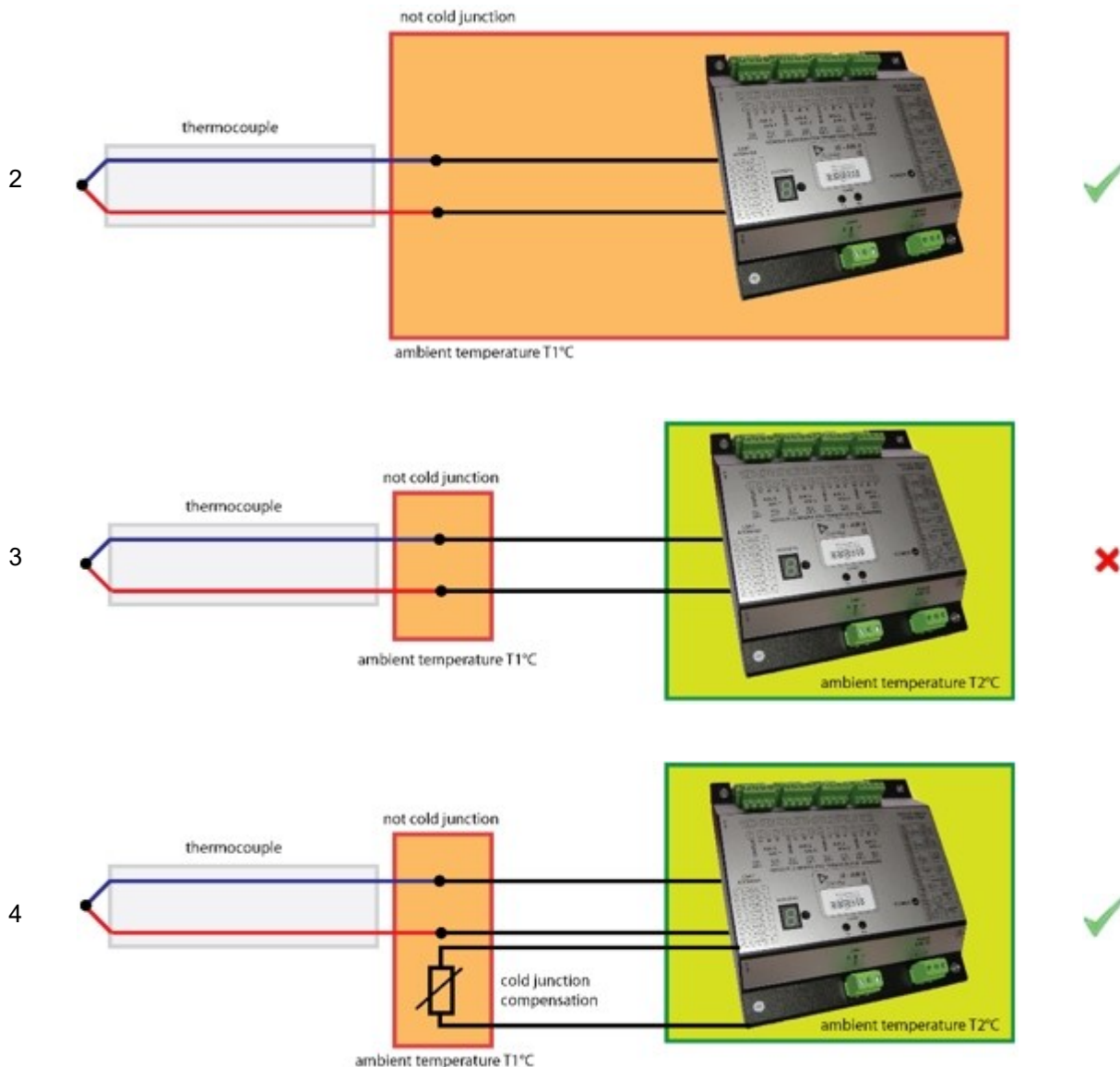


### Cold Junction Compensation (CJC)

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.







- **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  $0^{\circ}\text{C}$ . 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  $0^{\circ}\text{C}$ , but  $T1^{\circ}\text{C}$ . 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  $0^{\circ}\text{C}$ , but  $T1^{\circ}\text{C}$ . Resultant temperature is  $T-T1$  (reduced by  $T1$ ). Internal IS-AIN8 compensation should not be 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  $0^{\circ}\text{C}$ , but  $T1^{\circ}\text{C}$ . 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.

Name	Not Used	Sensor	Thermo(nc) J/°C
Dimension	°C	Resolution	Thermocpl K/°F
Bargraph 0%	-32 768	Offset	Thermocpl L/°F
Functions	Click + to add item	Bargraph 100%	Thermo(nc) J/°C
		History Abbreviation	Thermo(nc) K/°C
		Protections	Thermo(nc) L/°C
			Thermo(nc) J/°F
			Thermo(nc) K/°F
			Thermo(nc) L/°F

- **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.

Name	Not Used	Sensor	NI1000/°C
Dimension	°C	Resolution	Thermocpl J/°C
Bargraph 0%	-3 276,8	Offset	Thermocpl K/°C
Functions	Click + to add item	Bargraph 100%	Thermocpl L/°C
		History Abbreviation	PT100/°F
		Protections	PT1000/°F
			NI100/°F
			NI1000/°F
			Thermocpl J/°F

- **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**

HW Name	Name	Device	Functions	Protections	Sensor	Dimension	Input HW Type	Resolution	Sensor Range	Offset	Bargraph 0%	Bargr
AIN1	Not Used	IS-AIN8 1	-		PT1000/°C	°C		0,1	0,1	0,0	-3 276,8	3

Name	Not Used
Dimension	°C
Bargraph 0%	-3 276,8
Functions	Click + to add item

Item	Name	Used as (Source)
LAI57	Cold Temp 2	
LAI58	Cold Temp 3	
LAI59	Cold Temp 4	
LAI341	Cold Temp 5	



**Note:** LAI (logical analog input) Cold Temp 1 compensates every of 8 thermocouples inputs of IS-AIN8 on address 1 IS-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 be compensated by external sensor.

Even only one external sensor may be configured for more than one LAI Cold Temp.

## Technical data

<b>Dimension (W × H × D)</b>	146 × 160 × 46 mm (5.79' × 6.6' × 1.83')
<b>Interface to Controller</b>	CAN1
<b>Analog inputs</b>	8, galvanic separated from power supply, 16 bit *
<b>Power supply</b>	8 to 36 V DC
<b>Current consumption</b>	250 mA at 24 V
<b>Protection front panel</b>	IP20
<b>Humidity</b>	95% without condensation
<b>Storage temperature</b>	-40 °C to +80 °C
<b>Operating temperature</b>	- 30 °C to + 70 °C
<b>Heat radiation</b>	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

<b>Low Voltage Directive</b>	EN 61010-1:95 +A1:97
<b>Electromagnetic Compatibility</b>	EN 50081-1:94, EN 50081-2:96 EN 50082-1:99, EN 50082-2:97

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