

InteliMains 1010 SC

Mains Supervision Controller

SW version 1.1.0

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1.1 Declaration of Conformity

Supplier's Declaration of Conformity 47 CFR § 2.1077 Compliance Information
Unique identifier: IM31010SCBB
Responsible Party: Kevin Counts 10 N Martingale Rd #400 60173 - Schaumburg, IL USA
Tel: +1 815 636 2541 E-mail: info.us@comap-control.com
FCC Compliance Statement This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

1.2 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.

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

1.3 About this Global Guide

This manual contains important instructions for IntelliMains 1010 SC controllers family that shall be followed during installation and maintenance of the controllers.

This manual provides general information how to install and operate IntelliMains 1010 SC controllers.

This manual is dedicated for:

- Operators
- Control panel builders
- For everybody who is concerned with installation, operation and maintenance

1.4 Legal notice

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Warning: Some forms of technical support may be provided against payment. 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. IntelliConfig) 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 (page 711)** 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.

Used open source software:

Name of software	Modified	Type	License condition web address	
CMSIS FreeRTOS	✓	MIT	license	Copyright (C) 2020 Amazon.com, Inc. or its affiliates. All Rights Reserved.

FreeRTOS	✓	MIT	license	Copyright (C) Amazon Web Services, Inc. or its affiliates. All rights reserved.
Mbed TLS	✓	Apache 2.0	license	Copyright (C) 2006-2015, ARM Limited, All Rights Reserved
lwIP	✓	BSD 3	license	Copyright (c) 2001-2004 Swedish Institute of Computer Science. All rights reserved.
MD5	–	Free ad-hoc license	license	Copyright (C) 1991-2, RSA Data Security, Inc. Created 1991. All rights reserved RSA Data Security, Inc. MD5 Message-Digest Algorithm
Embedded Template Library	✓	MIT	license	Copyright (c) 2016 jwellbelove www.etlcpp.com
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Tiny Mersenne Twister	–	BSD 3	license	Copyright (c) 2011, 2013 Mutsuo Saito, Makoto Matsumoto, Hiroshima University and The University of Tokyo All rights reserved.
USB	✓	SLA0044	license	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.
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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.

To be sure:

- > Disconnect remote control
- > Disconnect binary outputs

1.5.2 SW and HW versions compatibility

Be aware to use the proper combination of SW and HW versions.

1.5.3 Dangerous voltage

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

Always connect grounding terminals!

In no case do not disconnect 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 .

IMPORTANT: Wrong adjustment of setpoints can destroy any part of the system.

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

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

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


1.6 Functions and protections

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

Description	ANSI code	Description	ANSI code
Multi-function device	11	Overcurrent IDMT	51
Speed and frequency matching device	15	AC circuit breaker	52
Data communications device	16ECFM+16SC	Power factor	55
Synchronizing-check	25	Overvoltage	59
Automatic Synchronizing Relay	25A	Pressure switch	63
Undervoltage	27	Liquid level switch	71
Annunciator*	30	Alarm relay *	74
Overload	32	Vector shift	78
Undercurrent	37	Reclosing relay	79
Current unbalance	46	Overfrequency	81H
Voltage unbalance	47	Underfrequency	81U
Temperature monitoring	49T	ROCOF	81R
Overcurrent	50/50TD		

* extension module IGL-RA15 required




























































1.7 Certifications and standards

<ul style="list-style-type: none"> > EN 61000-6-2 > EN 61000-6-4 > EN 61010-1 > EN 60255-1 > EN 60529 (IP20) 	<ul style="list-style-type: none"> > EN 60068-2-1 (-40 °C/16 h) > EN 60068-2-2 (70 °C/16 h) > EN 60068-2-6 (2÷25 Hz / ±1,6 mm; 25÷100 Hz / 4,0 g) > EN 60068-2-27 (a=500 m/s²; T=6 ms) > EN 60068-2-30 (25/55 °C, RH 95%, 48 h) 	<ul style="list-style-type: none"> > UL6200 > UKCA 	
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1.8 Document history

Revision number	Related sw. version	Date	Author
2	1.1.0	28.3.2025	Jakub Slavata
1	1.0.0	14.7.2023	Jakub Slavata

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
	Battery Energy Storage System		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		Starter
	Breaker		DC to AC Inverter		Load		Switch - manually operated
	Breaker		Diode		Mains		Transformer
	Capacitor		Ethernet male		Mains		USB type B male
			Ethernet female		Mobile provider		USB type B female



Voltage
measuring



Wifi / WAN /
LAN

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2.1 General description

The IntelliMains 1010 SC is a state-of-the-art mains/utility, for use in concert with the IntelliGen 1000 SC paralleling generator synchronizer and load sharing controller. The IntelliMains 1010 SC is ideal for control systems where an external PLC is used to dictate the system sequence of operation.

Use it wherever synchronization is needed, it actively synchronizes IntelliGen 1000 SC equipped generators to parallel with the utility/mains or connect multiple generator bus segments, greatly simplifying the system PLC control logic.

The IntelliMains 1010 SC provides revenue-grade mains/utility supervision and protection, with advanced decoupling protections like vector shift and ROCOF.

The controller provides easy-to-use operation and installation. Predefined configurations for typical applications are available as well as user-defined configurations for special applications.

Note: See chapter *Logical Sequence and Control (page 197)* for more information about functions and behavior of IntelliMains 1010 SC.

2.1.1 The key features of IntelliMains 1010 SC

- Capable to soft transfer or open transfer the load between generators and mains / utility.
- Compatible with the IntelliGen 1000 SC for control of gen-set/generator breakers, up to 64 controllers can be combined in a system.
- Pre-programmed functions allow fast and easy system setup.
- True RMS voltage and current measurement with .25% accuracy; power calculation to .50% accuracy.
- Cybersecure remote control and monitoring to ANSI/ISA-62443 standard.
- Redundant CAN inter-controller communication.
- Redundant controller hot-swap in <10ms.
- Internal PLC functionality with easy-to-use PLC Editor, for simple and fast creation of specific logic for local control when desired (ex. local load shed/restore).

- Modbus master optional software key allows easy integration of Modbus-based devices for data sharing/control.
- Ethernet communication networks for local and remote monitoring options, with connected clients split into “trusted” and “untrusted” zones.

Note: *The IntelliMains 1010 SC is not intended to be used with other ComAp non SC products.*

2.2 Getting Started

Congratulations to your new IntelliMains 1010 SC ComAp Mains controller. Follow these steps bellow for 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 (page 43)** 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.

3. Authorizing as Administrator

- The alarmlist should show **Wrn Default Password (page 711)**. If this alarm is not present, this procedure bellow will not work. You will need to use your changed password or **Reset accounts to factory default (page 178)**. If you see the warning, use function "Enter password" which is located in tab "Control".

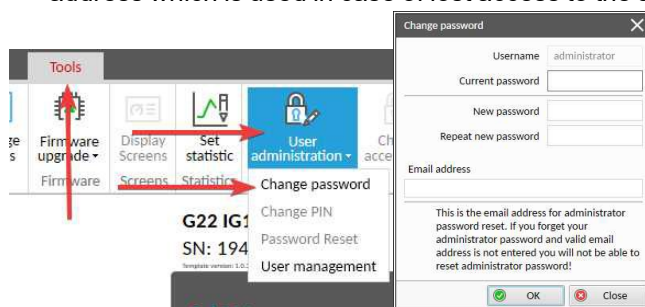
- Username = administrator
- Password = serial number of your controller

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 another 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 (page 179)**.

6. Connecting external display

- For IntelliVision displays wiring diagram see the chapter **IntelliVision Displays (page 77)**.

2.3 Measurement methods

The IntelliMains 1010 SC 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.

Only values from Symmetrical components, visible to user, are **+Mains Voltage (page 456)** and **+Mains Voltage Relative (page 456)**.

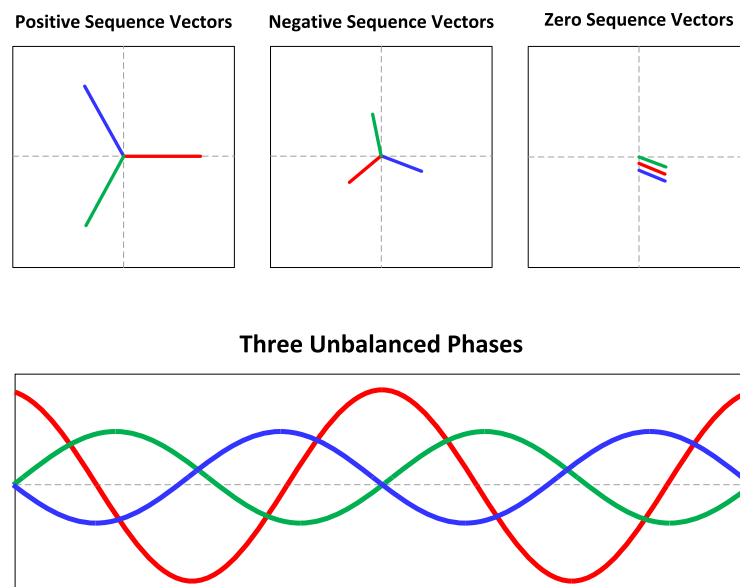
2.3.1 True RMS measurement

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 System working parallel with the mains cannot reach values in a certain range around the PF 1.00. The higher the deformation, the wider the power factor dead range. If the requested power factor is adjusted inside the dead range, the controller cannot reach the requested value because of this fact.

2.3.2 Symmetrical components

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



Note:

These images are based on:

https://upload.wikimedia.org/wikipedia/commons/e/e0/Unbalanced_symmetrical_components.pdf

Which has license: <https://creativecommons.org/publicdomain/zero/1.0/deed.en>

2.4 AC measurement

With IntelliMains 1010 SC it is possible to easily set the parameters for measuring.

2.4.1 AC measurement settings

AC Voltage measurement settings

The value of the AC voltage measured on the terminals of the controller can be adapted according to the used meas voltage. For measuring AC voltage use setpoints **Mains VT Ratio** (page 267) and **Bus Voltage Input Range** (page 269).

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 **Mains CT Ratio Prim** (page 263) and **Mains CT Ratio Sec** (page 264).

2.4.2 Frequency measurement accuracy and resolution

The resolution of the measurement is in mHz within a 45–75 Hz range. Values **Mains Frequency** (page 453) and **Bus Frequency** (page 466) are used for visualization of measured frequency.

2.4.3 PF measurement and evaluation

Power factor is measured with a resolution of 0.001.

Setpoints used for setting the Power factor regulation are **Import Power Factor** (page 303) with a 0.001 resolution and **#System Power Factor** (page 304) with a 0.01 resolution.

Values for the Power factor are:

- **Mains Power Factor** (page 450), **Mains Load Character** (page 450)
- **Mains Power Factor L1** (page 451), **Mains Load Character L1** (page 451)
- **Mains Power Factor L2** (page 451), **Mains Load Character L2** (page 451)
- **Mains Power Factor L3** (page 452), **Mains Load Character L3** (page 452)
- **Load Power Factor** (page 464), **Load Character** (page 464)
- **Total Running Power Factor** (page 483), **Total Running Load Character** (page 484)

2.4.4 Waveform distortion measurements

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

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:
 - **Mains Voltage THD L1** (page 452)
 - **Mains Voltage THD L2** (page 452)

» Mains Voltage THD L3 (page 453)

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:

» Mains Current THD L1 (page 453)

» Mains Current THD L2 (page 453)

» Mains Current THD L3 (page 453)

2.5 Communication peripherals

InteliMains 1010 SC contains 3x Ethernet terminals, 4x CAN terminals, 1x RS485 terminal and 1x USB type B terminal. Each terminal functions are slightly different, which depends on the purpose of usage.

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

Peripherals	Description	Relevant links
CAN1A	<p>This terminal is used for connecting of external modules and Electronic Control Units. See the chapters Supported combinations of modules (page 772) and Multiple ECU (page 154) for more information.</p> <p>Note: In case the function CAN1 ECU/IO Modules Splitting (page 124) is used this terminal is used only for communication with ECU.</p>	CAN bus wiring (page 68)
CAN1B	<p>This terminal is used for communication between Master and Backup Controller if the Hot Swap Redundancy (page 141) function is used.</p> <p>Note: In case the function CAN1 ECU/IO Modules Splitting (page 124) is used this terminal is used only for communication with external modules.</p>	
CAN2A	This terminal is used for CAN Intercontroller Communication (page 123) .	
CAN2B	This terminal is used for CAN Intercontroller Communication Redundancy (page 124) .	
RS485	This terminal is used for Modbus-RTU, Modbus/TCP (page 233) communication.	RS485 wiring (page 70)
USB Type B	This terminal is used for UART communication eg. InteliConfig, WinScope1000, etc. It is considered as Trusted (page 175) terminal and the default account is used for connection.	Controller configuration and PC tools connection (page 110)
Ethernet 1	In the default configuration port Ethernet 1 is configured as Trusted	Ethernet port 1

	(page 175) interface. It is used for LAN communication eg. Display, IntelliConfig, WinScope1000, Modbus Server. The default account is used for connection. Use this interface for local connection only.	(page 369)
Ethernet 2	In the default configuration port Ethernet 2 is configured as Untrusted (page 175) 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.	Ethernet port 2 (page 370)
Ethernet 3	In the default configuration port Ethernet 3 is configured as Modbus (page 176) interface. It is used for Modbus Client (Master) (page 151) or Modbus server. It is not possible to use Modbus interface as a terminal connection (Inteliconfig, WinScope 1000, etc.).	Ethernet port 3 (page 371)

You can see layout of the peripherals in the chapter **Terminal Diagram (page 43)**.

Note: The controller has one common MAC address. Do not connect more than 1 Ethernet into the same internet network.

2.6 Configurability and monitoring

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

2.6.1 Supported configuration and monitoring tools

- IntelliConfig - complete configuration and single / multiple controller monitoring
 - IntelliConfig - application for smart-phones
- WebSupervisor - web-based system for monitoring and controlling
 - WebSupervisor mobile - application for smart-phones
- WinScope 1000 - special graphical monitoring software
- IntelliSCADA - customizable SCADA diagram for monitoring

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

2.6.2 Configuration parts

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

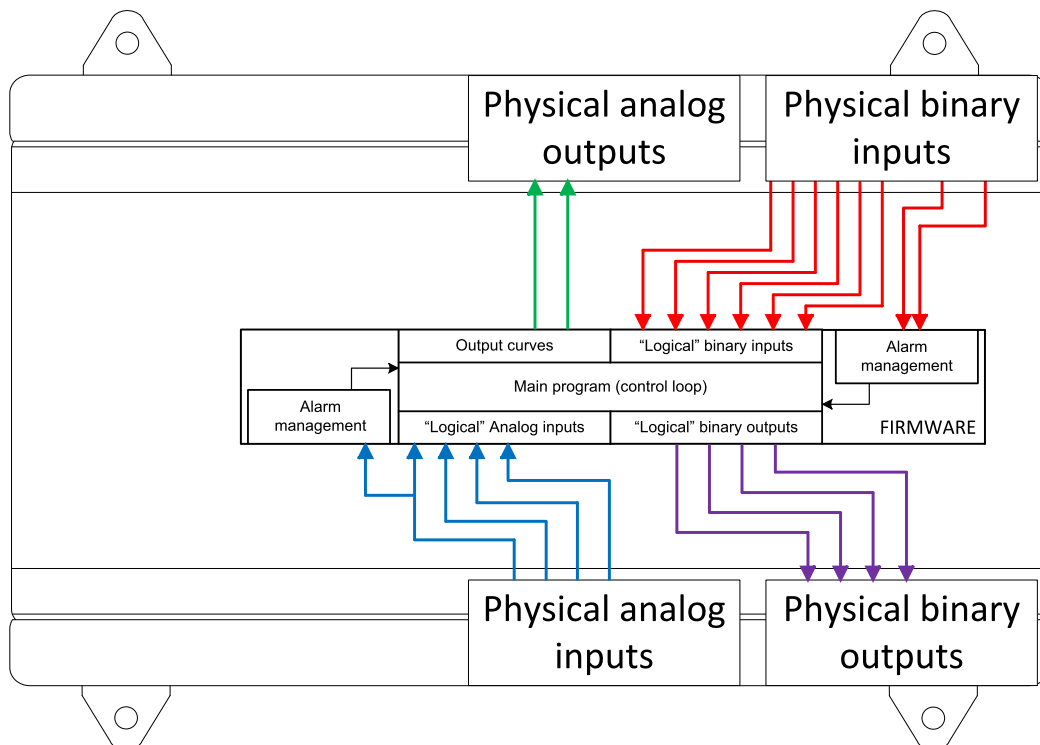


Image 2.1 Principle of inputs and outputs configuration

The controller is shipped with a **Default configuration (page 116)**, 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 .aig3. An archive contains a full image of the controller at the time of saving (if the controller is online for the PC) except the firmware. Besides configuration it also contains current adjustment of all setpoints, all measured values, a copy of the history log and a copy of the alarm list.

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

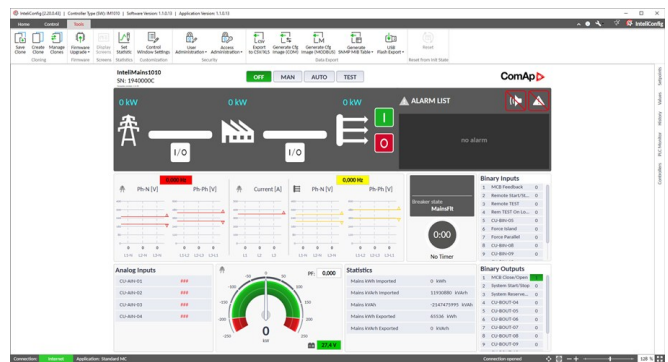
2.7 PC tools

2.7.1 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
- Reading/writing/adjustment of setpoints
- Reading of measured values
- Controllers and ECU Alarm monitoring + complete real time history
- Exporting data into a XLS file
- Controller language translation
- Power format and ECU unit selection
- Embedded manuals and F1 helps
- Auto-hiding of unused setpoints and values

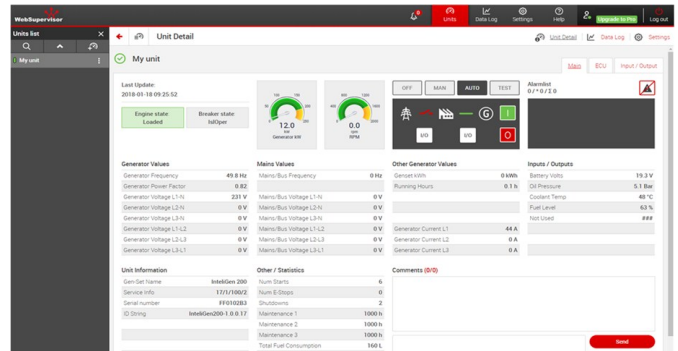


2.7.2 WebSupervisor

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

This tool provides the following functions:

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



WebSupervisor available at: www.websupervisor.net

Demo account:

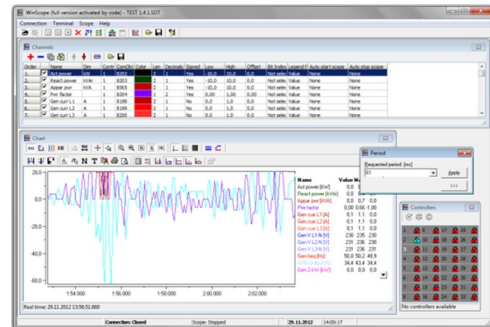
- Login: comaptest
- Password: ComAp123

2.7.3 WinScope 1000

Special graphical controller monitoring software used mainly for commissioning and System troubleshooting. See more in the [WinScope 1000 Global Guide](#).

This tool provides the following functions:

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

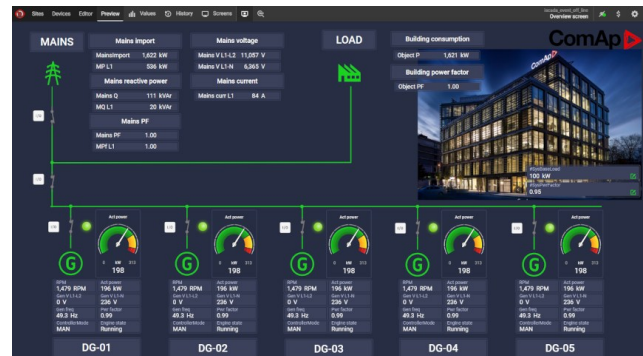


2.7.4 IntelISCADA

IntelISCADA is a Windows based software for monitoring of multiple controllers. See more in the [IntelISCADA Global Guide](#).

This tool provides the following functions:

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



2.8 Displays

Remote Displays / Panel PC Displays

2.8.1 IntelliVision 5.2

Remote colour display for ComAp controllers, designed as an easy-to-use Plug & Play display for monitoring and control of single gen-set 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



2.8.2 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

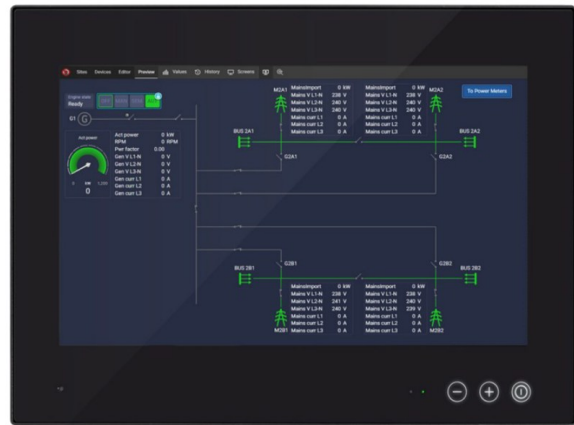


2.8.3 IntelliVision 13Touch

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



2.8.4 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



2.9 CAN Extension Modules

2.9.1 IntelI AIN8

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

Supported sensors:

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

Impulse/RPM sensor:

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



IMPORTANT: Impulse input is not supported by the controller.

🔍 back to CAN Extension Modules

2.9.2 IntelI IO8/8

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

Configuration 8/8

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

Configuration 16/0

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

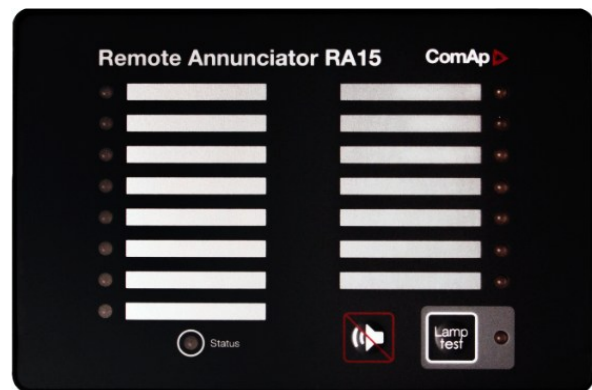
🔍 back to CAN Extension Modules



2.9.3 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

2.9.4 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

2.9.5 IntelI AIO9/1

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

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



🔍 back to CAN Extension Modules

2.9.6 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

2.9.7 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

2.9.8 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

2.9.9 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

2.9.10 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

2.10 CAN Communication Modules

2.10.1 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, 1x USB



🔍 back to CAN Extension Modules

2.10.2 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

2.11 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** (page 272).

2.11.1 Distributed modules

DIST-IN

DIST-IN virtual modules receives binary and analog values from other controllers via **CAN Intercontroller Communication** (page 123). There are 64 modules, DIST-IN 1 to DIST-IN64, which are firmly connected with **CAN Controller Address** (page 362).

IMPORTANT: This means that if you need to receive data from Controller Unit with CAN Controller Address (page 362) = 5, you need to use module DIST-IN 5.

Proper alarm from a range **Wrn DISTIN 01** (page 712) to **Wrn DISTIN 64** (page 727) is activated in case that data are not received from the Controller Unit.

Binary Inputs

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

- > Binary inputs 1 1-8 (page 571)
- > Binary inputs 1 9-16 (page 571)
- > Binary inputs 1 17-24 (page 572)
- > Binary inputs 1 25-32 (page 572)

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

GROUP: DIST-IN 1-32 (PAGE 571)

GROUP: DIST-IN 33-64 (PAGE 578)

IMPORTANT: Binary inputs X 9-16 and higher can be shared only if CAN Intercontroller Comm Mode (page 366) = 64C CAN FD or 32C CAN FD or 8C CAN FD.

Analog Inputs

Up to 4 analog values are shared:

- > DISTAIN-1 1 (page 573)
- > DISTAIN-1 2 (page 573)
- > DISTAIN-1 3 (page 573)
- > DISTAIN-1 4 (page 574)

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

GROUP: DIST-IN 1-32 (PAGE 571)

GROUP: DIST-IN 33-64 (PAGE 578)

IMPORTANT: Analog values can be shared only if CAN Intercontroller Comm Mode (page 366) = 64C CAN FD or 32C CAN FD or 8C CAN FD.

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

Configuration

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

protection upon module failure.

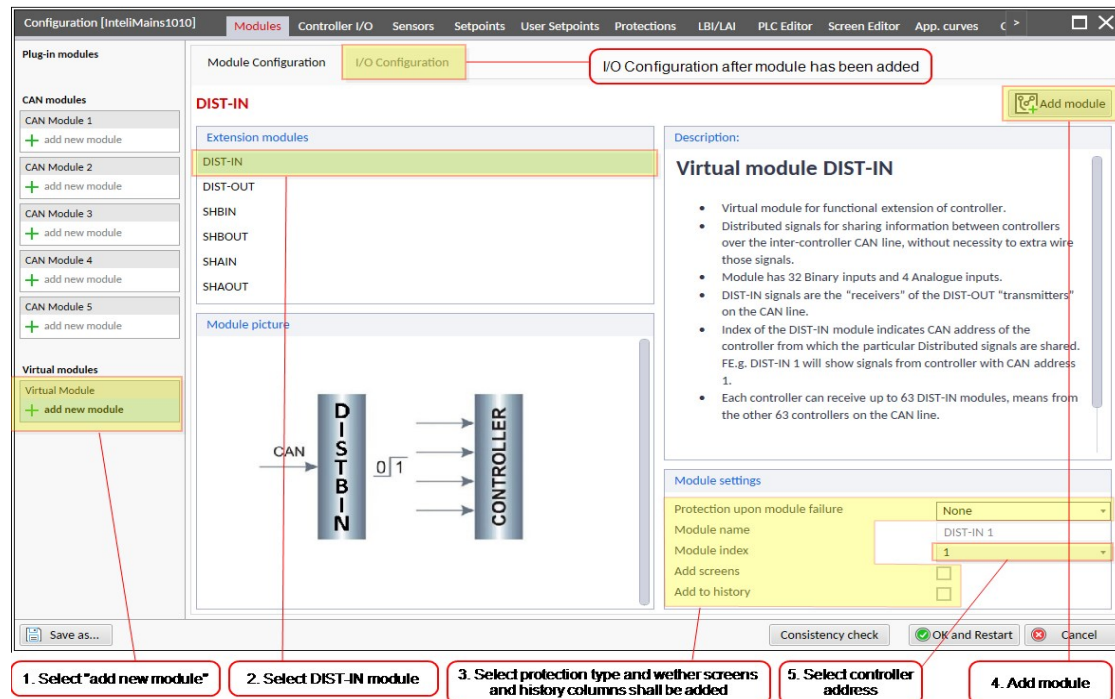


Image 2.2 Configuration of virtual module DIST-IN

DIST-OUT

This virtual module shares binary and analog values to other controller units via **CAN Intercontroller Communication** (page 123).

In case that there is detected module failure, alarm **Wrn DISTOUT** (page 728) is activated.

Binary Outputs

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

- Binary outputs 1-8 (page 593)
- Binary outputs 9-16 (page 593)
- Binary outputs 17-24 (page 594)
- Binary outputs 25-32 (page 594)

IMPORTANT: Binary outputs 9-16 and higher can be shared only if CAN Intercontroller Comm Mode (page 366) = 64C CAN FD or 32C CAN FD or 8C CAN FD.

Analog Outputs

Up to 4 analog values can be shared.

IMPORTANT: Analog values can be shared only if CAN Intercontroller Comm Mode (page 366) = 64C CAN FD or 32C CAN FD or 8C CAN FD.

Configuration

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

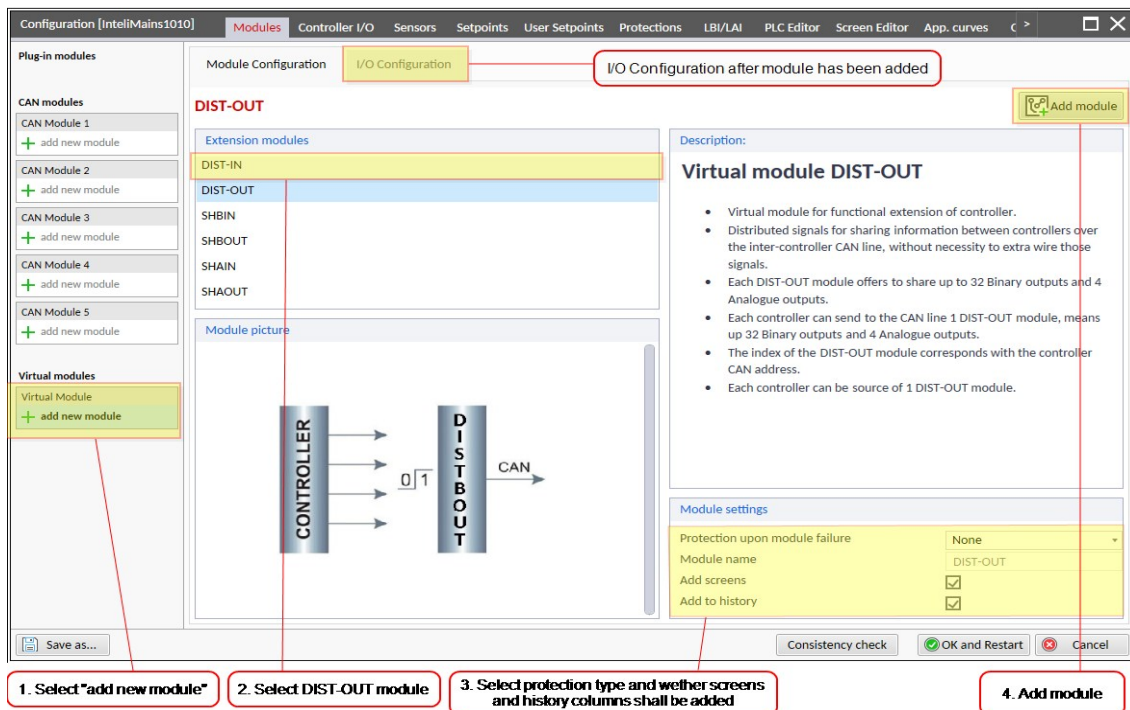


Image 2.3 Configuration of virtual module DIST-OUT

2.11.2 Shared modules

Shared modules are not connected with **CAN Controller Address (page 362)**, which means that you need to pay close attention during configuration so that you do not create collision. Each SHBOUT and SHAOUT module index can be used only once in CAN topology.

Binary shared modules

SHBIN

SHBIN virtual modules receives binary values from other controllers via **CAN Intercontroller Communication (page 123)**. 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 (page 741)** is activated in case that more than just one controller has configured SHBOUT module with same module index in CAN topology.

IMPORTANT: Shared modules work only if CAN Intercontroller Comm Mode (page 366) = 8C or 16C or 32C.

Proper alarm from a range **Wrn SHBIN 1 (page 740)** to **Wrn SHBIN 6 (page 741)** is activated in case that data are not received.

Binary Inputs

> SHBIN-1 (page 585)

Note: Value above is related to virtual module SHBIN-1. See values for other modules here: **Group: SH Modules (page 585)**

Configuration

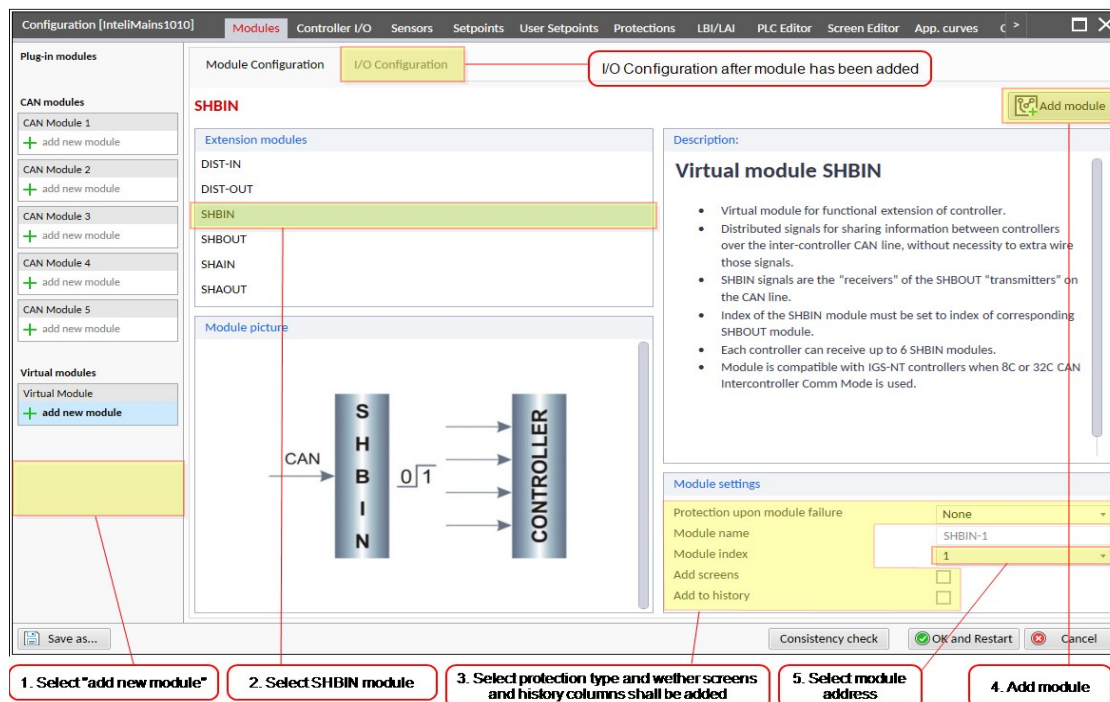


Image 2.4 Configuration of shared module SHBIN

SHBOUT

SHBOUT virtual modules share binary values to other controllers via **CAN Intercontroller Communication** (page 123). There are 6 modules, SHBOUT-1 to SHBOUT-6, which are firmly connected with SHBIN-1 to SHBIN-6.

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

IMPORTANT: Shared modules work only if CAN Intercontroller Comm Mode (page 366) = 8C or 16C or 32C.

Binary Outputs

➤ SHBOUT-1 (page 588)

Note: Value above is related to virtual module SHBIN-1. See values for other modules here: **Group: SH Modules** (page 585)

Configuration

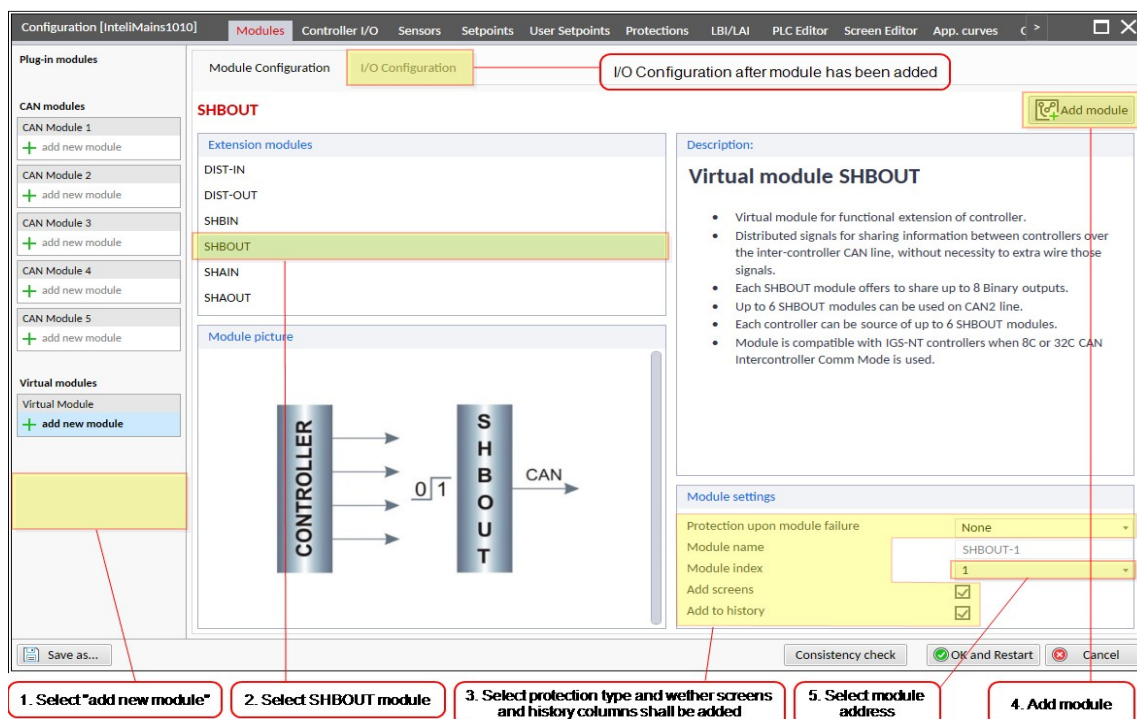


Image 2.5 Configuration of shared module SHBOUT

Analog shared modules

SHAIN

SHAIN virtual modules receives analog values from other controllers via **CAN Intercontroller Communication** (page 123). 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** (page 739) 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 Intercontroller Comm Mode** (page 366) = **8C** or **16C** or **32C**.

Proper alarm from a range **Wrn SHAIN 1** (page 739) to **Wrn SHAIN 2** (page 739) is activated in case that data are not received.

Analog Inputs

- > SHAIN-1 1 (page 591)
- > SHAIN-1 2 (page 591)
- > SHAIN-1 3 (page 591)
- > SHAIN-1 4 (page 591)

Note: Value above is related to virtual module SHAIN-1. See values for other modules here: **Group: SH Modules** (page 585)

Configuration

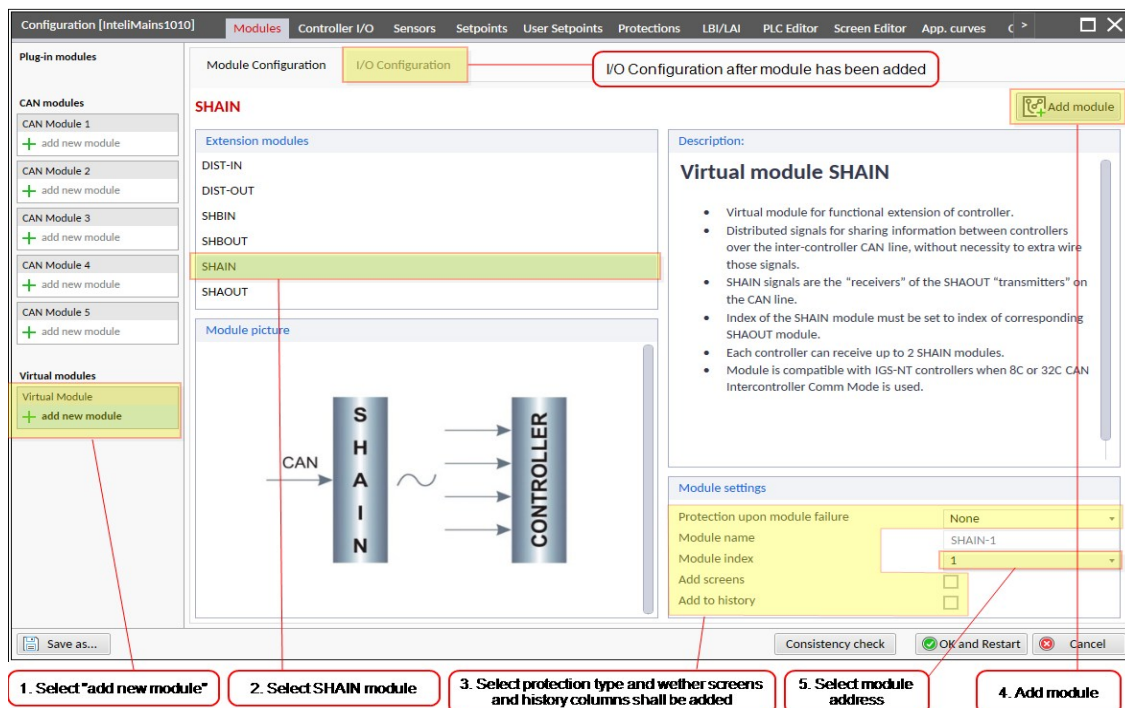


Image 2.6 Configuration of shared module SHAIN

SHAOUT

SHAOUT virtual modules share analog values to other controllers via **CAN Intercontroller Communication** (page 123). 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 Intercontroller Comm Mode (page 366) = 8C or 16C or 32C.

Configuration

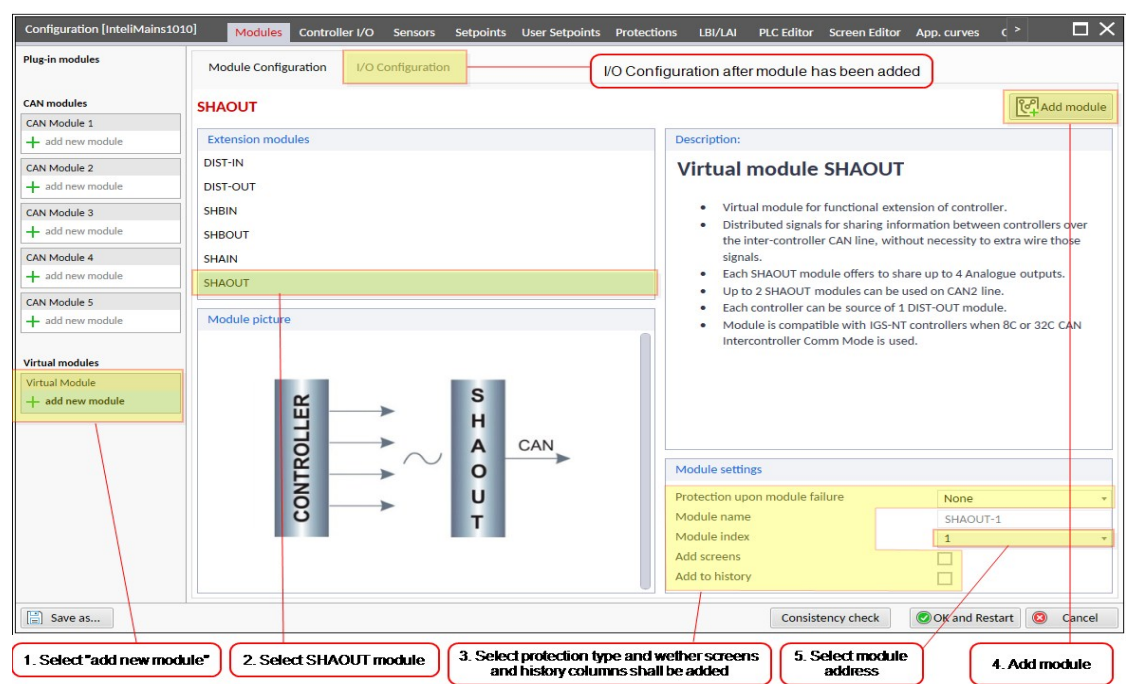


Image 2.7 Configuration of shared module SHAOUT

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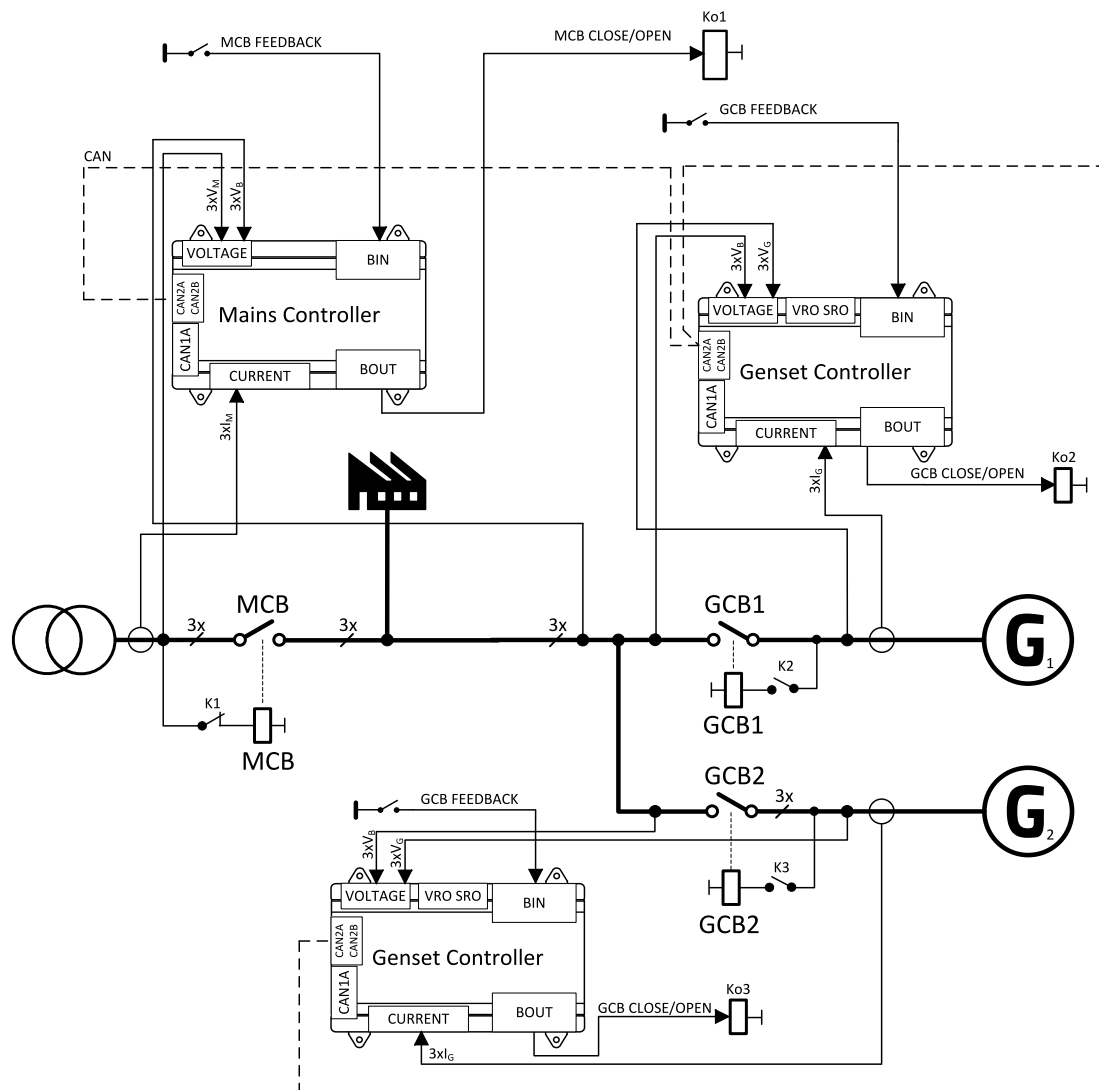
3 Applications overview

3.1 MCB 38

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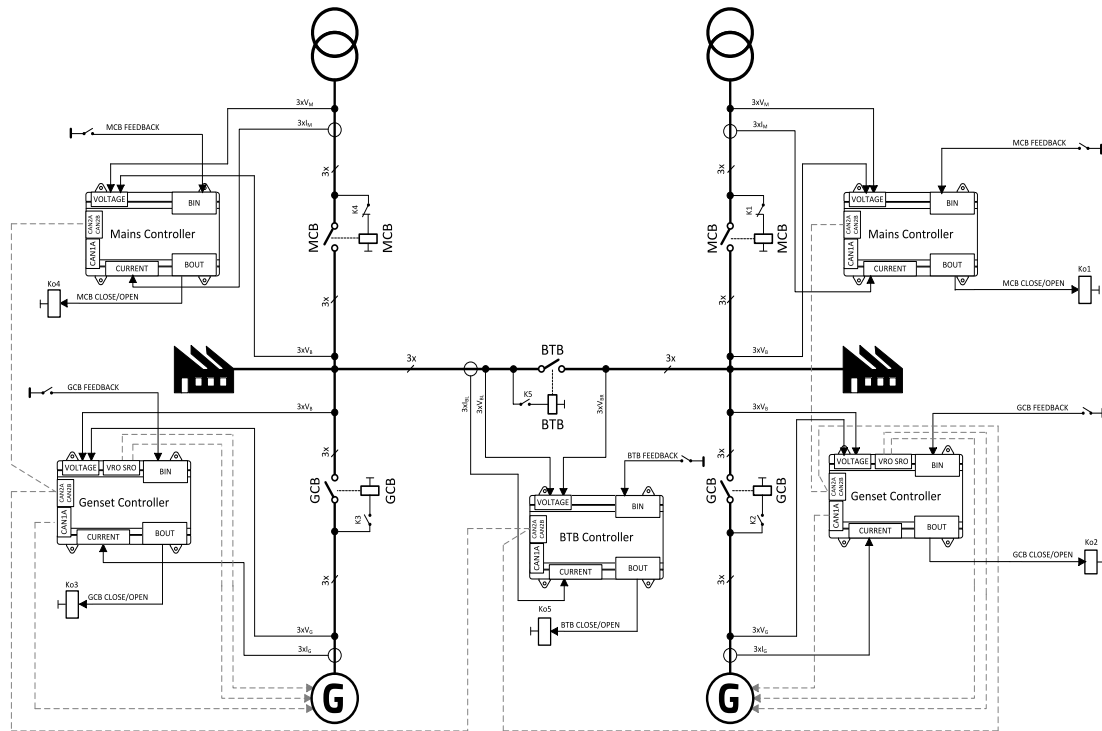
3.1 MCB

3.1.1 MCB application with one mains incomer



InteliMains 1010 SC directly controls only the MCB. Frequency/Power and Voltage/Power Factor of the system is controlled via load sharing and var sharing outputs using **CAN2A** (page 18) and/or **CAN2B** (page 18) communication.

3.1.2 MCB application with multiple mains incomers



It is possible to use IntelliMains 1010 SC with multiple mains incomers. In this case it is necessary to also use BTB controller to split site into 2 groups. For more information please see IntelliMains 1010 SC BTB Global Guide.

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4 Installation and wiring

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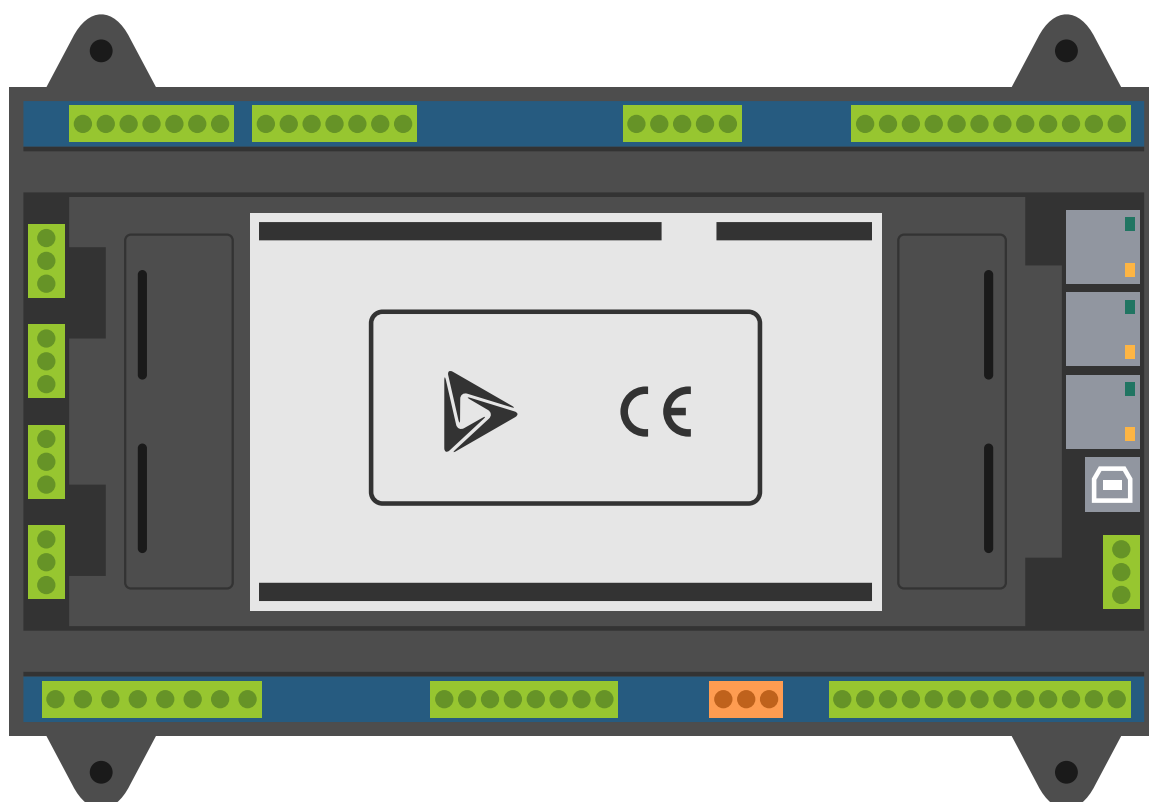
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4.1 Package content

The package contains:

- Controller IntelliMains1010 SC
- Terminal blocks

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



4.2 Controller installation

4.2.1 Dimensions

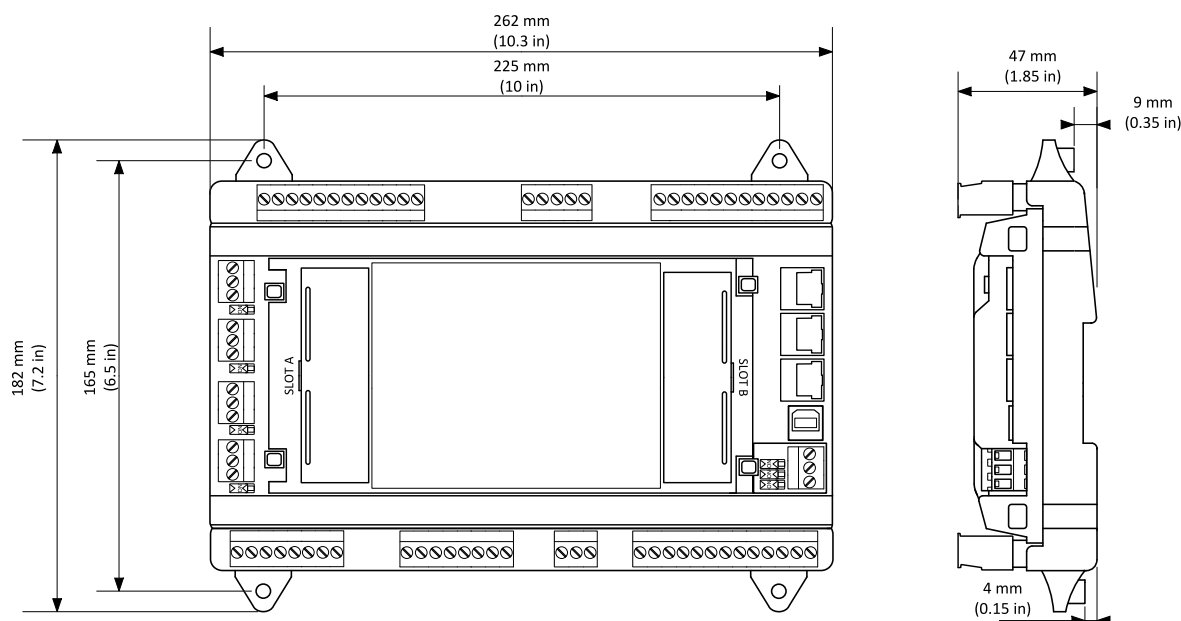


Image 4.1 Controller dimensions

Note: Dimensions are in millimeters.

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

4.2.2 Mounting

The controller unit should be mounted onto the backside of the switchboard door and after the installation it should be inaccessible for nonauthorized people. There are two ways how to mount the CU.

Mounting on DIN rail

Mount the controller on the DIN rail as described on the picture below.

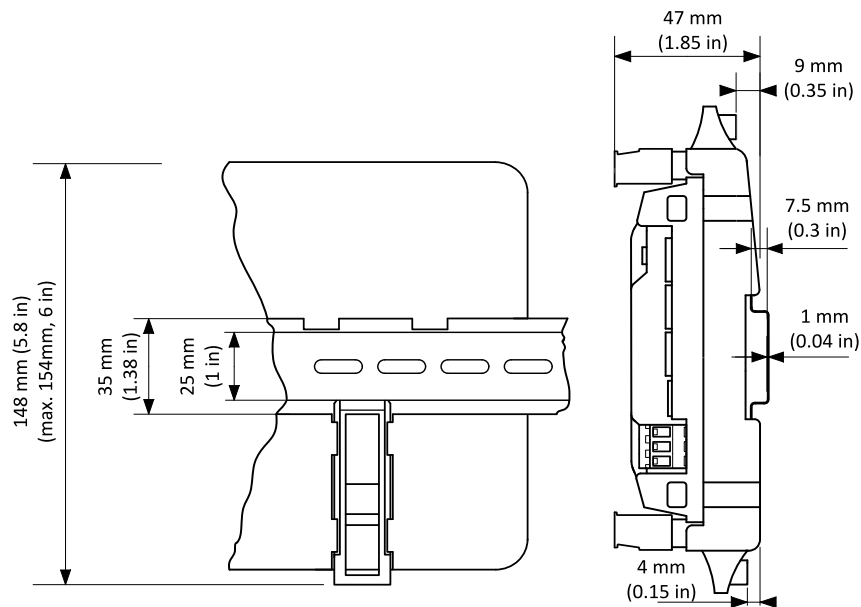


Image 4.2 Controller mounting on DIN rail

Mounting in switchboard doors

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

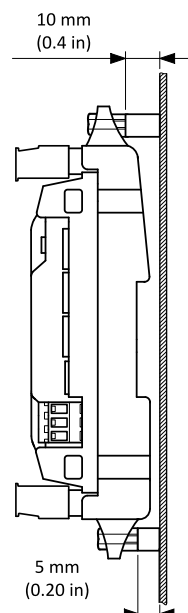
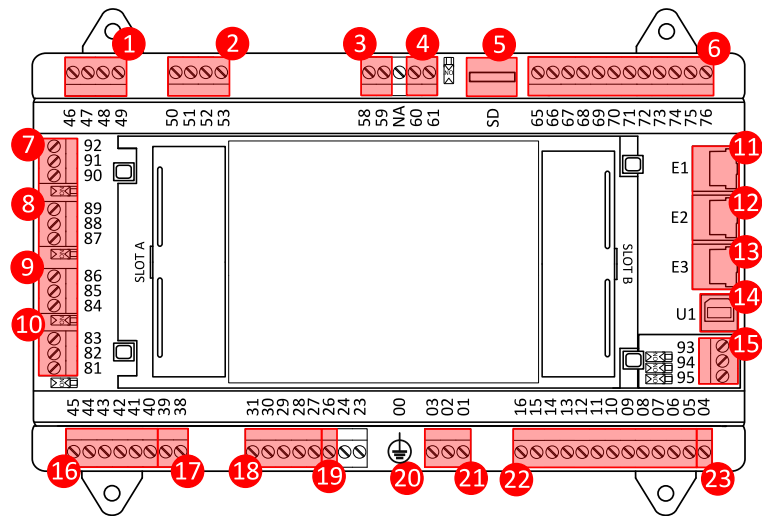


Image 4.3 Controller mounting in the switchboard doors

4.3 Terminal Diagram

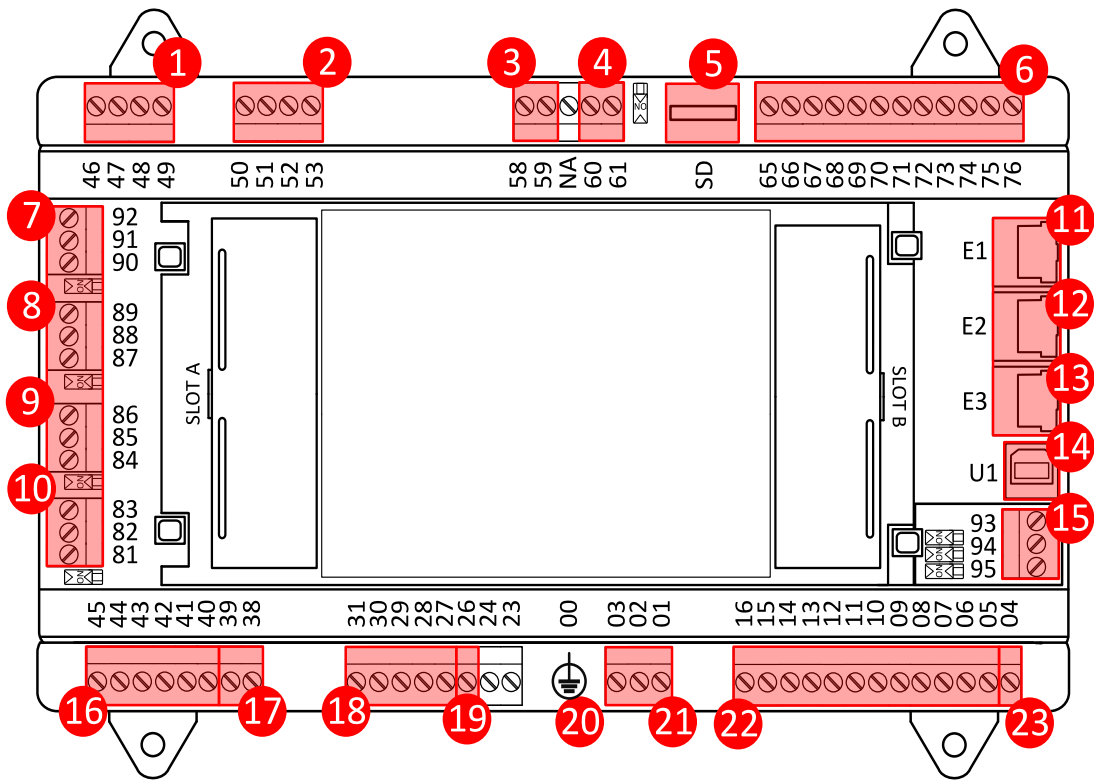
① MAINS (BUS-L) VOLTAGE	46	N	⑥ BINARY INPUTS	65	BI1	⑧ CAN2A	89	H
	47	L1		66	BI2		88	COM
	48	L2		67	BI3		87	L
	49	L3		68	BI4	⑨ CAN1B	86	H
② BUS (BUS-R) VOLTAGE	50	N		69	BI5		85	COM
	51	L1		70	BI6		84	L
	52	L2		71	BI7	⑩ CAN1A	83	H
	53	L3		72	BI8		82	COM
③ ④ ANALOG OUTPUTS	58	AO1 COM		73	BI9		81	L
	59	AO1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



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

4.4 Recommended wiring

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1	Mains (Bus-L) voltage inputs	max 600 V AC Ph-Ph	Voltage measurement wiring (page 53)
2	Bus (Bus-R) voltage inputs	max 600 V AC Ph-Ph	Voltage measurement wiring (page 53)
3	Analog output	max ± 10 V DC	Analog Outputs (page 67)
4	Analog output	max ± 10 V DC	Analog Outputs (page 67)

5	SD card slot		
6	Binary inputs	max 36 V DC	Binary Inputs (page 61)
7	CAN2B	H, COM, L	CAN bus and RS485 wiring (page 68)
8	CAN2A	H, COM, L	CAN bus and RS485 wiring (page 68)
9	CAN1B	H, COM, L	CAN bus and RS485 wiring (page 68)
10	CAN1A	H, COM, L	CAN bus and RS485 wiring (page 68)
11	Ethernet 1	ETH 1	Ethernet (page 72)
12	Ethernet 2	ETH 2	Ethernet (page 72)
13	Ethernet 3	ETH 3	Ethernet (page 72)
14	USB		USB (page 71)
15	RS485	A, COM, B	CAN bus and RS485 wiring (page 68)
16	Mains (Bus-L) Current	max 5 A AC	Current measurement wiring (page 49)
17	Aux current	max 5 A AC	Current measurement wiring (page 49)
18	Analog inputs	max 10 V DC	Analog Inputs (page 63)
19	Sensor power supply	5 V DC max 100 mA	
20	Grounding		Improves resistance to electrical interference if connected to the ground.
21	Power supply	+, N/A, - 8 - 36 V DC max 7,5 A	Power supply (page 48)
22	Binary outputs	max 36 V; 0,5 A	Binary Outputs (page 62)
23	E-stop	max 1 A	E-Stop (page 63)

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 Bus (Bus Right) Voltage and Mains (Bus Left) 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 mm².

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 mm²
- Maximum continuous DC power supply voltage is 36 V DC
- Minimum continuous DC power supply voltage is 8 V DC
- It is strongly recommended to use 8 A fusing (12xBOUT 0.5 A)

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

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

The controller includes internal capacitors that allows the controller to continue in operation if the voltage dip occurs. The capacitors are useful mainly during short cranking voltage dips for the connections with 12 V battery power supply. If the voltage dip goes during cranking to 0 V and after 50 ms it recovers to 8 V, the controller continues operating. When this situation occurs the binary outputs are temporarily switched off and after recovering to 8 V back on. This cycle can be repeated several times.

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

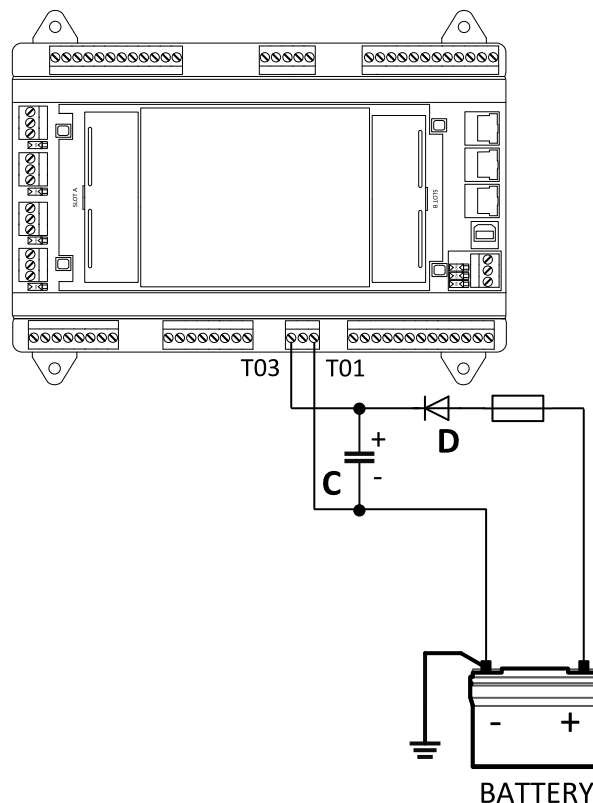


Image 4.4 Controllers power supply with external capacitor, separating diode and fusing

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

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

Note: Low voltage circuits (35 volts or less) shall be supplied from the engine starting battery or an isolated secondary circuit.

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 starting battery. Fuse value and type depends on number of connected devices and wire length. It is recommended to use slow blow fuse T8 A. The fast blow fuse is inappropriate due to internal capacitors charging during power up.

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 mm² cables for voltage connection and 2.5 mm² for current transformers connection. Adjust **Connection type** (page 265), **MainsAC Shore Nominal Voltage Ph-N** (page 267), **Mains Nominal Voltage Ph-Ph** (page 267), **Bus AC Bus Nominal Voltage Ph-N** (page 266), **Bus Nominal Voltage Ph-Ph** (page 266) and **Nominal Current** (page 263) by appropriate setpoints in the Basic Settings group.



IMPORTANT: Risk of personal injury due to electric shock when manipulating voltage terminals under voltage. Be sure the terminals are not under voltage before touching them.

Do not open the secondary circuit of current transformers when the primary circuit is closed. Open the primary circuit first.

Current measurement wiring

The number of CT's is automatically selected based on selected value of setpoint **Connection type** (page 265). Current and power measurement is suppressed if current level is below 1 % of CT range.

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

ConnectionType: 3Ph4Wire / High Leg D / 3Ph3Wire

Connection type (page 265) = 3Ph4Wire / High Leg D / 3Ph3Wire

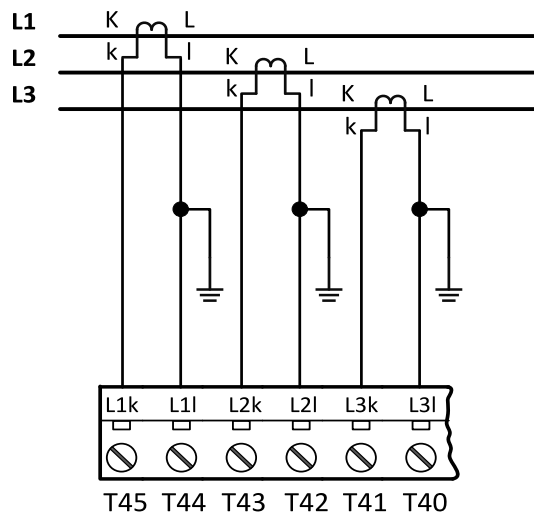


Image 4.5 Mains current measurement wiring

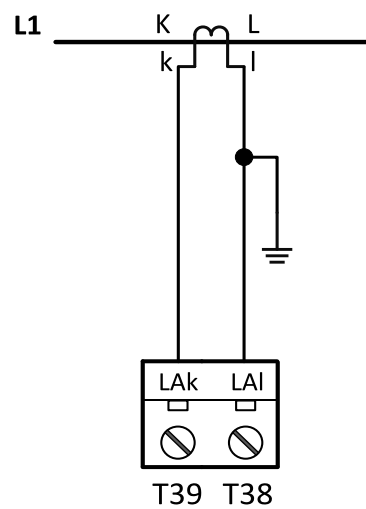


Image 4.6 AUX Bus current measurement wiring

ConnectionType: SplitPhase

Connection type (page 265) = SplitPhase

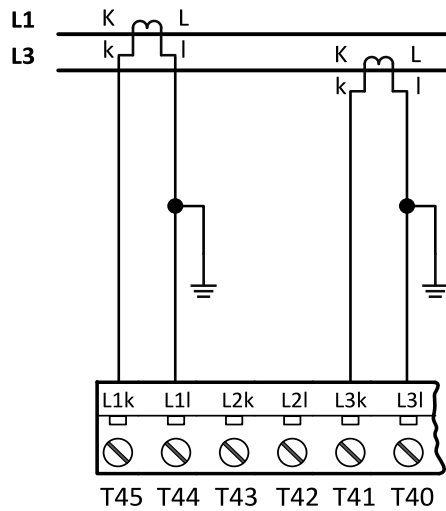


Image 4.7 Mains current measurement wiring

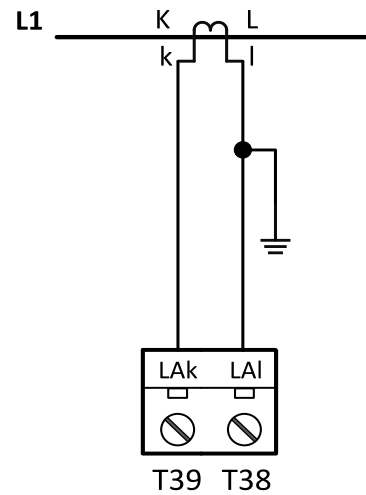


Image 4.8 AUX Bus current measurement wiring

ConnectionType: MonoPhase

Connection type (page 265) = MonoPhase

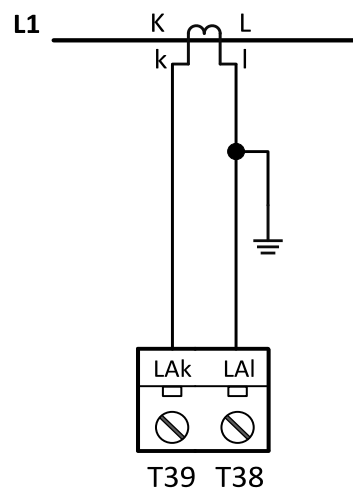
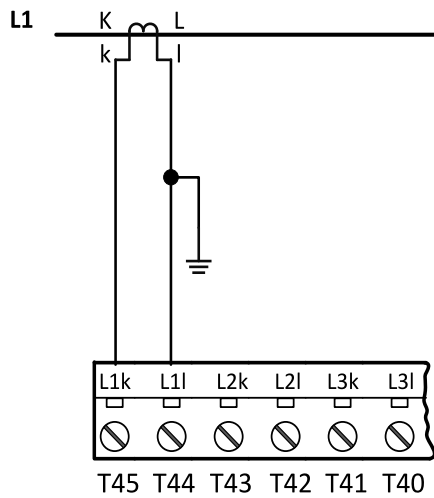


Image 4.9 Mains current measurement wiring Image 4.10 AUX Bus current measurement wiring

Principle of two transformers measuring for 3 phase connections

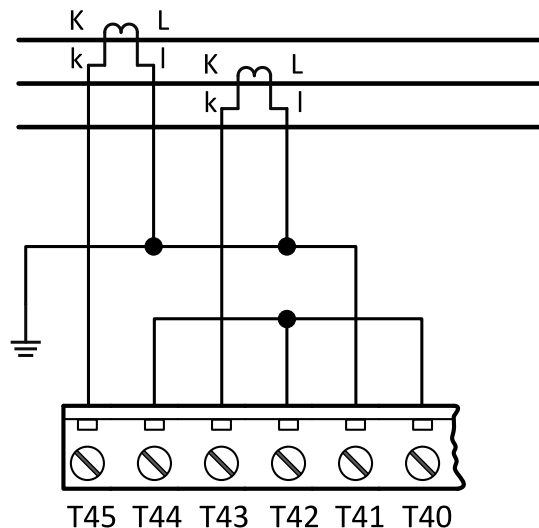


Image 4.11 Principle of two current transformers measuring

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

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 (page 229)** for more information.

Note: It is necessary to use manual IP address on both PC and controller if there is no device which will provide DHCP.

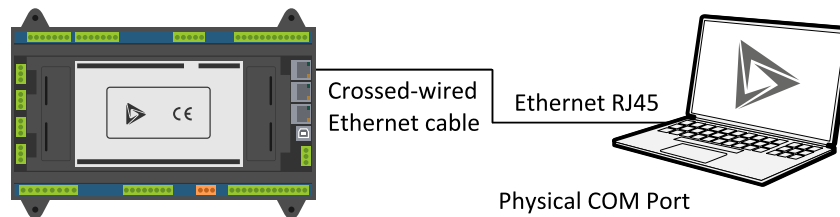


Image 4.12 Ethernet Connection

IMPORTANT: The IntelIMains1010 SC 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.

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

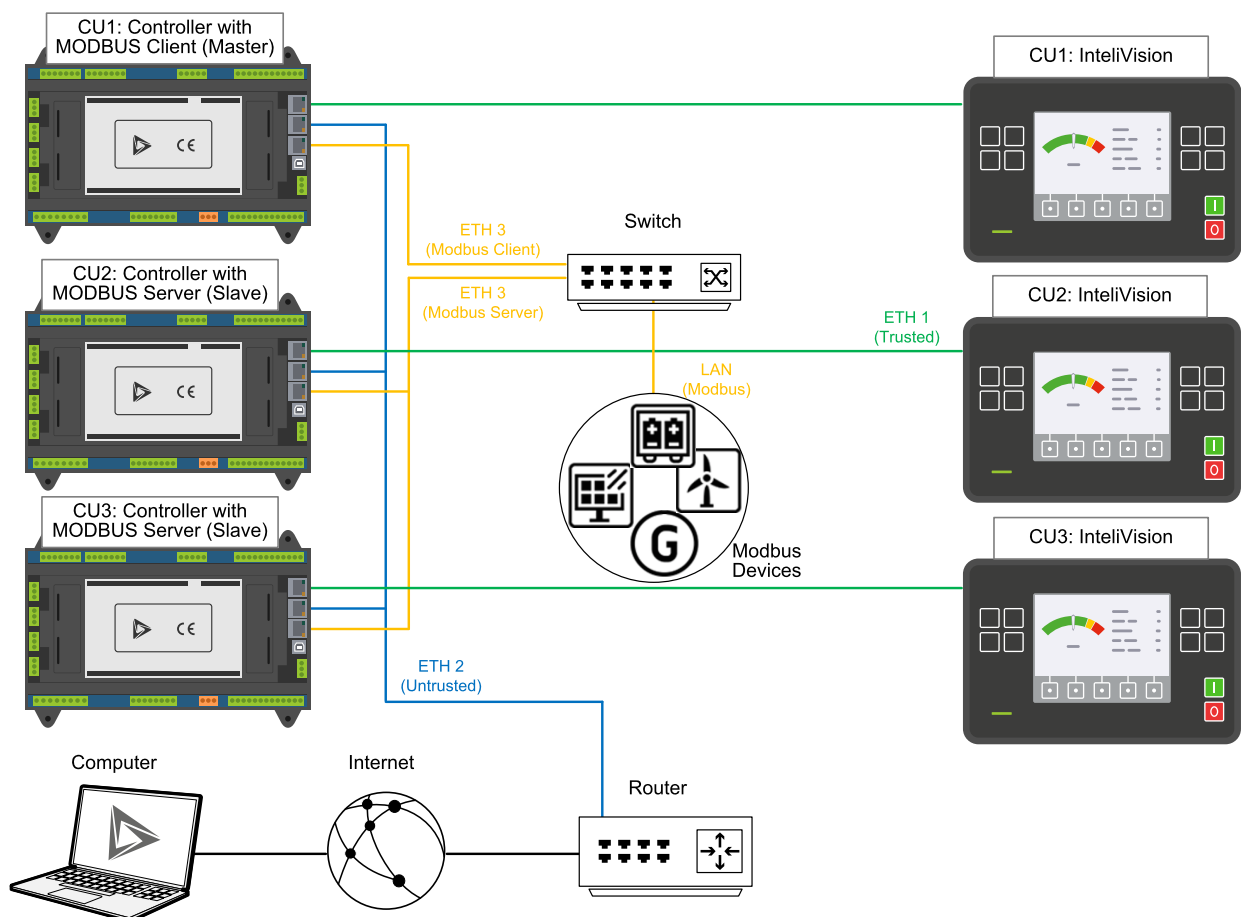


Image 4.13 Advanced Ethernet Topology With One Modbus Client

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

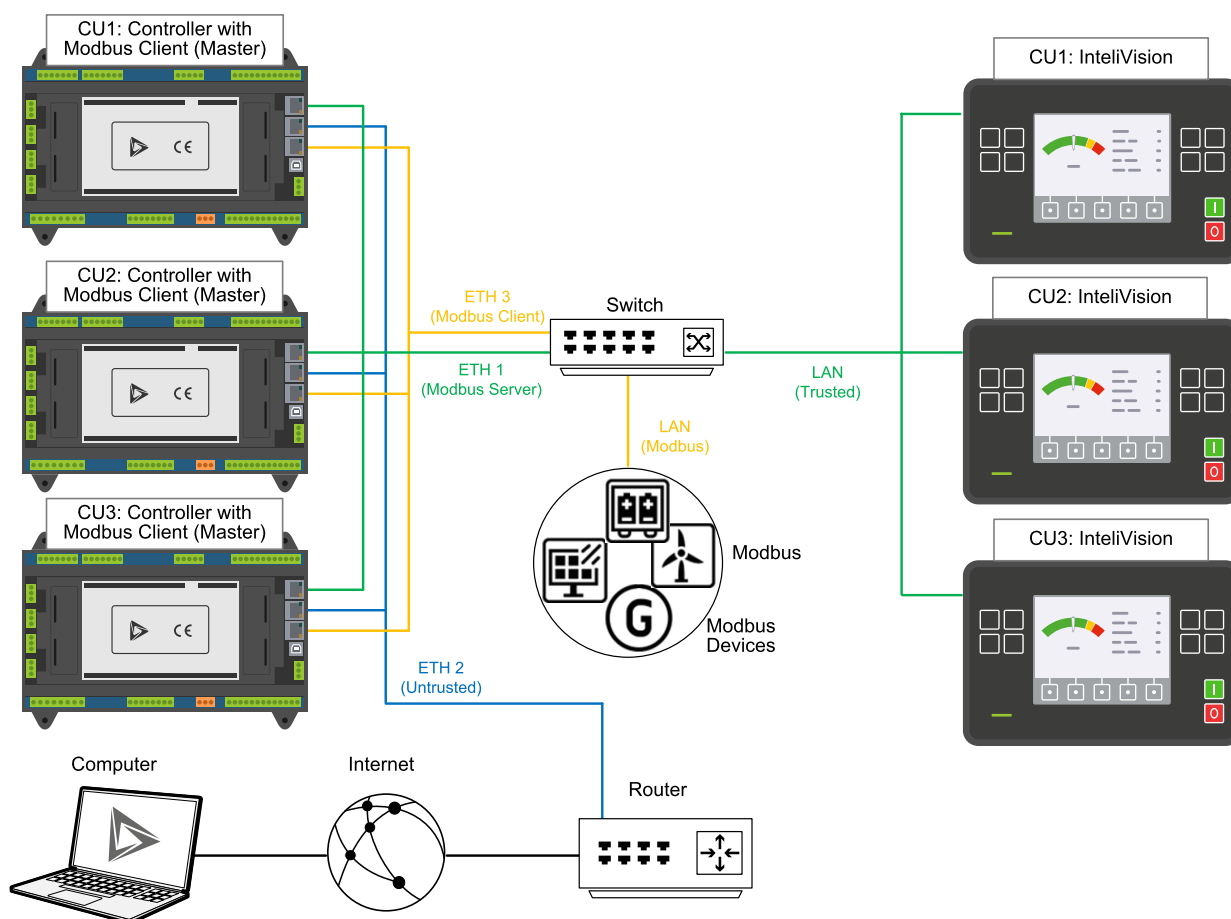


Image 4.14 Advanced Ethernet Topology With Multiple Modbus Clients

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* (page 22).

Voltage measurement wiring

The Mains and Bus protections are evaluated from different voltages based on **Connection type** (page 265) setting:

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

ConnectionType: 3 Phase 4 Wires

Connection type (page 265) = 3Ph4Wire

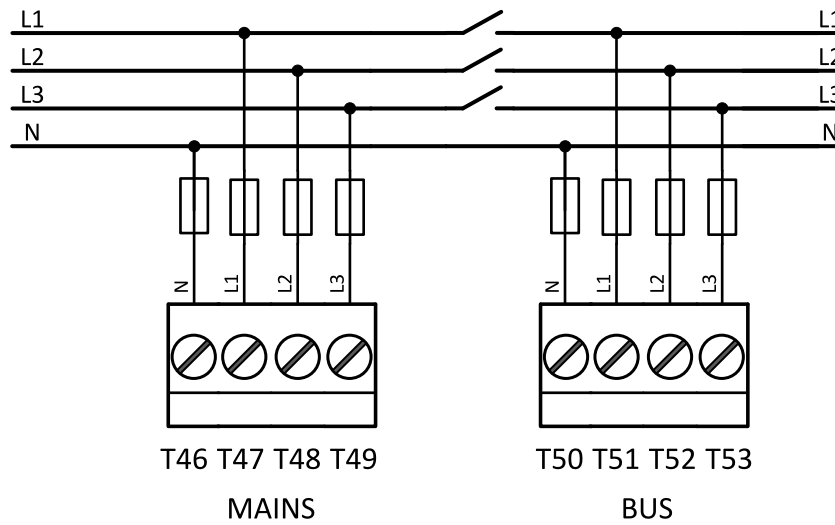


Image 4.15 Controller wiring for voltage measurement of 3 phase application with neutral

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

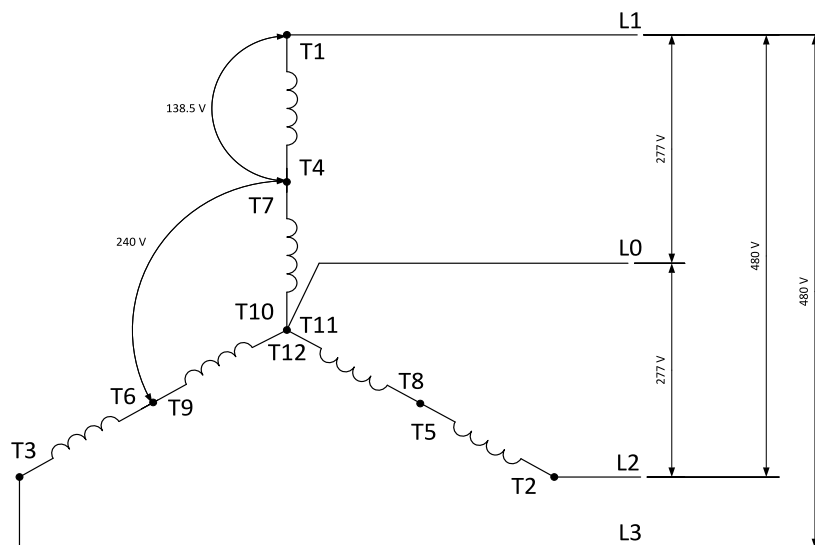


Image 4.16 Typical Mains wiring of 3 phase application with neutral

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

ConnectionType: High Leg D

Connection type (page 265) = High Leg D

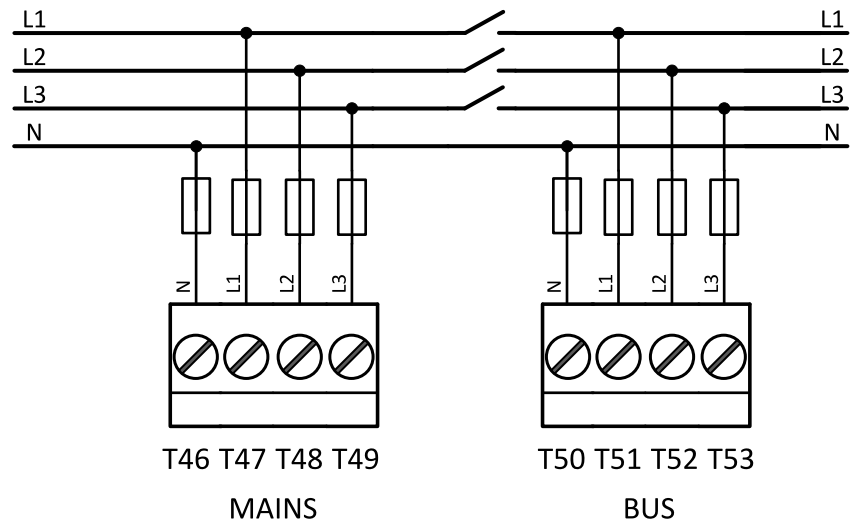


Image 4.17 Controller wiring for voltage measurement of High Leg Delta application

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

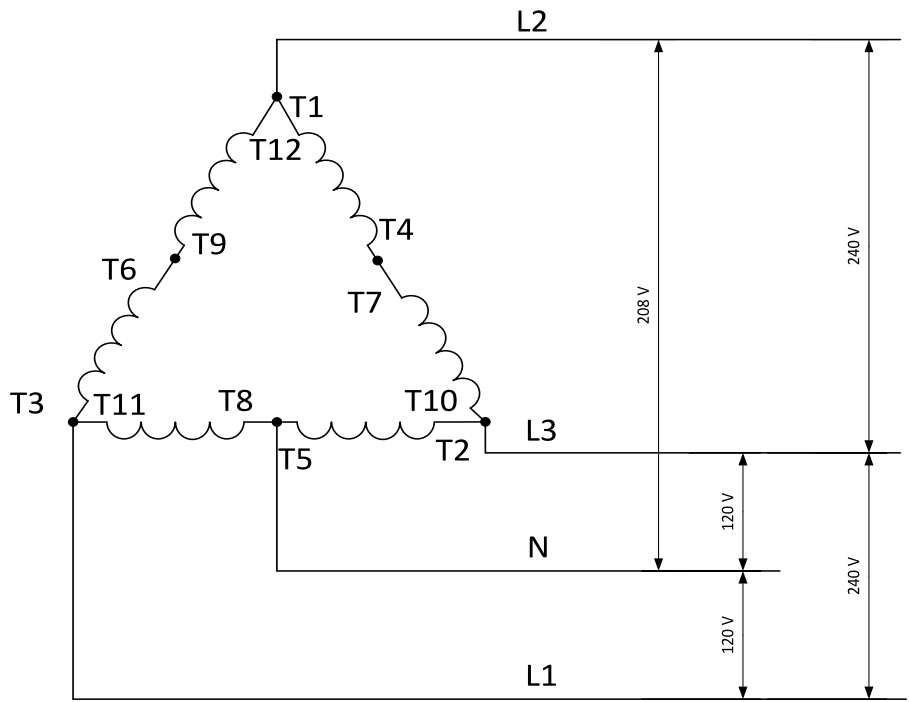


Table 4.1 Typical Mains wiring of High Leg Delta application

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

ConnectionType: 3 Phase 3 Wires

Connection type (page 265) = 3Ph3Wire

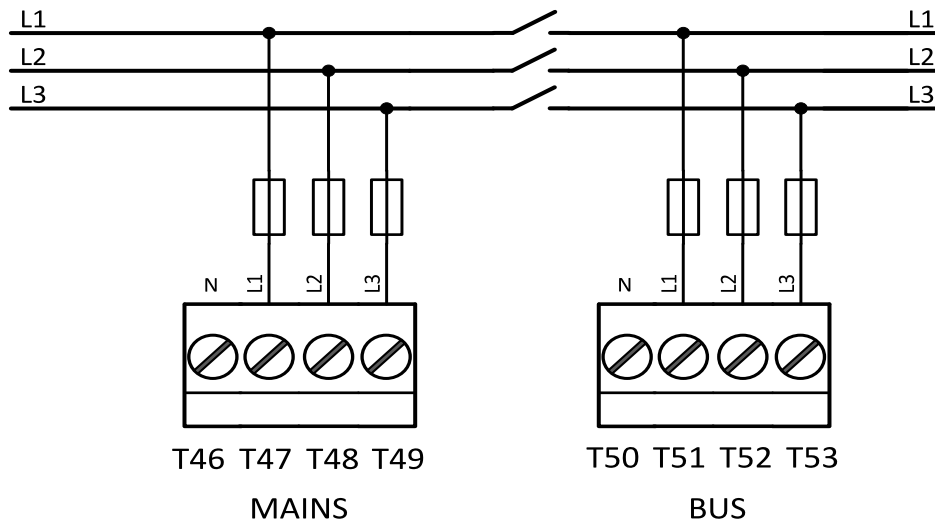


Image 4.18 3 Controller wiring for voltage measurement of 3 phase application without neutral

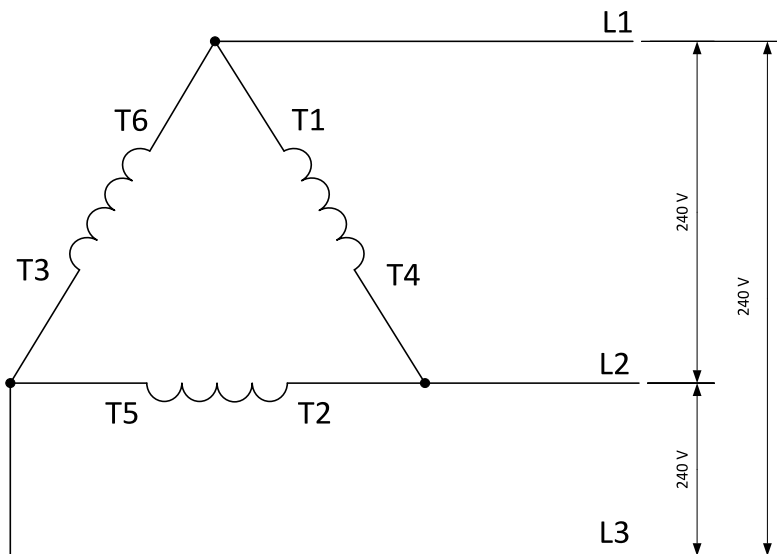


Image 4.19 Typical Mains wiring of 3 phase application without neutral

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

ConnectionType: SplitPhase

Connection type (page 265) = SplitPhase

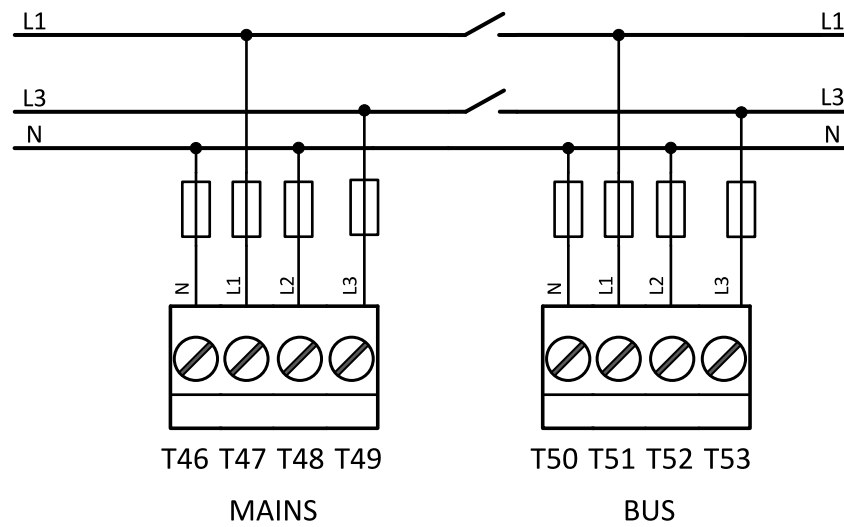
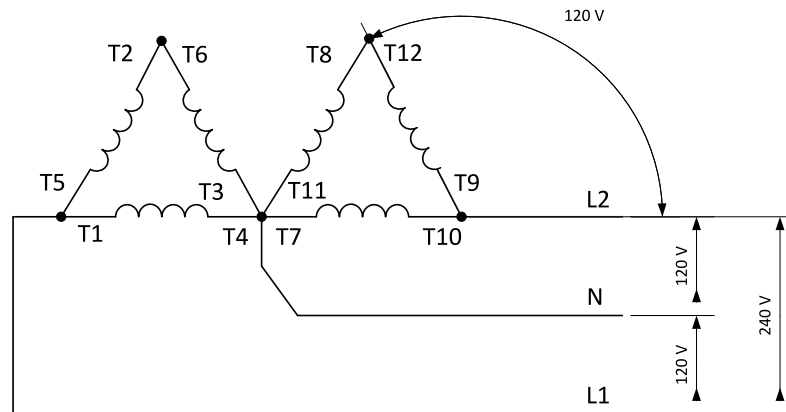


Image 4.20 Controller wiring for voltage measurement of SplitPhase application

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

DOUBLE DELTA Connection



ZIG ZAG (DOG LEG) Connection

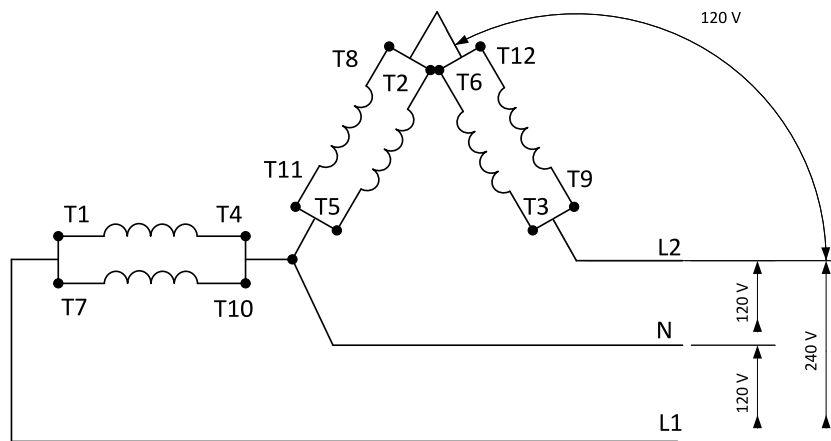


Image 4.21 Typical Mains wiring of SplitPhase application

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

ConnectionType: Mono Phase

Connection type (page 265) = MonoPhase

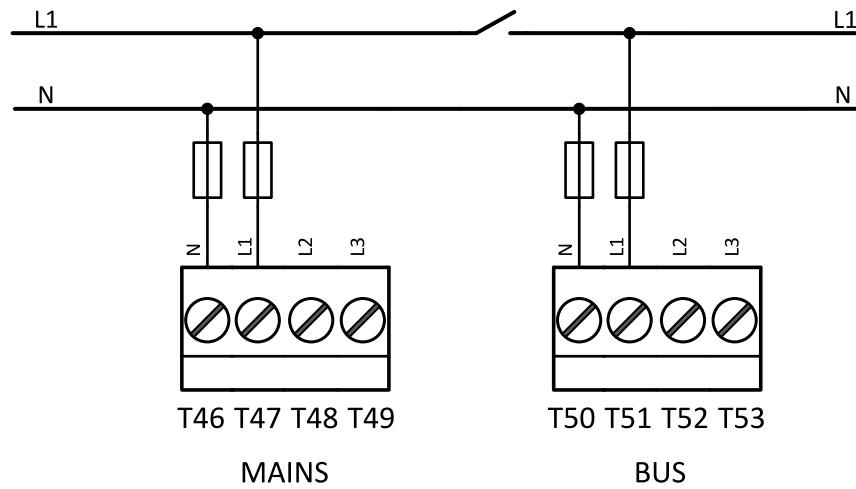


Image 4.22 Controller wiring for voltage measurement of MonoPhase application

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

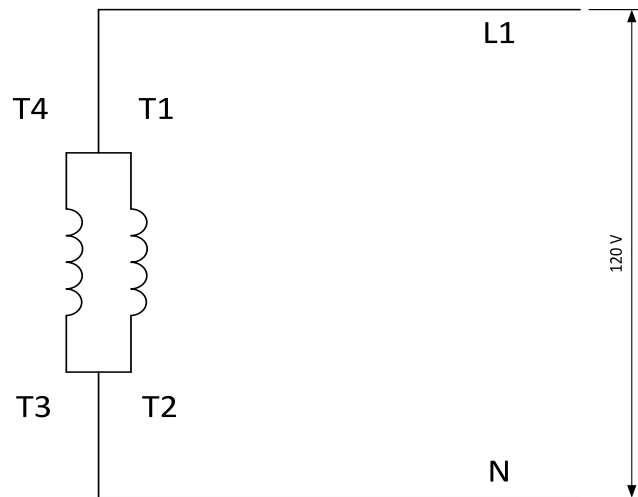


Image 4.23 Typical Mains wiring of MonoPhase application

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

Principle of two transformers measuring for 3 phase connections

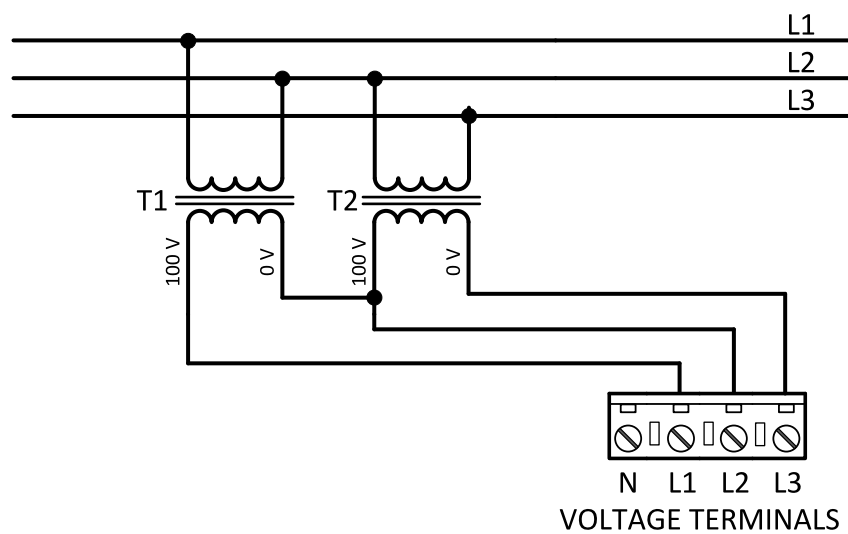


Image 4.24 Principle of two voltage transformers measuring

4.4.5 Binary Inputs

InteliMains 1010 SC offers switchable types of inputs. You can select from **Pull Up** and **Pull Down** settings. Use minimally 1 mm² 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 (page 773)** 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.

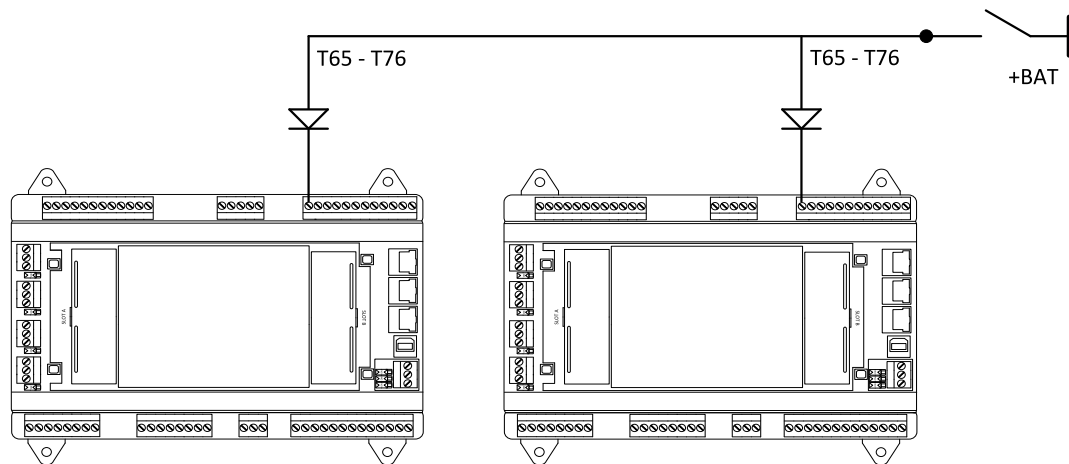


Image 4.25 Wiring of pull down binary inputs with separation diodes

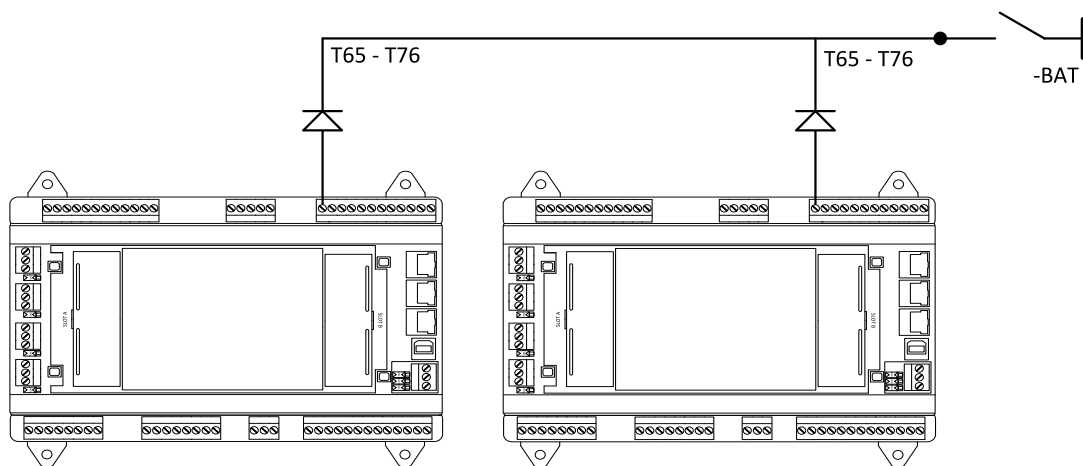


Image 4.26 Wiring of pull up binary inputs with separation diodes

4.4.6 Binary Outputs

Use min. 1 mm² cables for wiring of binary outputs. Use external relays as indicated on the schematic below for all outputs except those where low-current loads are connected (LED signalization etc.). There are two Binary Output groups, the first one is powered by E-STOP (BO1 and BO2) and second one is powered by the controllers main power supply connector (BO3 .. BO12). Every group of outputs can provide steady current of up to 2 A. Every single binary output can provide up to 0.5 A of steady current unless the total current of the group of outputs does not exceed 2 A.

Note: Because of safety reasons the IntelliMains 1010 SC supports only high side binary outputs.

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

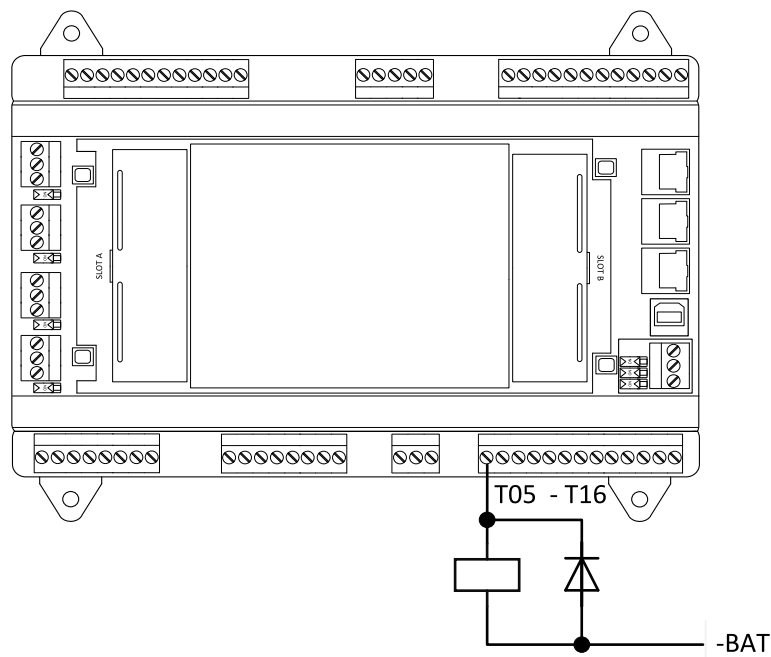


Image 4.27 Wiring of binary outputs (high side)

4.4.7 E-Stop

The E-Stop in the IntelliMains 1010 SC controller is common HW part of the PCB and it is not used for any special function. It has dedicated terminal T04 which should be wired to the battery voltage because it is used as power supply for binary output 1 (T05) and binary output 2 (T06).

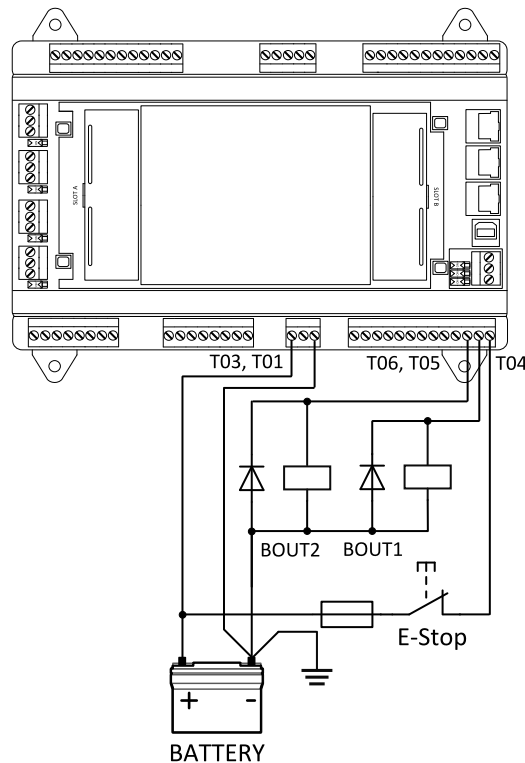


Image 4.28 E-Stop wiring

Note: Recommended fusing is 1.2 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 ground as near to the sensors as possible.
- 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.

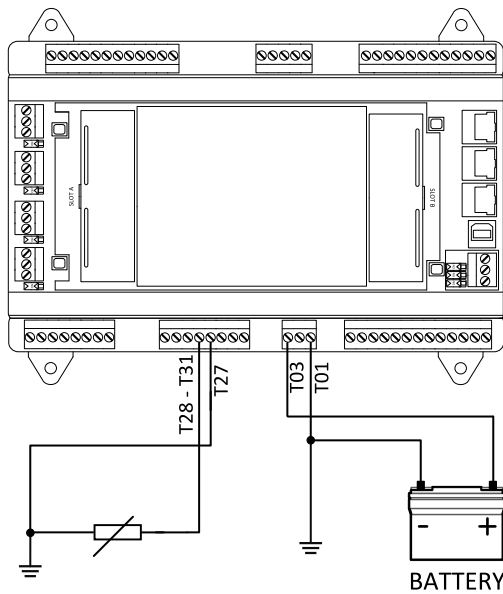


Image 4.29 Grounded sensors

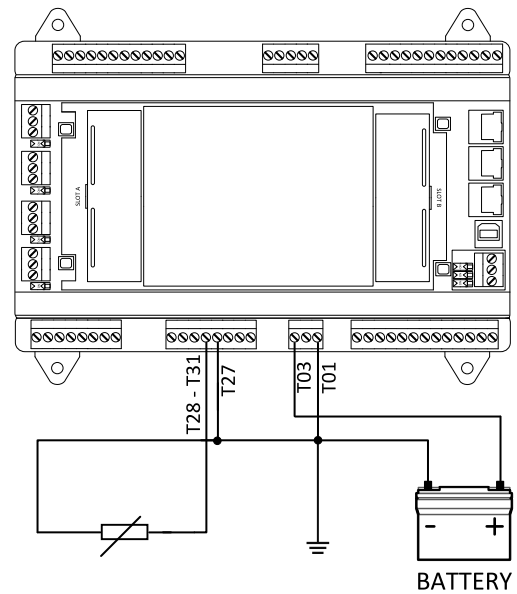


Image 4.30 Isolated sensors

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

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

Voltage sensors

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

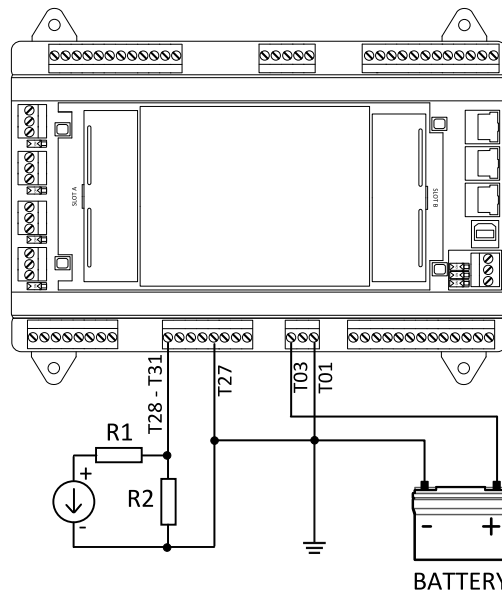


Image 4.31 Wiring of analog input with voltage sensor

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

Current sensors

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

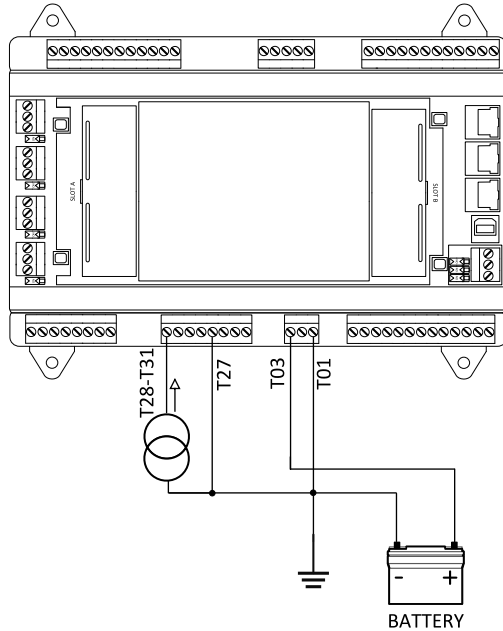


Image 4.32 Wiring of analog input with active current sensor

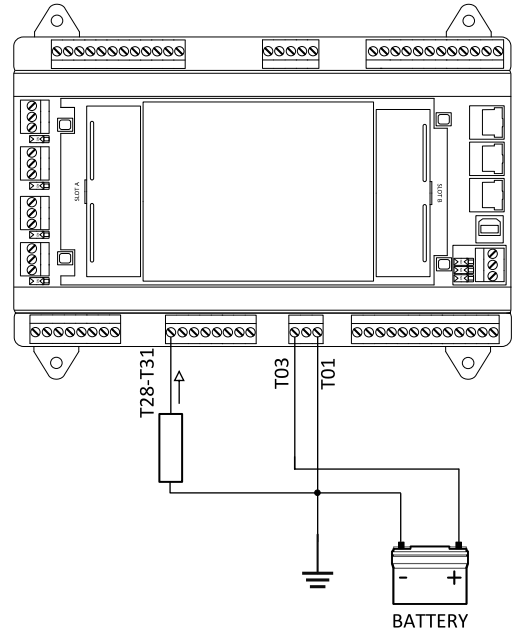


Image 4.33 Wiring of analog input with passive current sensor

Analog as binary or tristate inputs

Analog inputs can be used also as binary or tri-state, i.e. for contact sensors without or with circuit check. The threshold level is 750 Ω . In the case of tri-state, values lower than 10 Ω and values over 2500 Ω are evaluated as sensor failure (short or open circuit), values over 750 Ω are evaluated as logical 0 and values below 750 Ω are evaluated as logical 1. This can be used for example to prevent running the engine with failed temperature sensor, so it won't be overheated.

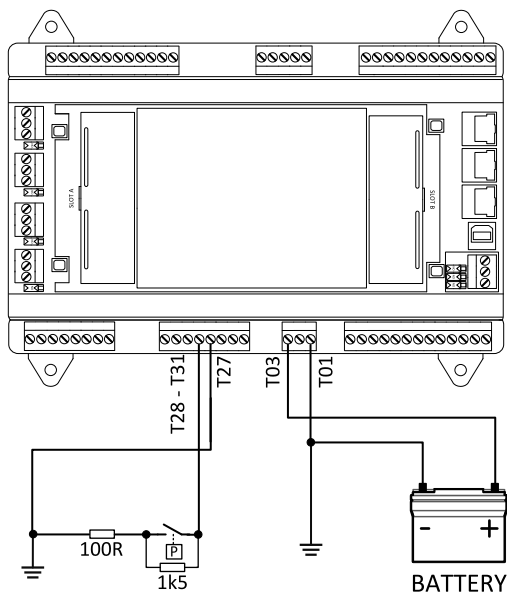


Image 4.34 Analog inputs as tristate

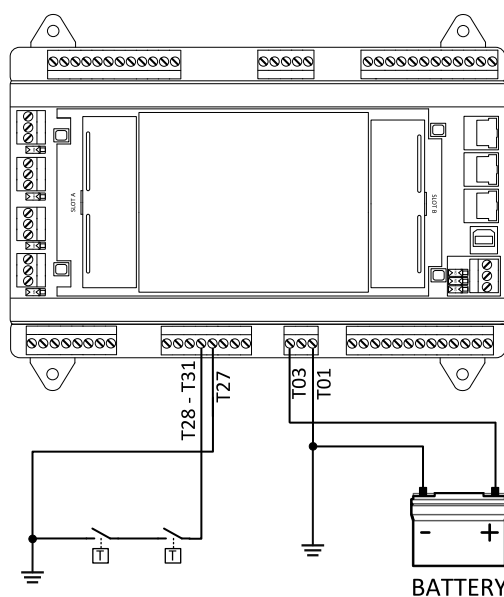


Image 4.35 Analog inputs as binary

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

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

Tristate sensor has 3 states:

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

Curve of sensor:

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

4.4.9 Analog Outputs

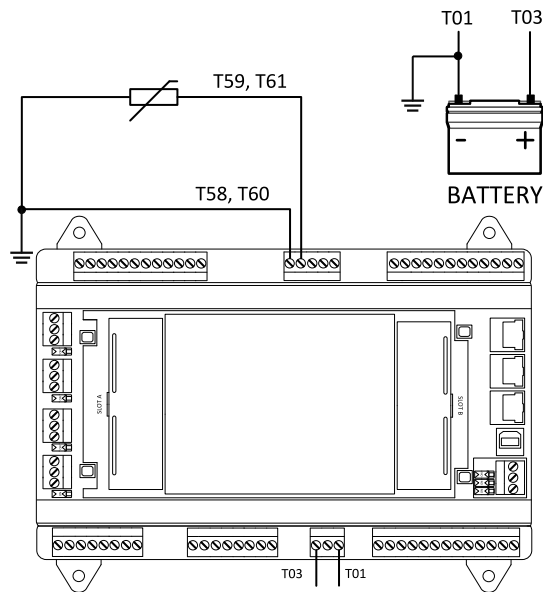


Image 4.36 Analog outputs - Wiring

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

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

> Voltage

- » Output range: -10 to +10 V
- » Maximum load: 5 mA
- » Output accuracy: 1 % from set value ± 100 mV (measured at load 10 k Ω)
- » Minimum step: 1/10000 of full range (approx. 14bit resolution)
- » Step response: 10 ms max. (measured between 10 and 90 %)
- » Output ripple: 30 mV max. (measured at 50% duty cycle at 3000 Hz PWM)

> Current

- » Output range -20 to +20 mA
- » Maximum load: 500 Ω
- » Output accuracy: 1 % from set value ± 200 μ A
- » Minimum step: 1/10000 of full range (approx. 14bit resolution)
- » Step response: 10 ms max. (measured between 10 and 90 %)
- » Output ripple: 60 μ A max. (measured at 50% duty cycle at 3000 Hz PWM)

> PWM

- » Output voltage levels: 0 V / 5 V
- » Maximum load: 10 mA
- » Output High level: >4 V @ 10 mA
- » Output Low level: <1 V @ 10 mA

- » Minimum step: 1/10000 of full range (approx. 14bit resolution)
- » Frequency range: 500 to 3000 Hz (settable during configuration)

4.4.10 CAN bus and RS485 wiring

CAN bus wiring

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

- The maximum length of the CAN bus depends on the communication speed. For a speed of 250 kbps, which is used on the **CAN1A (page 18)** bus (extension modules, ECU) and **CAN2A (page 18) (CAN2B (page 18))** 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 cable¹ 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 Ω resistors at both ends use a cable with following parameters:

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

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

Note: A termination resistor at the CAN (120 Ω) is already implemented on the PCB. For connecting, close the DIP switch near the appropriate CAN terminal. External 120 Ω resistor can be used between L and H instead of DIP switch with integrated termination resistor. If external resistor is used the DIP switch must be set to the OFF position.

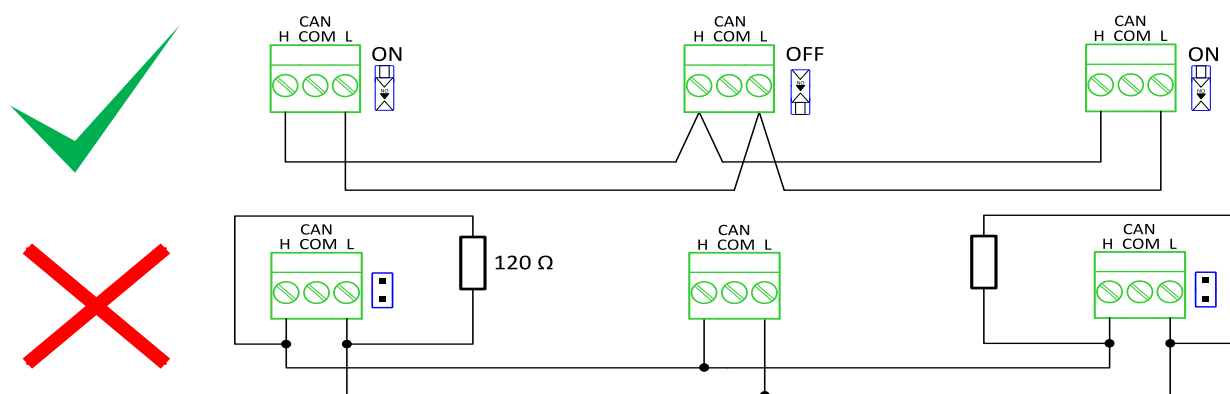


Image 4.37 CAN bus topology

¹Recommended 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 shorter distances (connection within one building)

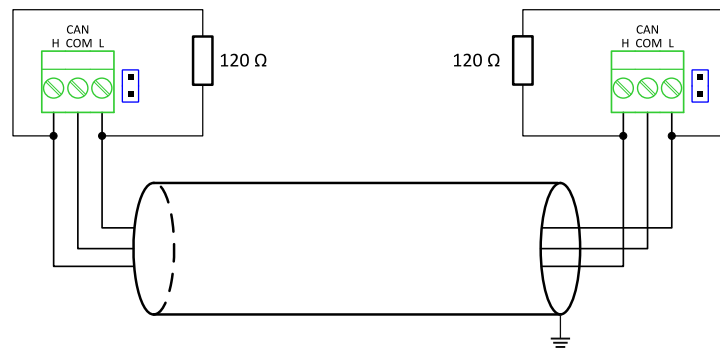


Image 4.38 CAN bus wiring for shorter distances

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

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

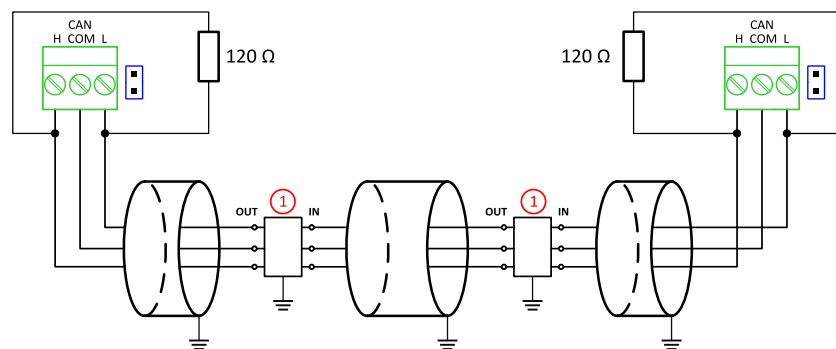


Image 4.39 CAN bus wiring for longer distances

① Recommended PT5-HF-12DC-ST¹

¹Protections 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

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 DIP switch near the RS485 terminal. External 120 Ω resistor can be used between L and H instead of DIP switch with integrated termination resistor. If external resistor is used the DIP switch must be set to the OFF position.

- Standard maximum bus length is 1000 m.
- Shielded cable¹ 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 Ω resistors at both ends.
- For shorter distances (connection within one building).

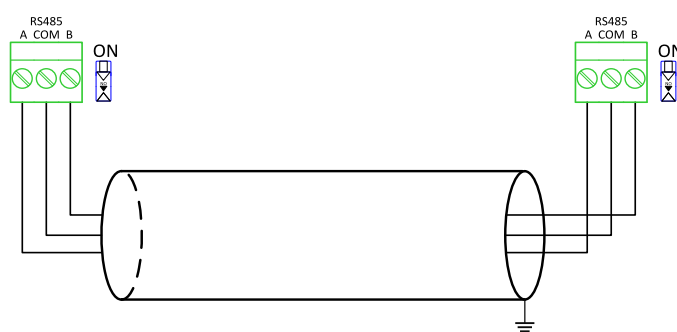


Image 4.40 RS485 wiring for shorter distances

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

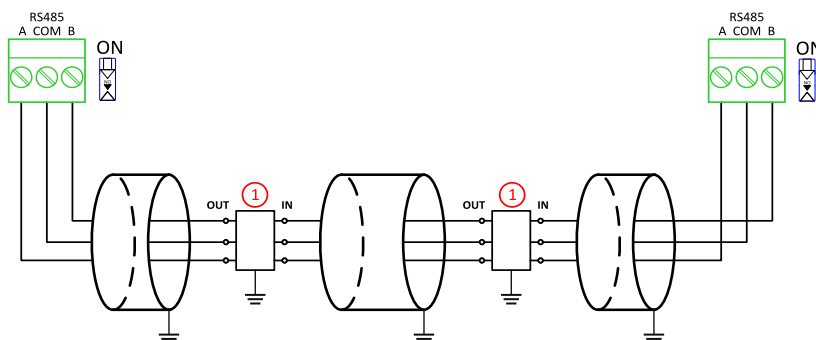


Image 4.41 RS485 wiring for longer distances

① Recommended PT5HF-5DC-ST²

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

¹Recommended 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)

²Recommended 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 Ω 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 milli-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 DIP switches PULL UP/PULL DOWN to connect the balancing resistors.

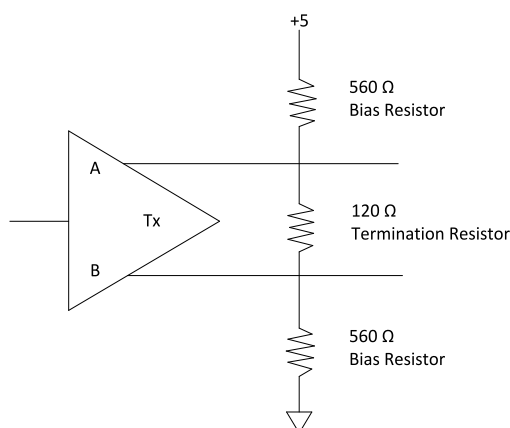


Image 4.42 Balancing resistors

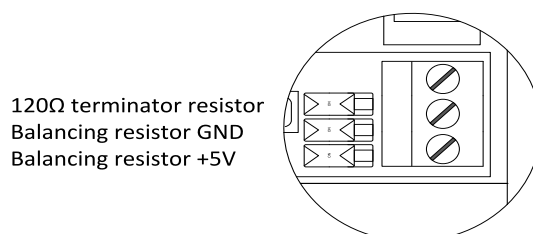


Image 4.43 RS485 on board

4.4.11 USB

The USB can be used for direct computer connection. Use the shielded USB A-B cable. See the chapter **Connection via USB (page 228)** for more information.

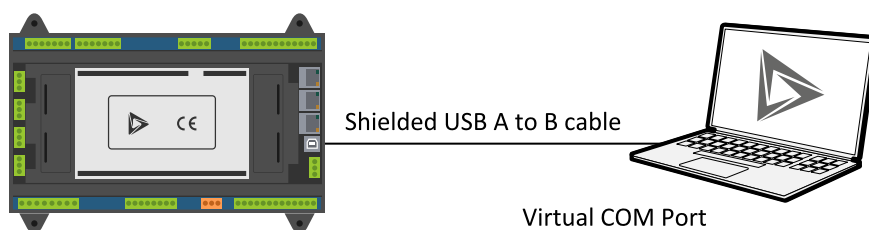


Image 4.44 USB connection

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

4.4.12 Ethernet

Ethernet Cat5/Cat6 cable fitted with the RJ45 connector can be connected to the ethernet interface. The ethernet can be used for direct computer connection. See the chapter **Connection via Ethernet (page 229)** for more information.

Note: It is necessary to use manual IP address on both PC and controller if there is no device which will provide DHCP.

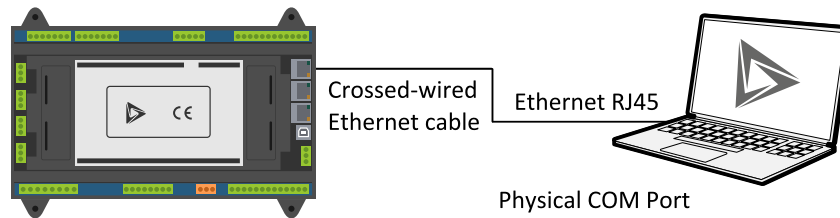


Image 4.45 Ethernet Connection

IMPORTANT: The IntelliMains1010 SC 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.

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

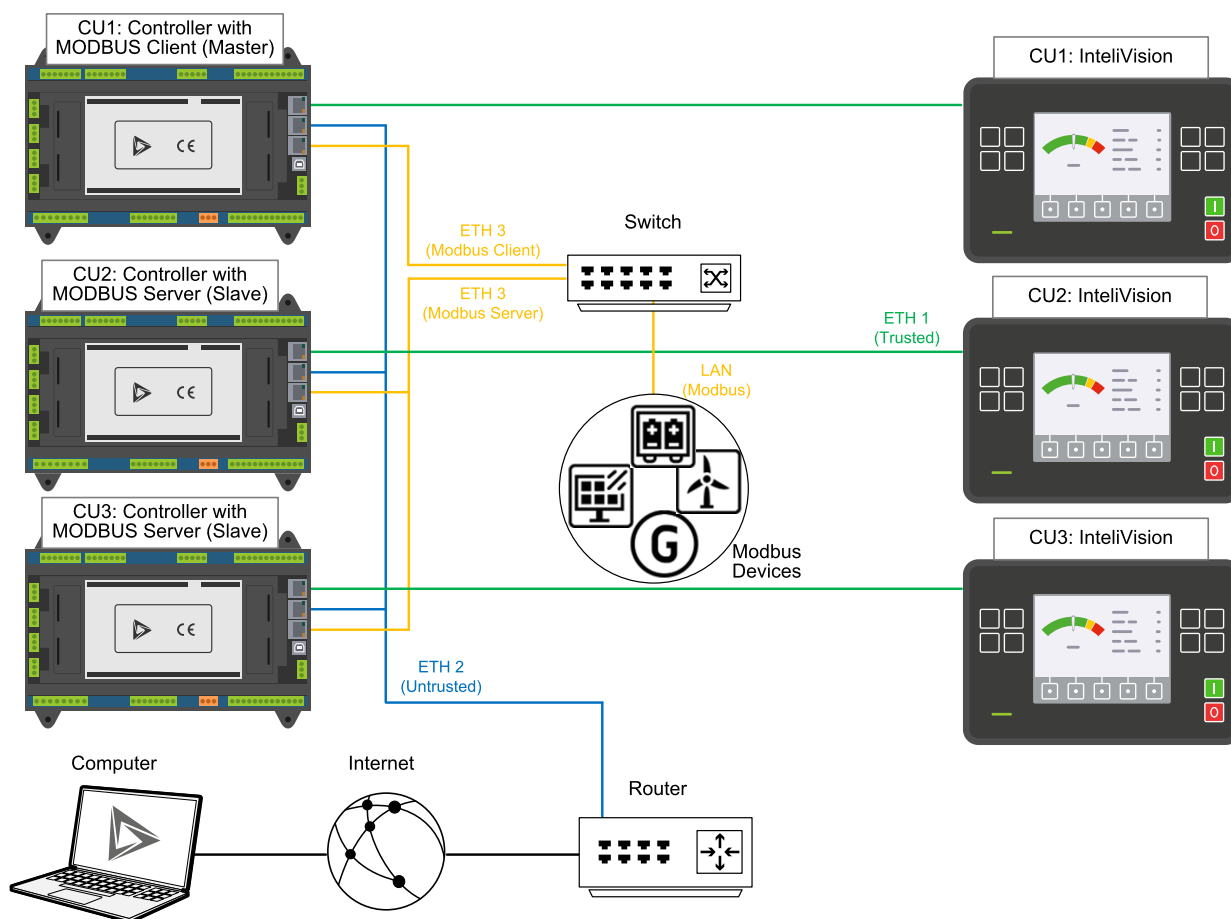


Image 4.46 Advanced Ethernet Topology With One Modbus Client

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

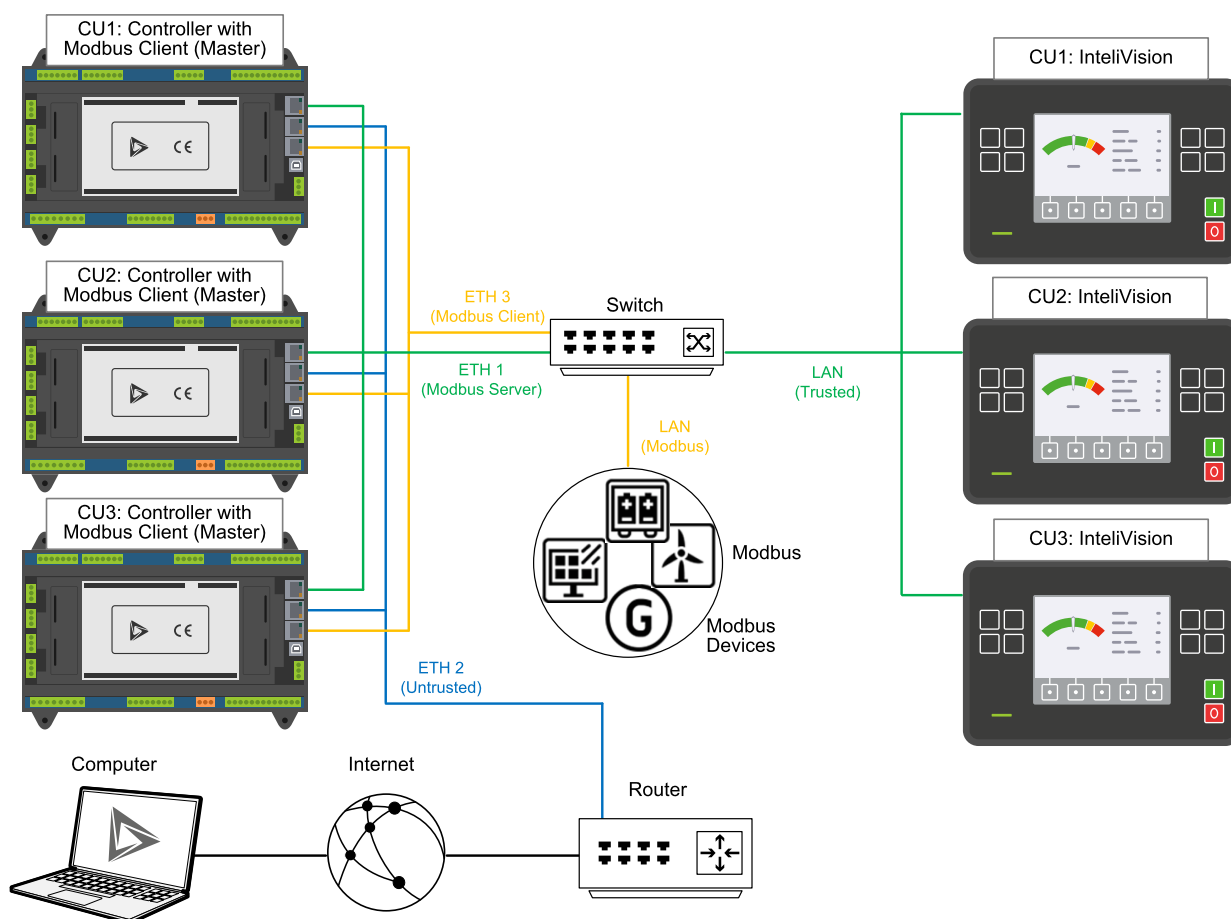


Image 4.47 Advanced Ethernet Topology With Multiple Modbus Clients

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* (page 22).

4.4.13 Cellular Connection

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

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

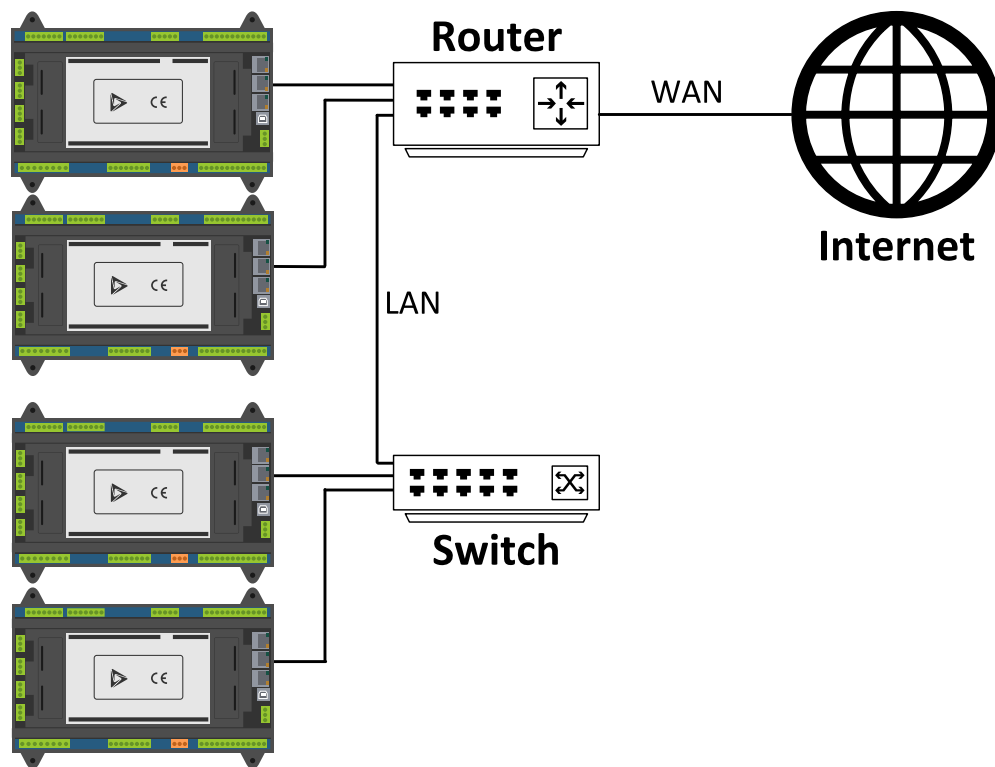


Image 4.48 Example of a topology

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

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

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

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

Cellular network technology

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

Technology	Description
4G (LTE)	Current, most advanced, technology. It is being deployed rapidly in some areas it may replace the legacy 2G networks. We recommend using this technology if it is available in the target area <ul style="list-style-type: none">➤ Provides highest data throughput rate and lowest latency➤ Best user experience – like a wired connection
3G (UMTS, HSPA, CDMA)	Successor of 2G. It is in operation in some areas, but it is not expanding anymore. <ul style="list-style-type: none">➤ Provides lower throughput rate and higher latency then 4G*➤ Still quite good user experience
2G (GSM, GPRS, EDGE)	Very first digital cellular network technology. It is still available in many areas, however it is slowly starting to decline. <ul style="list-style-type: none">➤ Provides lowest throughput rate and quite high latency➤ Generally not suitable for connection of multiple ComAp devices via a router

Frequency bands

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

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

Additional router functions

Backup WAN connection

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

Connection alive check

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

Automatic scheduled reboot

Router may perform periodically scheduled reboot. This function is a bit "harder" alternative to the **Connection alive check (page 76)**.

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

Typical router configuration

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

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

Cellular network

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

WAN interface

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

LAN setup

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

Cellular router examples

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

4.5 External display

InteliMains 1010 SC does not have an integrated display. External Remote Displays or PC Panel Displays are used when needed. InteliMains 1010 SC package does **not** include any external displays. External displays must be acquired separately, see the chapter **Displays (page 22)**.

4.5.1 InteliVision Displays

Wiring diagrams

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

For display connection it is recommended to use Ethernet 1 (trusted interface in default). Direct connection of InteliVision display to InteliMains 1010 SC 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 InteliMains 1010 SC at one time.

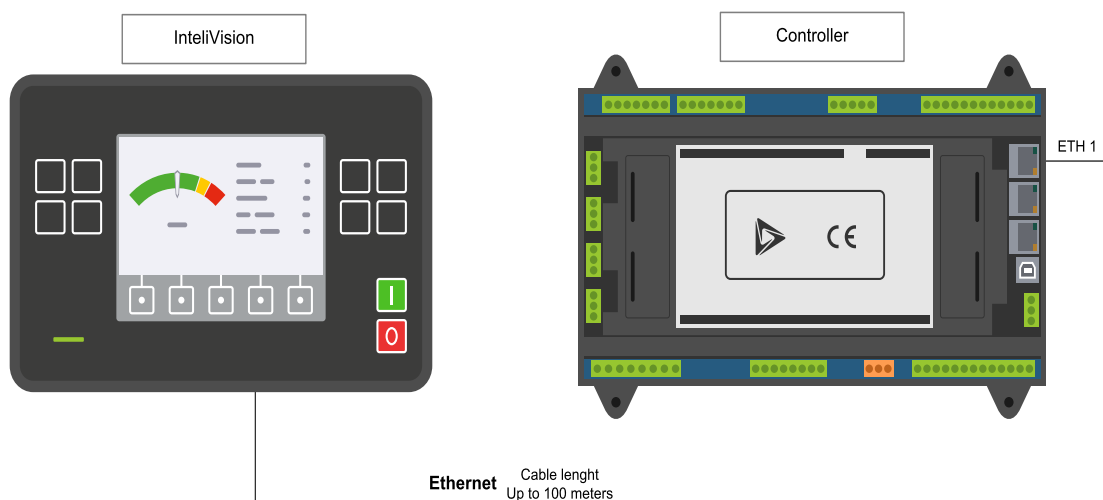


Image 4.49 Connection of IntelIVision display to IntelIMains 1010 SC

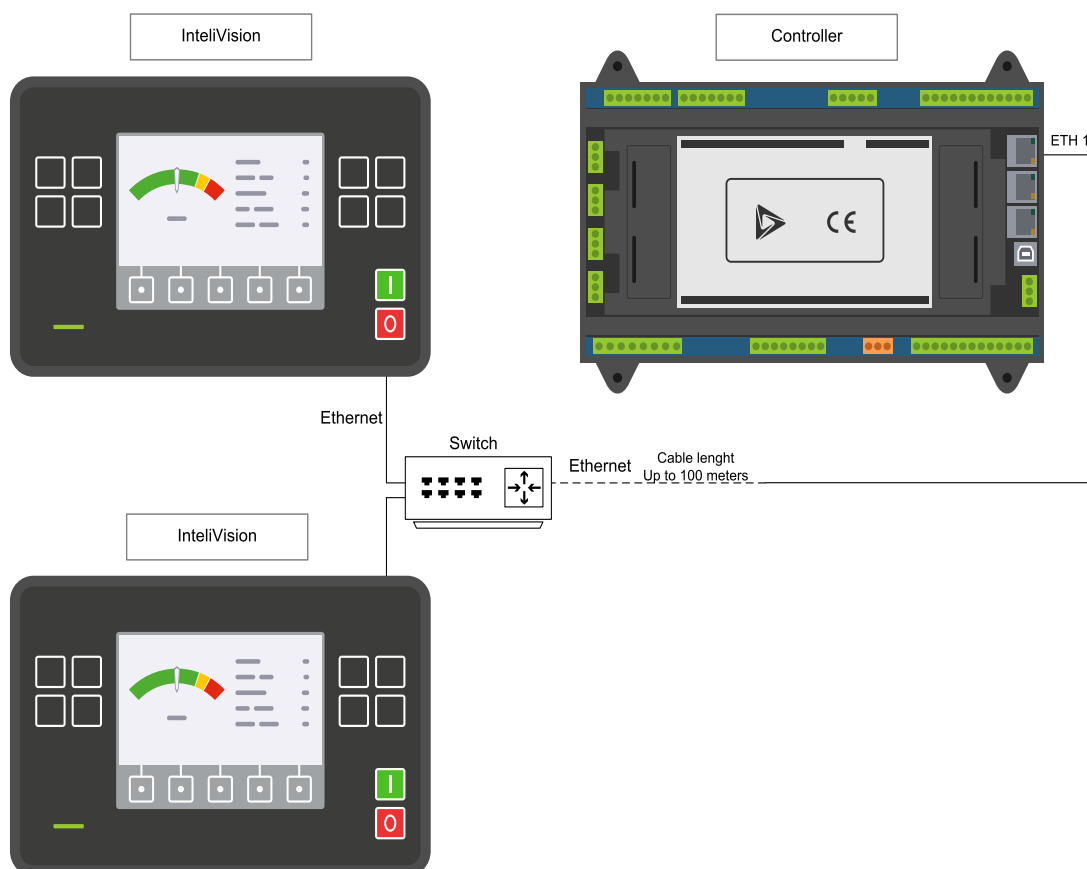


Image 4.50 Multiple connection to a single controller via switch

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

Note: IntelIVision 5.2 is used for illustrative purposes, the same wiring diagrams apply for all supported displays mentioned in *Displays* (page 22).

4.6 Maintenance

4.6.1 Backup battery replacement

The internal backup battery lifetime is approx. 6 years. If alarm **Wrn RTC Battery Flat (page 738)** 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 plugin modules and back cover.
- Power the controller on, adjust date and time and check all setpoints.

🔍 **back to Installation and wiring**

5 Controller setup

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5.1 Operator Guide

Note: This chapter is relevant only for users who want to use external displays. If you want to operate / monitor / configure your site using the computer with installed PC tool see the chapter **PC tools** (page 21). See the chapter **Displays** (page 22) if you want to use any PC panel display, for example with installed IntelliSCADA PC tool. In above mentioned chapters you can find links to Global Guide for each product.

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Note: The images used in the Operator Guide are only illustrative. The screens shown in the images are compatible with the IntelliGen 1000 Controller, but the functionality of the IV 5.2 Display such as Connection, Login, Setpoints Settings, Display Settings, etc. remains the same.

Front panel elements

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



Image 5.1 : Front panel overview

Navigation buttons

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

Arrow left and right



Image 5.2 : Arrow left and right

The buttons are used for :

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

Arrow up and down



Image 5.3 : Arrow up and down

The buttons are used for :

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

Enter



Image 5.4 : Enter button

The button is used for :

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

Menu



Image 5.5 : Menu button

The button is used for :

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

Function buttons

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



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

- **Start** :activating System Start/Stop
- **Stop** : deactivating System Start/Stop
- **Alarm/Horn reset** : resets the horn and confirms all the alarms in the alarmlist
- **Horn reset** : resets only the horn

User buttons



Image 5.7 : User button

User button is dedicated for predefined user function.

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

Special and button combination

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



Image 5.8 : Shortcut (jump to the administration)

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

Status LED

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



Image 5.9 : Status LED

- > LED intensity is directly connected with the actual setting of the backlight intensity in Administration menu "Settings" accessible by shortcut Enter + Menu
 - » the intensity respects the value of the Manual or External 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

Priority	LED State	Description
1	Red is flashing	<ul style="list-style-type: none"> > Active unconfirmed level2 (shutdown) alarm > Inactive unconfirmed level2 (shutdown) alarm > Lost of internal communication line > Controller unit in init state
2	Red lights	<ul style="list-style-type: none"> > Active confirmed level2 (shutdown) alarm > Display unit in init state > Display unit booting procedure > Lost of communication line with controller unit
3	Cyan lights	<ul style="list-style-type: none"> > temperature inside the housing exceeded the 85°C (185°F)
4	Yellow lights	<ul style="list-style-type: none"> > Active unconfirmed level1 (warning) alarm > Inactive unconfirmed level1 (warning) alarm > Active confirmed level1 (warning) alarm > Active unconfirmed fail sensor alarm > Inactive unconfirmed fail sensor alarm > Active confirmed fail sensor alarm
5	Green lights	<ul style="list-style-type: none"> > unit is running correctly without any errors or alarms

Page Structure

Pages

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

The actual GUI consists of 6 different pages :

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

Screens

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

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

Status bars

Bottom status bar

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

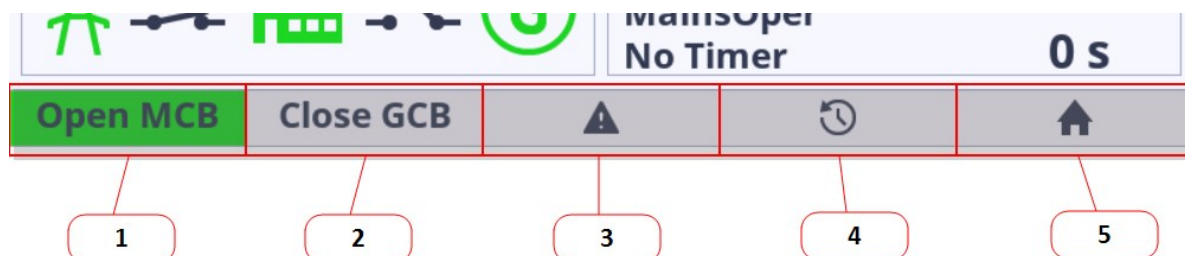


Image 5.10 : Bottom status bar on Home metering screen

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

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

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

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

Top status bar

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

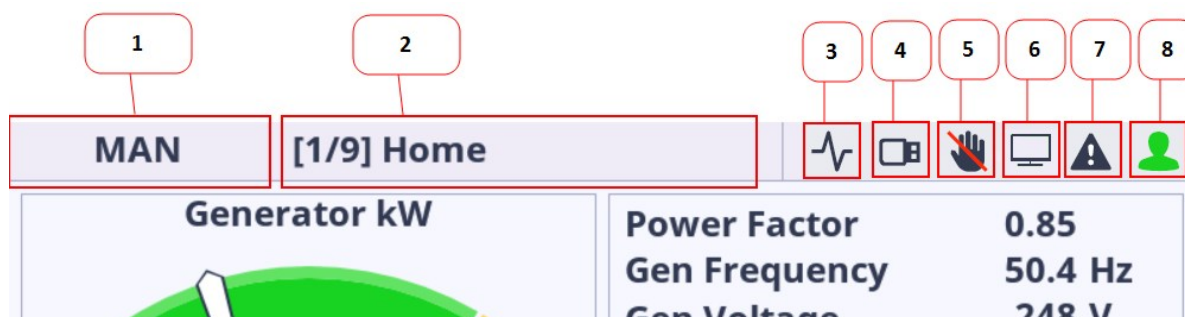


Image 5.11 Top Status Bar description



Image 5.12 : Top Status Bar - Mode selector dialog

1. **Mode selector** - Mode selector is dedicated for the controller mode selection. Using arrow left and right the controller mode is changed (only on the metering screens). The choice must be always confirmed by enter button. There is 5s timer for the automatic mode selector dialog cancellation. The mode selector dialog can be also canceled by menu button.
2. **Page title** - Each page and each metering screen has its own title. The first number in square brackets describes the actual metering screen position. The second number describes the total available number of metering screens.
3. **Trending** - The icon is active when the trending is running. Icon is inactive when the trending is stopped.
4. **USB Stick** - The icon is active if the USB stick is plugged in the display unit. Icon is inactive if there is no USB stick plugged in.
5. **Access Lock** - Access lock icon is active if the display is locked for security reasons. Icon is inactive if the controller unit is not locked.
 - IntelIMains 1010 SC - the function in IntelIMains 1010 SC is connected to the specific user account. It means only the user with sufficient rights can operate the controller or deactivate access lock function.
 - Icon (🔒 - Single Lock) is displayed if the controller is locked and actually logged-in user is the lock owner. User is able to operate the controller or to deactivate the access lock function.
 - Icon (🔒🔒 - Double Lock) is displayed if the controller is locked and actually logged-in user is NOT the lock owner. Also the Access Lock function can not be deactivated because of insufficient access rights. See chapter Access Lock for more information.
6. **PC connection** - PC connection icon is not supported in IntelIVision 5.2.
7. **Alarm indication** - The alarm icon is flashing red if there is at least one unconfirmed alarm (shutdown or warning) in the alarmlist. The icon lights red if there is at least one confirmed active alarm and no unconfirmed alarm in the alarmlist. The icon is inactive if the alarmlist is empty.
8. **User** - The user icon lights green if the user is logged in to the controller. The icon is inactive if the user is logged out.

StartUp screen

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

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

StartUp screen is displayed :

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

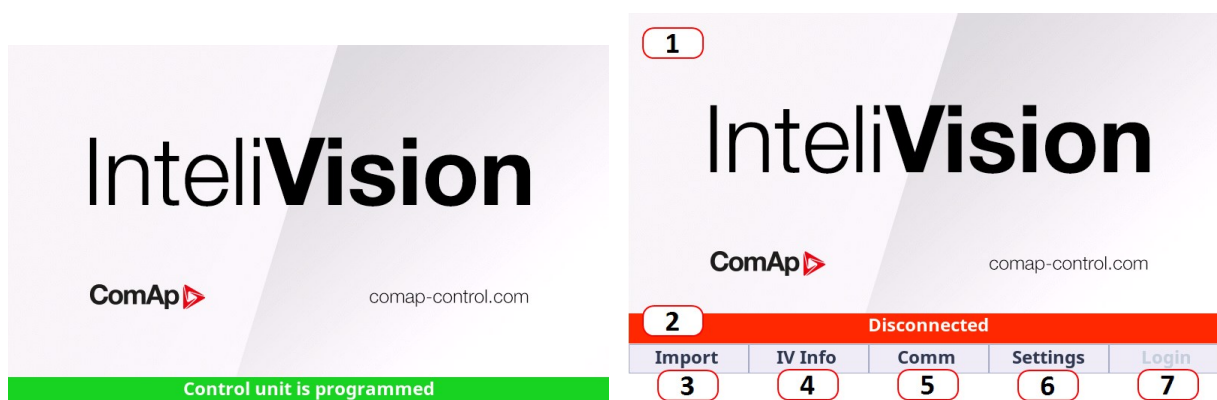


Image 5.13 : StartUp screen

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

Status panel message table

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

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

Note: Connecting and connected state are marked red because at that moment the user is not logged in yet. Login procedure is automatic to IntelliMains 1010 SC 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.

Connecting to the controller

The procedure of connecting display to the controller slightly differs based on which Ethernet terminal is used. In case of using **Ethernet 1 (page 18)** will not be required user login for connection and basic operations because the terminal is considered as Trusted. Any other terminal is considered as Untrusted and before actual connection user login is required.

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



1. **Accept Unknown Certificate** - Connection acceptance of the unknown devices (with unknown public keys) or not supported branches.
 - a. Never (by default) - display unit never accepts the unknown devices.
 - b. Always - display unit always accepts the unknown devices.
2. **IP Controller** - IP address of the controller unit to be connected.
3. **IP Port** - IP port of the controller unit to be connected. Default IP Port is 23.
4. **Address** - Terminal Comm Address (page 362) of the controller.
5. **IP Mode** - there are two modes :
 - a. Automatic - display unit ethernet communication parameters are acquired automatically from the DHCP server (which must exist in the network infrastructure).
 - b. Manual (by default) - display unit ethernet communication parameters are configured manually by user.
6. **IP InteliVision** (by default 192.168.1.101) - The IP address of the display. Note that IP InteliVision address and IP Controller address must be in the same network to establish the connection.
7. **IP Subnet Mask** (by default 255.255.255.0) - Mask of the network where the ethernet communication is established.
8. **IP Gateway** (by default 192.168.1.101) - The gateway in network on which the packets are directed.
9. **User button 1 : Connect** - By pressing the button the communication automat is restarted to newly set parameters. Until the button is not pressed the previous communication channel is still in progress.

Login to the controller

Login via Untrusted terminal

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



Login

☐ UserID
 ☒ Username

Username

Password

Login via Trusted terminal

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

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

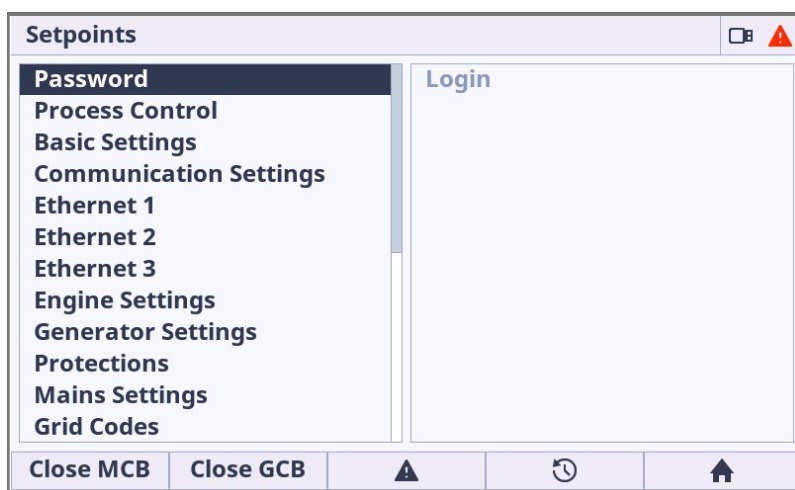


Image 5.14 : Main Setpoints Page

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

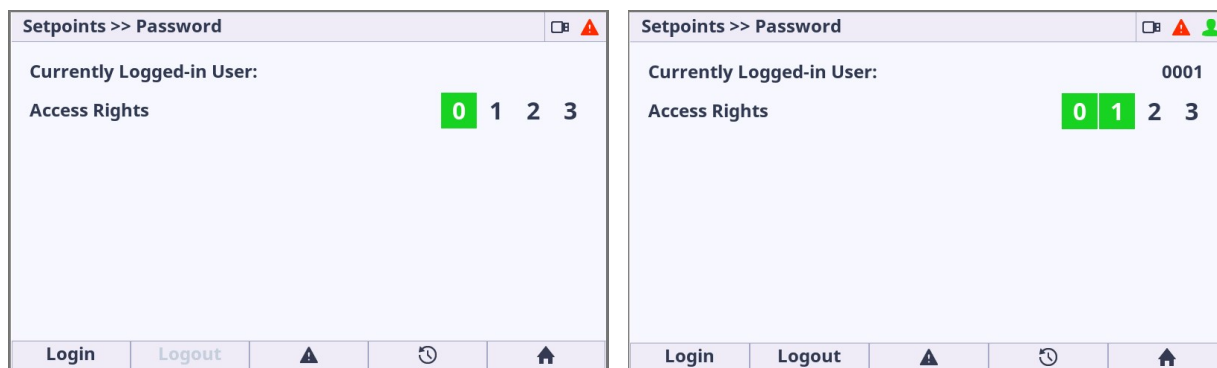


Image 5.15 : Setpoints Password Page

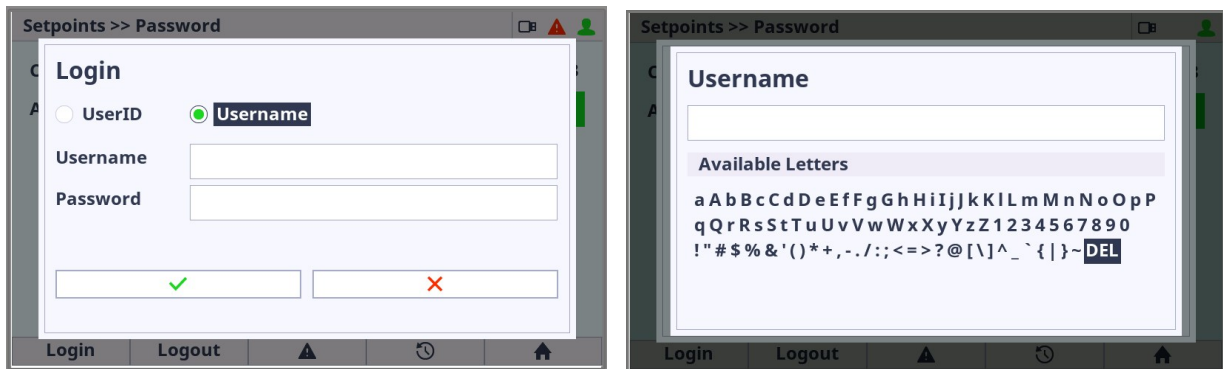


Image 5.16 : Login Dialog

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

Enter Password

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

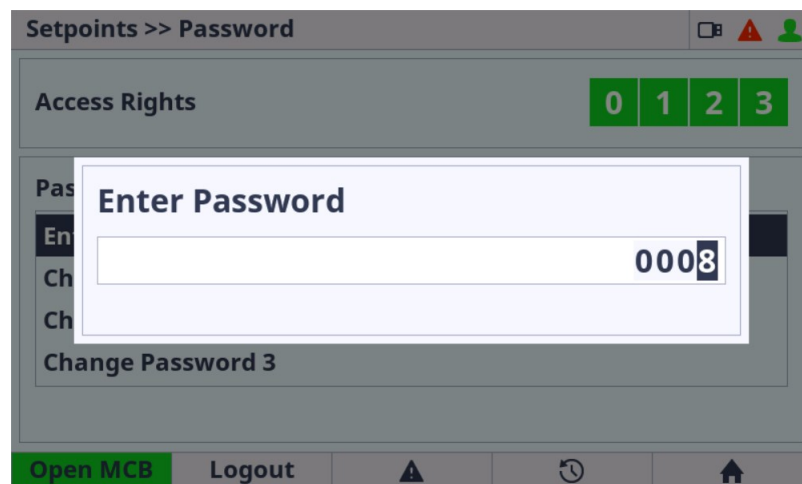


Image 5.17 : Dialog Password overview

Password Change

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

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

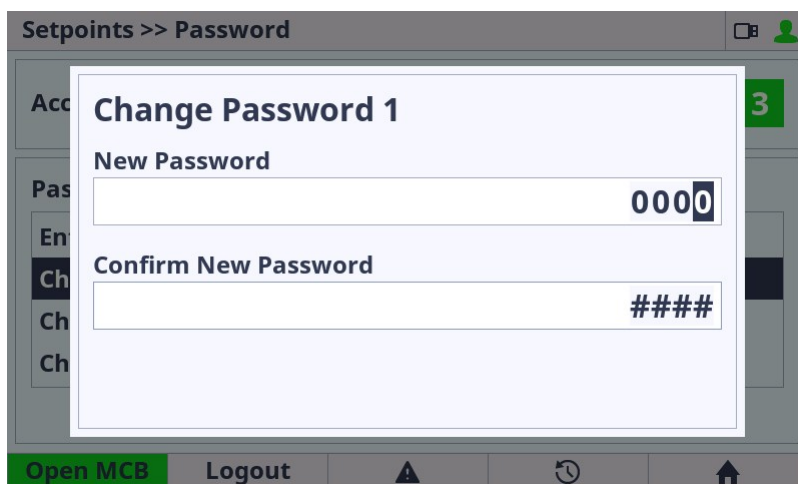


Image 5.18 : Dialog Password Change overview

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

Setpoints

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

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

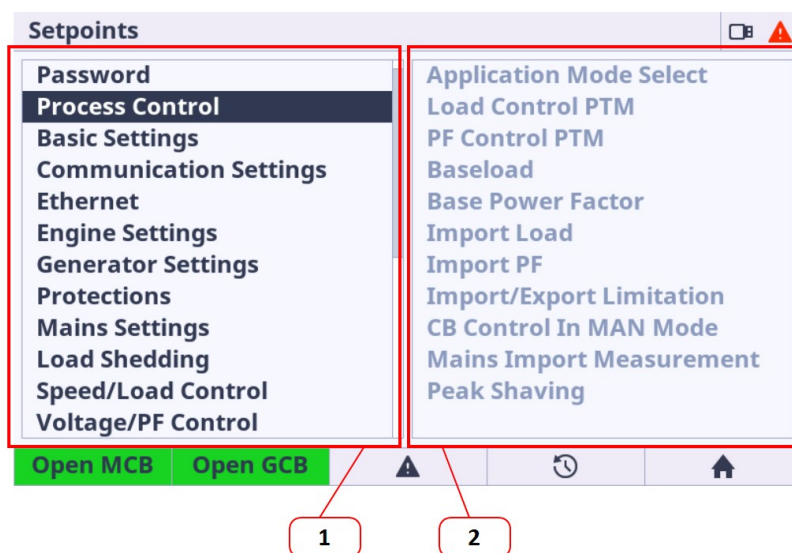


Image 5.19 : Setpoints Page overview

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

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

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

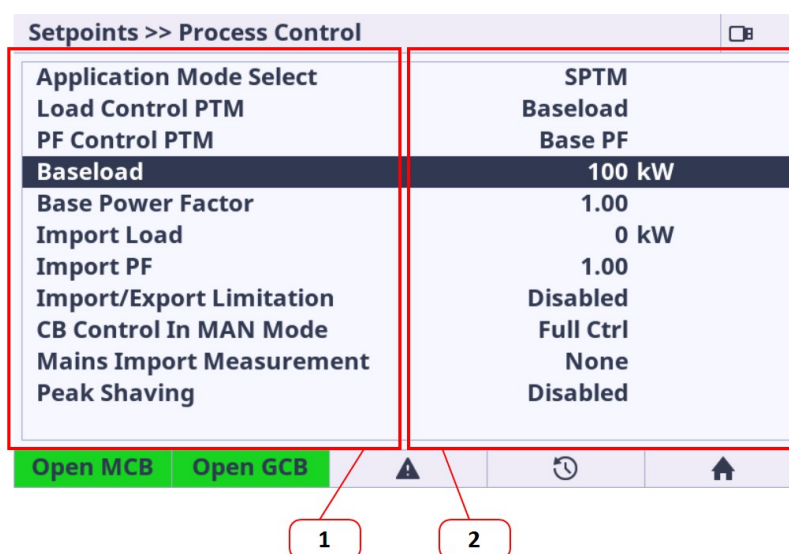


Image 5.20 : Group Setpoints Page

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

Protected Setpoint Indication

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

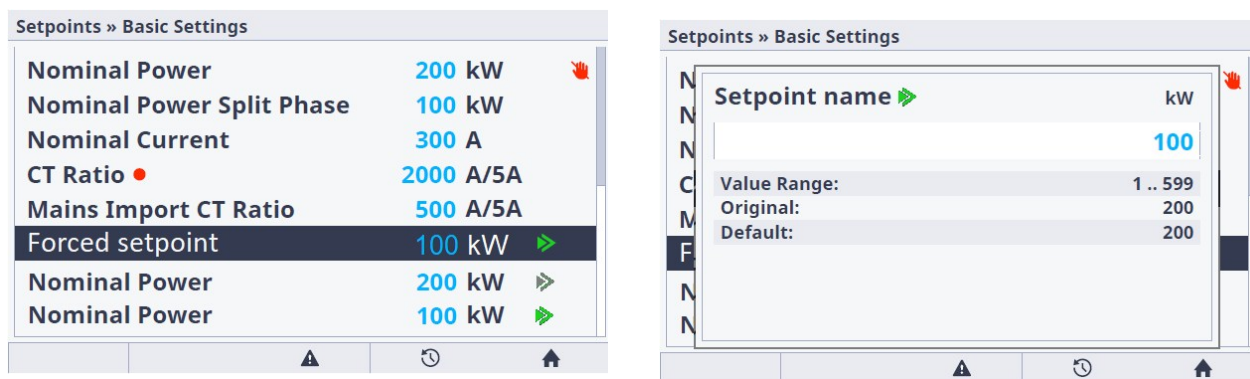


Image 5.21 : Force Value and Protected Setpoint Indication

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.

Numeric change

Value

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

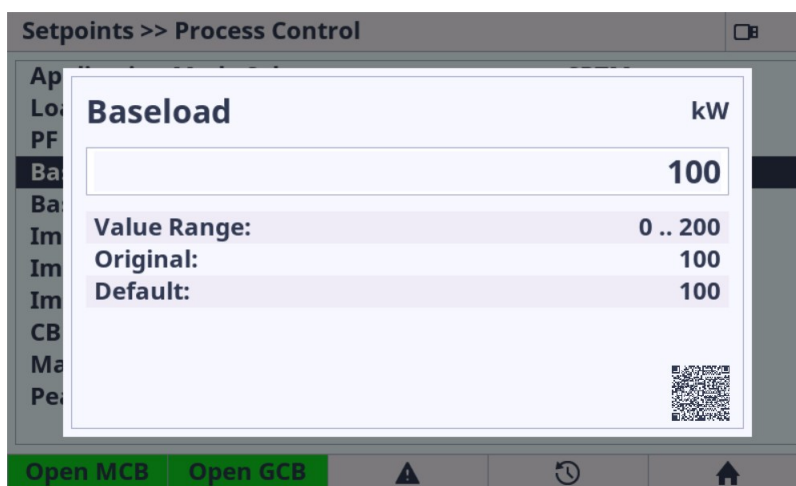


Image 5.22 : Dialog Value overview

Value Extended

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

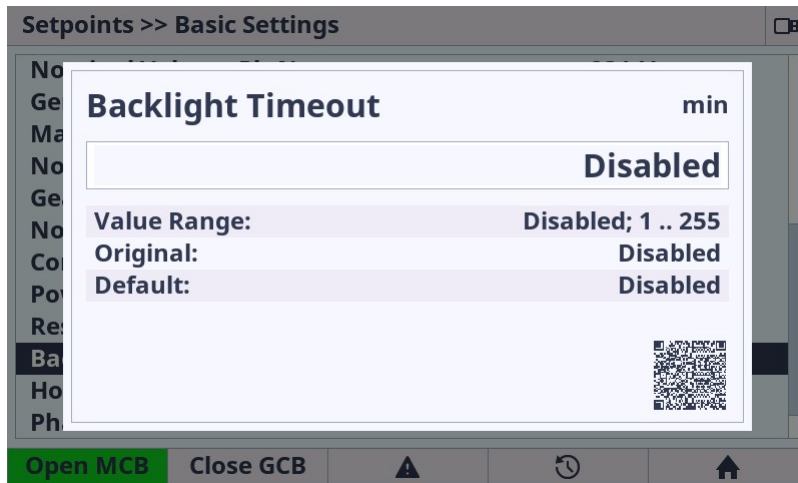


Image 5.23 : Dialog Value Extended overview

IP address

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

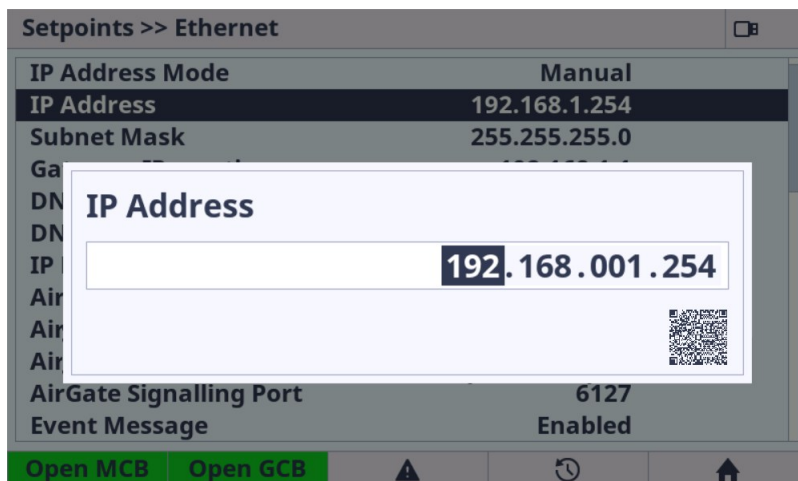


Image 5.24 : Dialog IP address overview

String List Selection

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

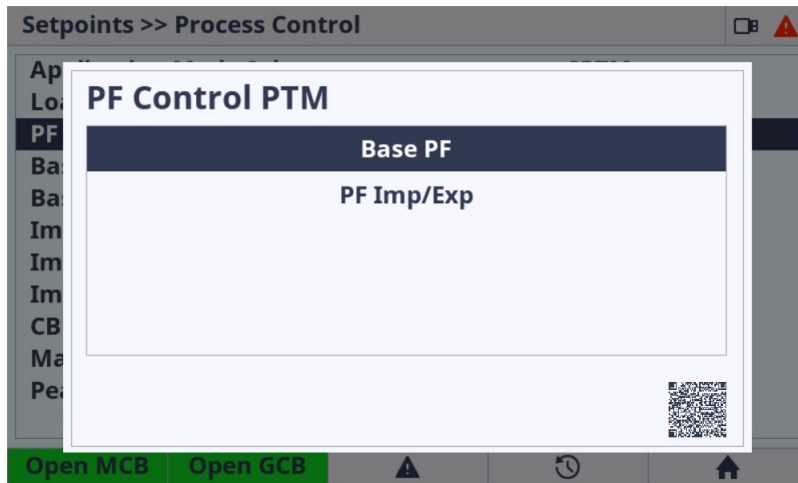


Image 5.25 : Dialog String List overview

Text Edit

The dialog text is dedicated for text inserting or modification. When the dialog is active the buttons arrow up and down are used for letter selection. Arrow up means the selection in left direction, arrow down means the selection in right direction. Arrows right/left are used for moving between the letters to the next/previous letter position in the text field. If actual position is very right letter then the arrow right inserts new letter to the right. Letter DEL deletes 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.

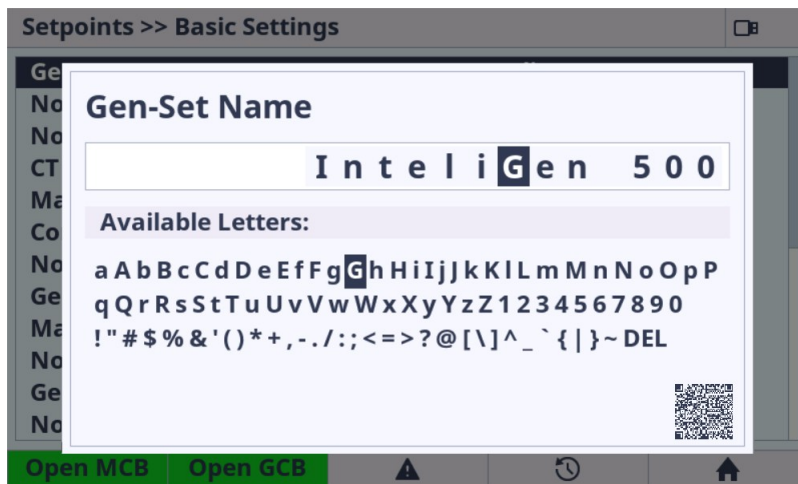


Image 5.26 : Dialog Text overview

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

Time and date edit

Date

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

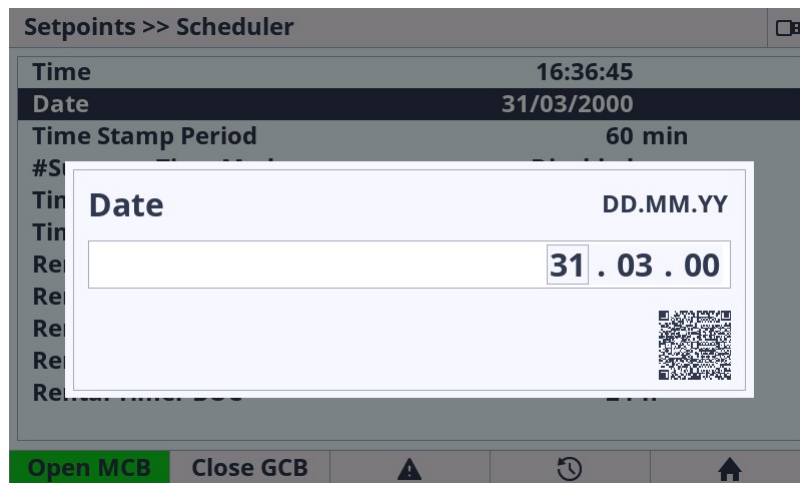


Image 5.27 : Dialog Date overview

Time

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

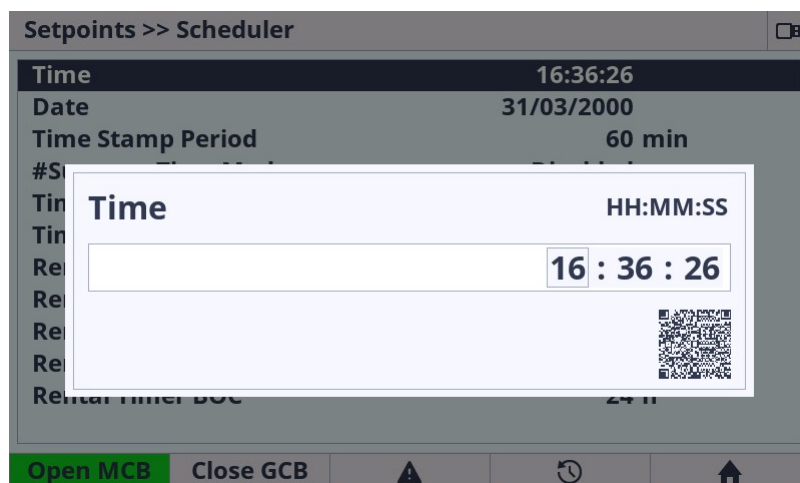


Image 5.28 : Dialog Time overview

Timer settings

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

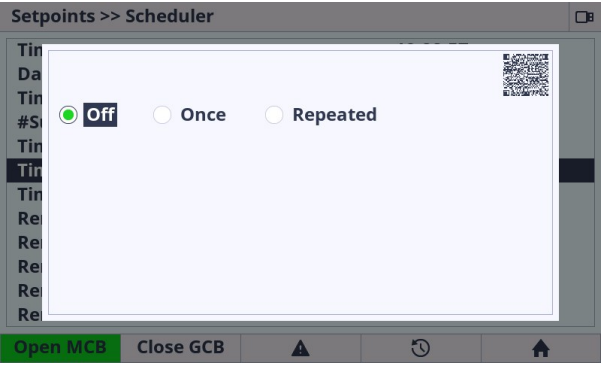


Image 5.29 : Dialog Timer (Off) overview

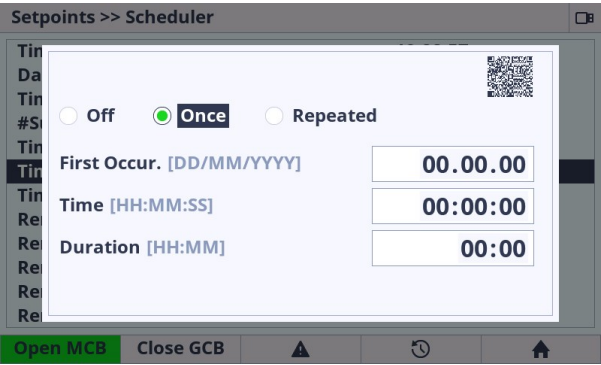
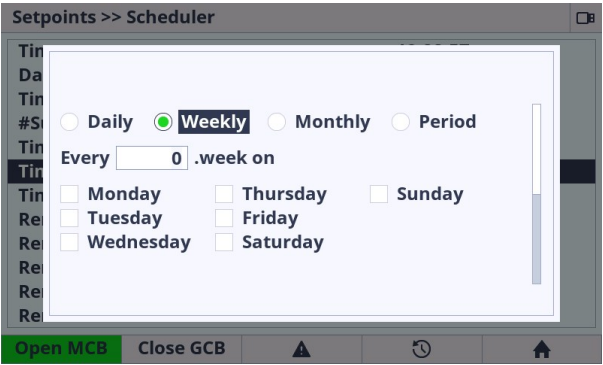
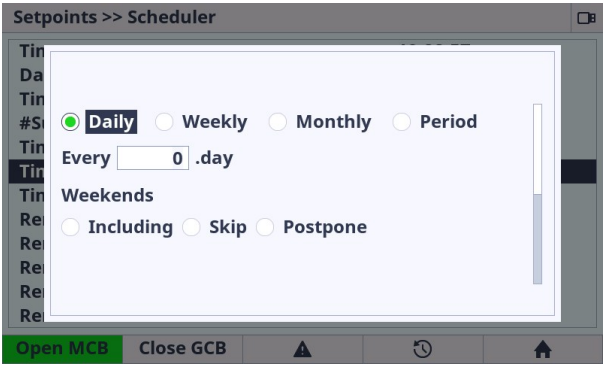
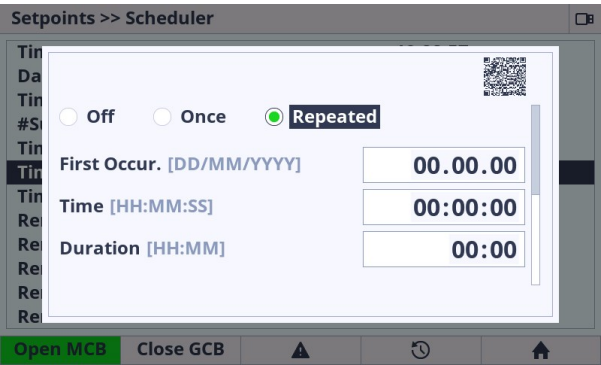


Image 5.30 : Dialog Timer (Once) overview



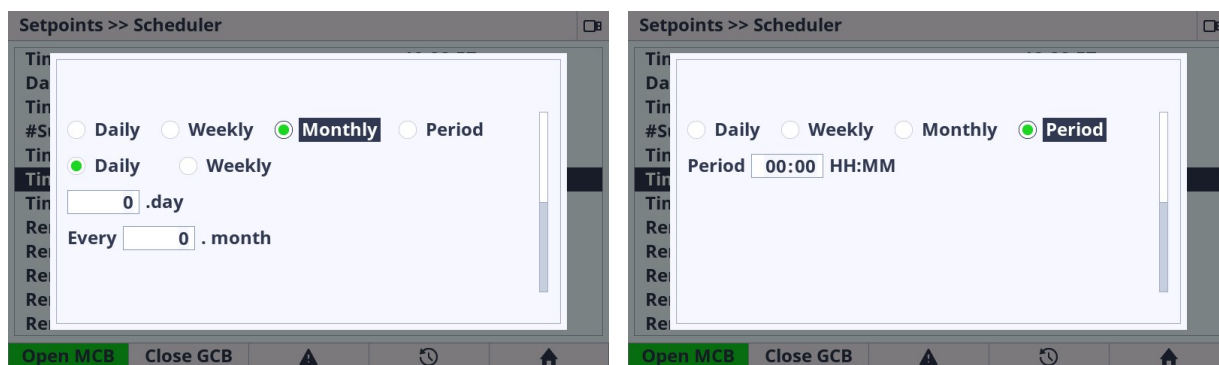


Image 5.31 : Dialog Timer (Repeated) overview

Metering screens

InteliMains 1010 SC Controller screens

InteliMains 1010 SC metering screens are predefined by ComAp and covers all the application types.

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

InteliMains 1010 SC metering screens

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

Alarmlist

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

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

There are 4 different types of controller alarms :

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

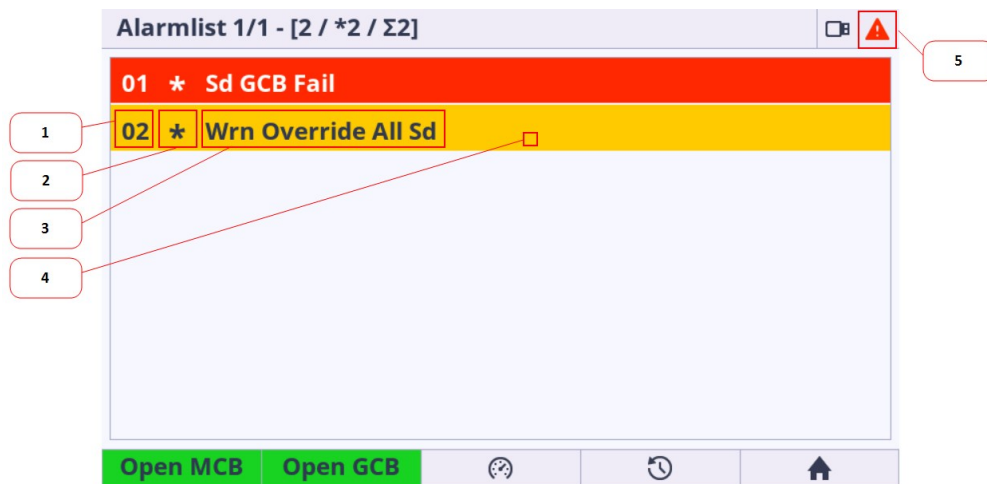


Image 5.32 : Alarmlist Page

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

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

5. **Topstatus bar Alarmlist icon** - The alarm icon is 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: IntelliVision 5.2 displays maximum 16 alarms.

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

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

History

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

There are 2 types of history records :

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

The screenshot shows the 'History' page interface. Callout 1 points to the 'History' title bar. Callout 2 points to the 'Reason' column. Callout 3 points to the 'RPM' column. Callout 4 points to the '1st Row/Col' button. Callout 5 points to the '1x' button.

No.	Reason	Date	Time	RPM
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 5.33 : History page overview

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

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

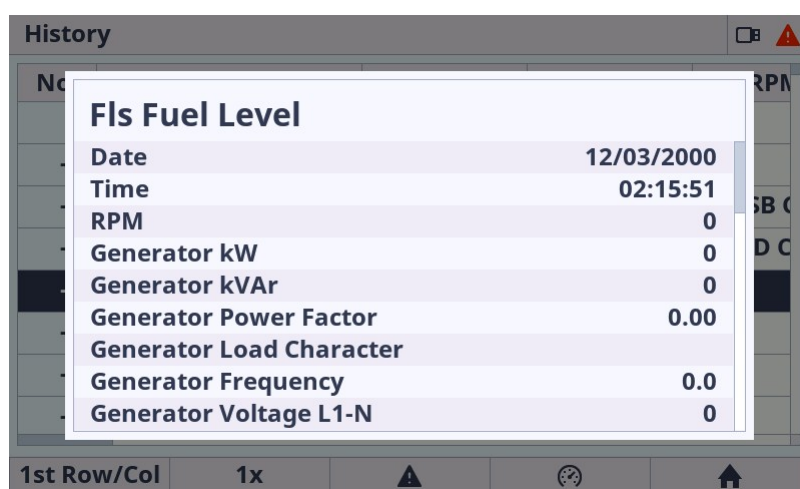


Image 5.34 : History page - Item detail dialog

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

IMPORTANT: Each controller unit supports the specific number of history records. E.g. controller IntelliMains 1010 SC supports 1000 history records. Default configuration consists of 33 columns. Maximal column amount is approximately 100 columns based on the type of the observed value.

Trends

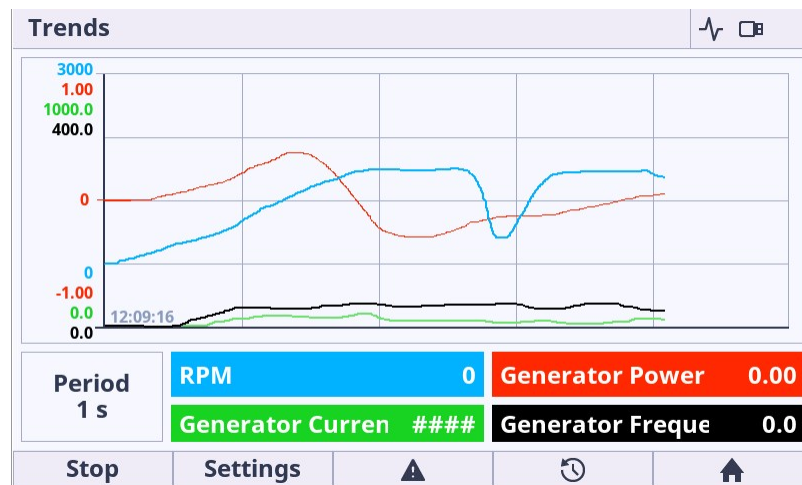


Image 5.35 : Trends page overview

The Trends page is divided on to 3 main blocks :

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

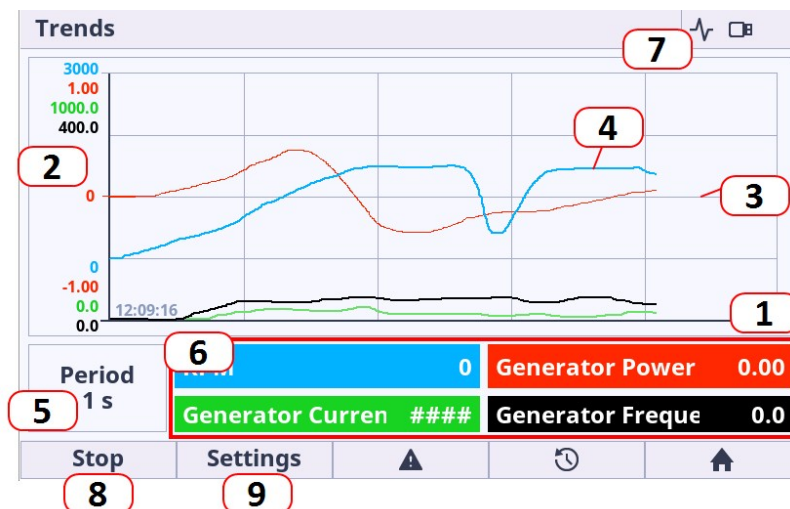


Image 5.36 : Trends page description

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

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

Administration

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



Image 5.37 : Shortcut (jump to the administration)

Configuration Level



Image 5.38 : Administration Page - Configuration Level

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

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

Display settings

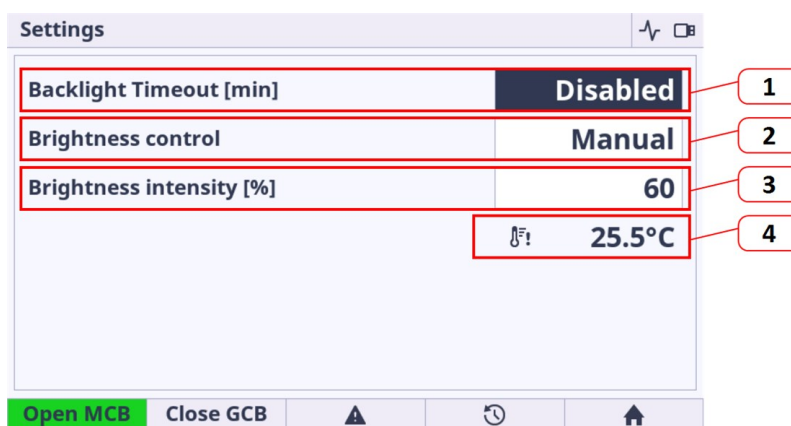


Image 5.39 : Administration Page - Settings

1. **Backlight Time** - if the cell area is pressed the dialog for time settings is displayed. The user is able to set the period from 1 up to 241 minutes. There is also the option to set NO Timeout which means the display unit is backlit 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).
2. **Brightness Control** :
 - a. Manual (by default) - the value of the backlight is set manually using the value dialog (point 3)
 - b. External - the value of the backlight is controlled by the external resistor or potentiometer. Resistor 5-2400 Ω corresponds to 0-100% backlight. If the resistor value is out of range, the manual option is used.
3. **Brightness intensity** - the value is selected using the value dialog. Note the value is applied immediately during the change of the value.
4. **Internal Temperature information**- gives the actual inside temperature of the unit. There is implemented automatic mechanism for lowering the backlight intensity based the internal derating backlight curve. If the inside temperature exceeds 35 °C the area behind the temperature lights yellow. The yellow color indicates that the display backlight curve is applied and automatically starts derate the backlight intensity. The backlight intensity returns to normal when the temperature is decreased below 35 °C. This feature saves the lifetime of the internal components.

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

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

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

Languages

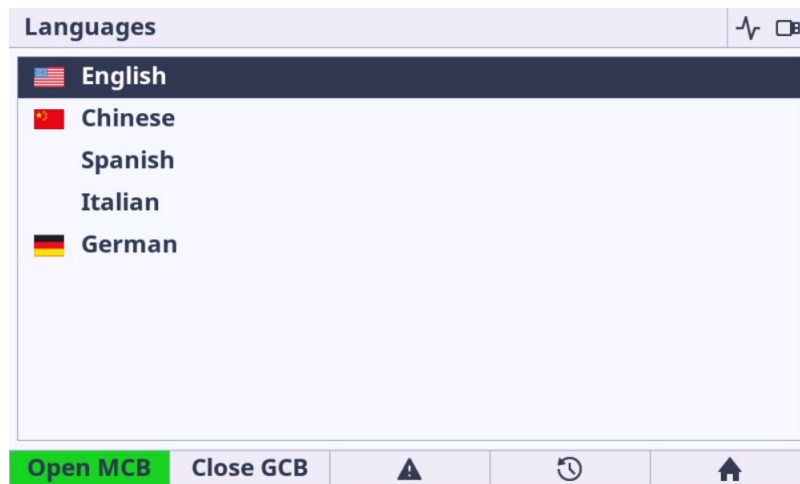


Image 5.40 : Administration Page - Languages

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

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

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

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

Controller Info

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

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

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

Controller Info		Controller Info	
Name	Value	Name	Value
ID String	InteliGen-500-1.2.1.2	Hardware features	0100000000000000
Software version	1.2.1.2	Application version	1.2.1.2
Serial number	FF08038A	Controller type (SW)	21
Controller type (HW)	21	Application type (SW)	2
Application type (HW)	2	Application branch (SW)	1
Application branch (HW)	1	Application	Standard-GC
Hardware type (PCB)	2	Configuration format	6 / 5
Hardware version	1.0.0.0	Configured by	24 5.6.0.21
Close GCB		Close GCB	

Image 5.41 : 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.

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

Modules Info

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

- > Plug-In modules
- > CAN peripheral extension modules

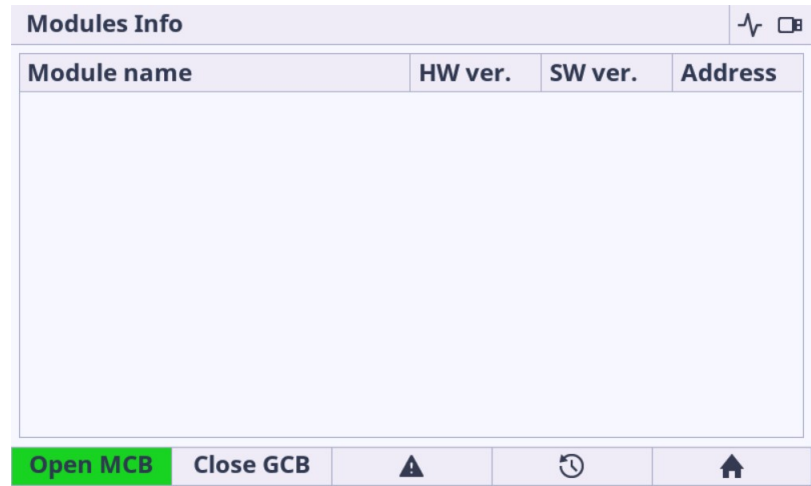


Image 5.42 : Administration Page - Modules Info

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

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

ECU Modules Info

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

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

> ECU Modules

ECU Modules			 
ID	Module name	Module Addr.	Contr. Addr.
4	ECU 1	255	255

Close GCB








Image 5.43 : Administration Page - ECU Modules

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

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

Operating Modes

The operating mode can be selected by pressing Left and Right buttons  on the front panel/display, by changing the **Controller mode (page 271)** 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 PRG MODE (page 621)
- Remote RUN MODE (page 620)

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.

5.2 Controller configuration and PC tools connection

5.2.1 USB	110
5.2.2 Ethernet	111

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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 Reference Guides.

5.2.1 USB

You may connect to the controller using the 📶 USB (page 43) Port. In this case standard USB A to B cable should be used - USB (page 71) connection.

Connection using InteliConfig

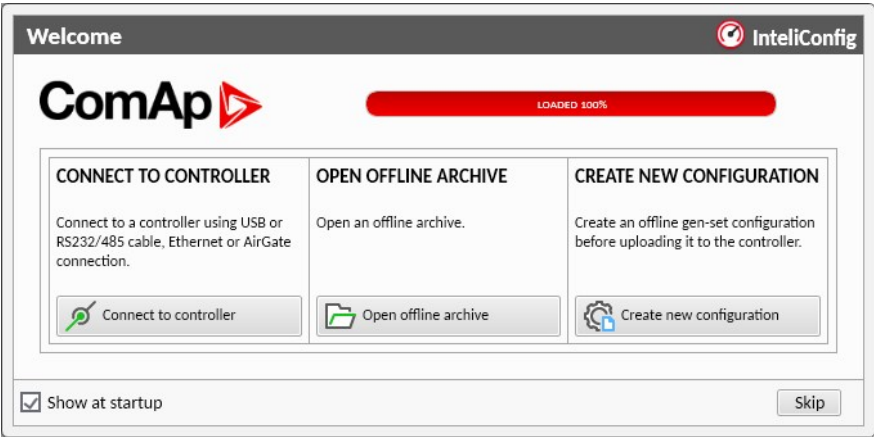


Image 5.44 First screen of InteliConfig - select connect to controller

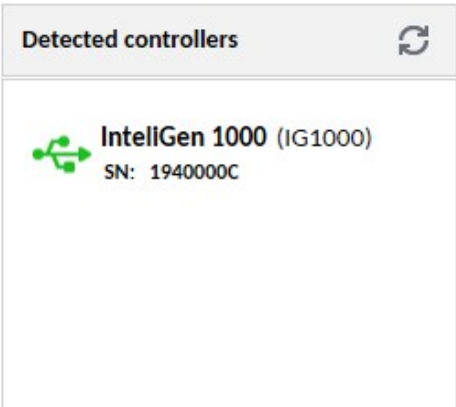


Image 5.45 Second screen of InteliConfig - Select your controller from list of Detected controllers.

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

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

Connection using WinScope

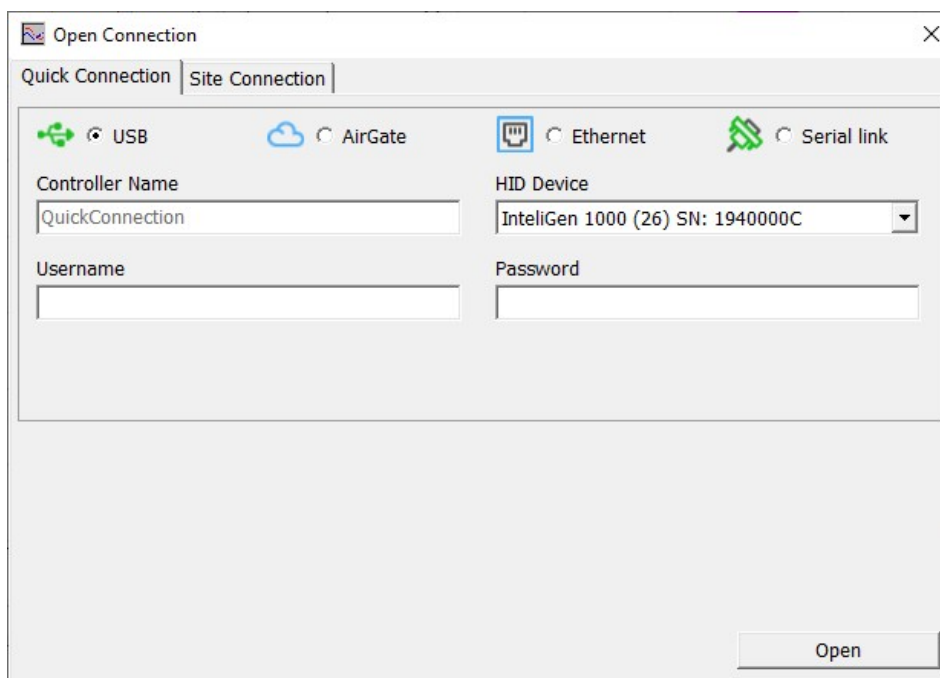


Image 5.46 WinScope screen - Select your controller from list of Detected controllers.

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

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

5.2.2 Ethernet

You may connect to the controller using any of the **Ethernet 1 (page 46)**, **Ethernet 2 (page 46)** or **Ethernet 3 (page 46)** ports, if correct ETH Port Configuration settings are applied (**Ethernet port 1 (page 369)**, **Ethernet port 2 (page 370)**, **Ethernet port 3 (page 371)**).

Note: See *Communication peripherals (page 18)* to see differences between these peripherals.

Note: Go to *Types of interfaces (page 175)* to see types of ethernet interfaces and possibilities of connections.

Direct connection

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

- **Direct Connection Port (page 376)** has to be set to the same value as in the PC tool.
- **IP Address Mode (page 372)** can be set to AUTOMATIC when there is DHCP service is available. Otherwise it needs to be set to FIXED.
- **IP Address (page 373)** is either set automatically or it can be adjusted to a specific requested value.
- **Subnet Mask (page 373)** is either set automatically or it can be adjusted to a specific requested.
- **Gateway IP (page 374)** can be set here when it is used.

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

Connection using IntelliConfig

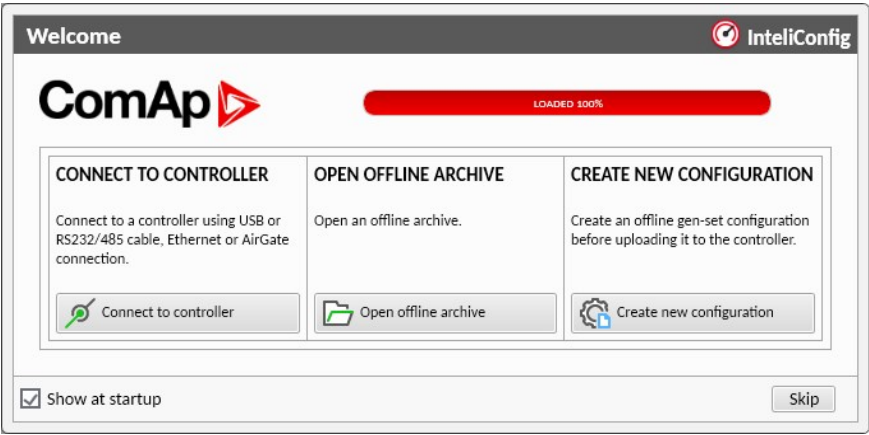


Image 5.47 First screen of IntelliConfig - select connect to controller

The screenshot shows the 'Online Connection' tab in the IntelConfig interface. Three connection methods are available: AirGate, Ethernet (selected), and Serial link. Below the selection, there are input fields for 'IP address' (containing '10.0.0.6:23'), 'Access code', 'Controller address' (containing '1'), 'Username/UID', and 'Password/PIN'. A red 'OPEN' button is located at the bottom right of the form.

Image 5.48 Second screen of IntelConfig - select Ethernet

Use **IP address** which is stored in proper value (based on selected Ethernet peripheral) and fill **Controller address** - this needs to be same as value of **Terminal Comm Address** (page 362).

IMPORTANT: Never fill Access code!

IMPORTANT: In case of using Ethernet 2 (page 19) you need to fill Username and Password of actual user account.

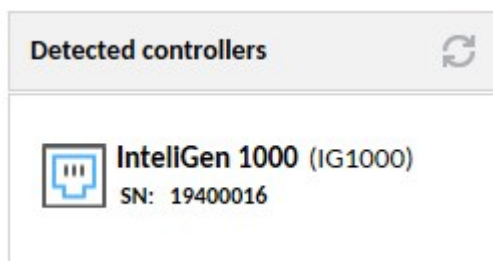


Image 5.49 Second option of connection via IntelConfig

You can also select controller from "Detected controllers" feature. If this controller is connected via **Ethernet 2** (page 19) you will be prompted to fill **Username** and **Password** of actual user account.

Connection using WinScope

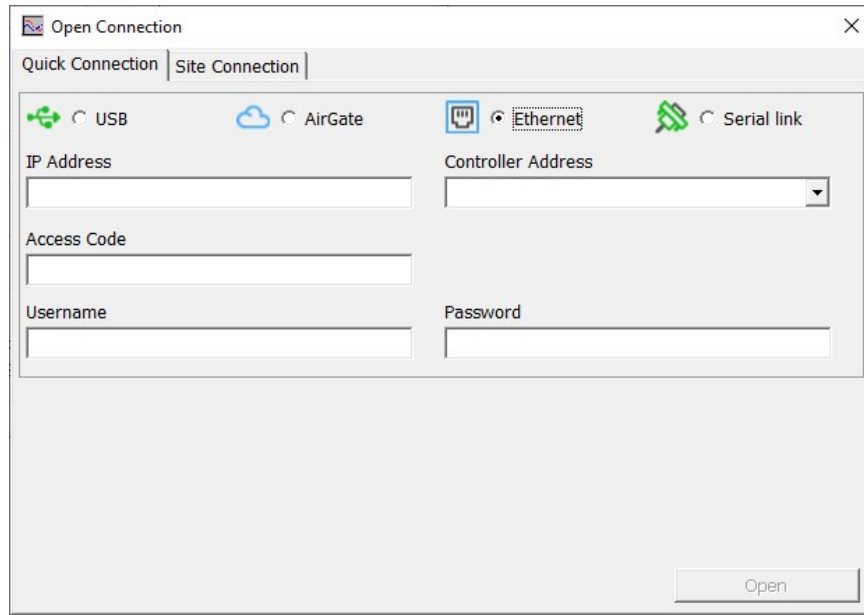


Image 5.50 WinScope screen - select Ethernet

Use **IP address** which is stored in proper value (based on selected Ethernet peripheral) and fill **Controller address** - this needs to be same as value of **Terminal Comm Address** (page 362).

IMPORTANT: Never fill Access code!

IMPORTANT: In case of using Ethernet 2 (page 19) you need to fill Username and Password of actual user account.

AirGate connection

You may connect to the controller using AirGate which works only via **Ethernet 2 (page 19)**. 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 IntelliConfig.

Setpoints and values related to connection via AirGate:

- > **AirGate Connection (page 381)** - has to be **ENABLED**
- > **AirGate Address (page 382)** - manually adjusted address of AirGate server
- > **AirGate Port (page 382)** - manually adjusted port for communication between Controller and AirGate server
- > **AirGate Status (page 510)** - has to be **connected, operable**
- > **AirGate ID (page 511)** - 9 numbers long ID of the controller

IMPORTANT: Controller has to be connected to the Internet.

Connection using IntelliConfig

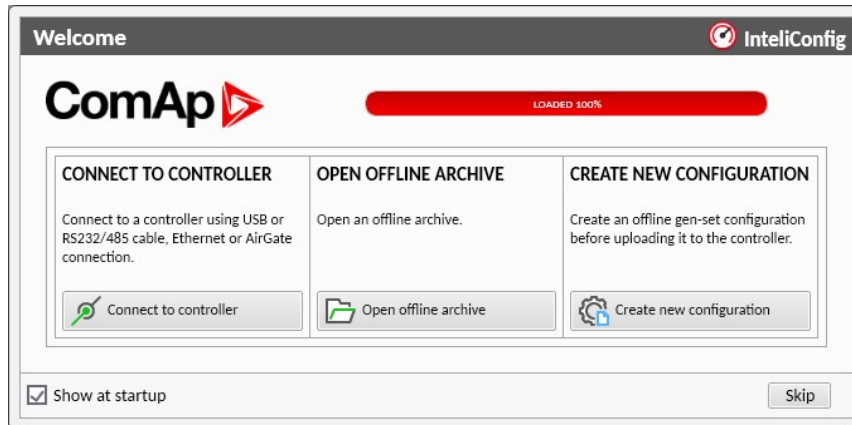


Image 5.51 First screen of IntelliConfig - select connect to controller

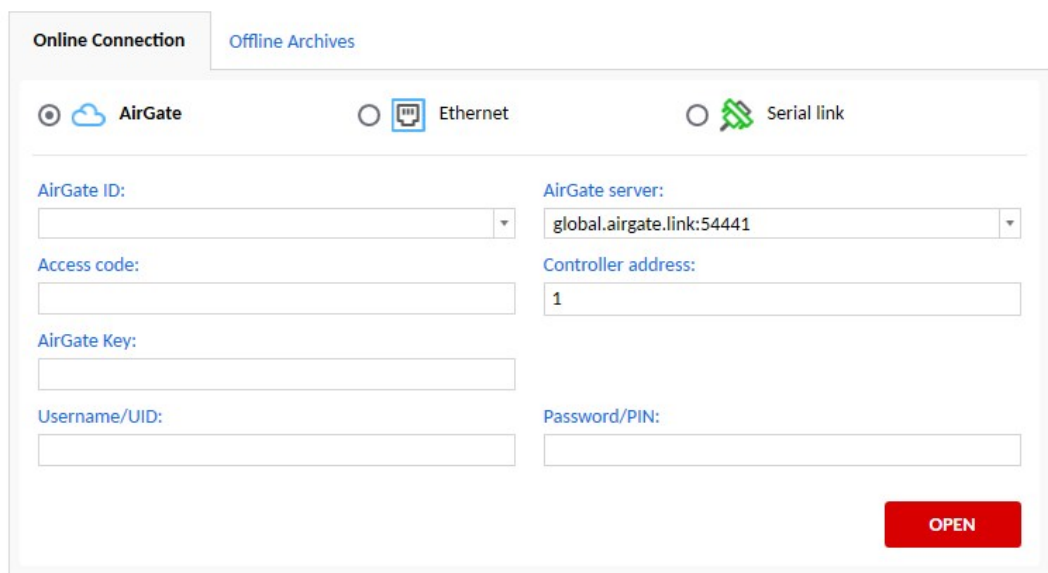
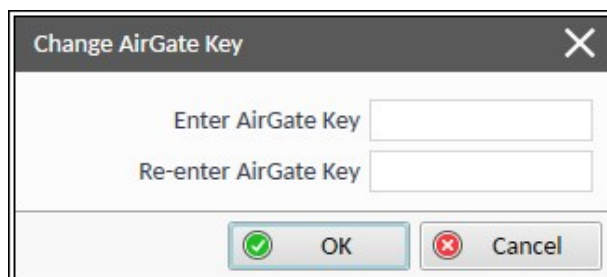
The image shows the 'Online Connection' tab of the IntelliConfig software. It features three radio buttons for connection types: 'AirGate' (selected), 'Ethernet', and 'Serial link'. Below these are several input fields: 'AirGate ID' (a dropdown menu), 'AirGate server' (a dropdown menu with 'global.airgate.link:54441' selected), 'Access code' (a text field), 'Controller address' (a text field with '1' entered), 'AirGate Key' (a text field), 'Username/UID' (a text field), and 'Password/PIN' (a text field). A red 'OPEN' button is located at the bottom right.

Image 5.52 Second screen of IntelliConfig - AirGate

Use **AirGate ID**, **AirGate server** with proper port (54441 for global.airgate.link), **AirGate Key** and **Controller address** - this needs to be same as value of **Terminal Comm Address** (page 362). Valid user account - **Username** and **Password** - is required for the connection.

IMPORTANT: Never fill Access code!

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

The image shows a 'Change AirGate Key' dialog box. It has a title bar with a close button (X). Inside, there are two text input fields: 'Enter AirGate Key' and 'Re-enter AirGate Key'. At the bottom, there are two buttons: 'OK' (with a green checkmark icon) and 'Cancel' (with a red X icon).

Connection using WinScope

Image 5.53 WinScope1000 screen - select AirGate

Use **AirGate ID**, **AirGate Server** with proper port (54441 for global.airgate.link), **Device Access Key** and **Controller Address** - this needs to be same as value of **Terminal Comm Address** (page 362). Valid user account - **Username** and **Password** - is required for the connection.

IMPORTANT: Never fill Access code!

5.3 Default configuration

This chapter describes default configuration of physical inputs and outputs of the CU. For the MCB application there is also **Preconfigured** archive with user defined PLC functions, Protections and setpoints.

5.3.1 Binary inputs

HW Name	Name	Description	Configured function
BIN1	Sync Check	Check of synchronization process	SYNCHRONIZATION CHECK (PAGE 621)
BIN2	Sync Permissive	Passive synchronization	SYNCHRONIZATION PERMISSIVE (PAGE 621)
BIN3	Sync Run	Active synchronization	SYNCHRONIZATION RUN (PAGE 621)
BIN4	MCB Feedback	Mains circuit breaker feedback	MCB FEEDBACK (PAGE 616)
BIN5	**Volt Raise	Excitation voltage of Gen-sets raise	VOLTAGE RAISE (PAGE 622)
BIN6	**Volt Lower	Excitation voltage of Gen-sets lower	VOLTAGE LOWER (PAGE 622)
BIN7	Imp/Exp Control	Switching between System Baseload and Import/Export control	IMP/EXP CONTROL (PAGE 613)

BIN8	Utility Unload	Request to open MCB	UTILITY UNLOAD (PAGE 622)
BIN9	Ramp Pause	Freeze of Required P	RAMP PAUSE (PAGE 620)
BIN10	Load Raise	Load/Frequency raise	LOAD RAISE (PAGE 614)
BIN11	Load Lower	Load/Frequency lower	LOAD LOWER (PAGE 614)
BIN12	*Process Control	Activation of process control	PROCESS CONTROL (PAGE 618)

* Request for the Process Control is not connected to any source in the default archive. The source is connected in the **Preconfigured** archive which uses PID block in the internal PLC.

** These inputs are named as Not Used in Preconfigured archive but they are used in the internal PLC logic which makes each input active if specific Volt Raise/Lower input is activated or both inputs active if input for breaker feedback is activated.

5.3.2 Binary outputs

HW Name	Name	Description	Configured source
BOUT1	CU-BOUT-01	Free slot	Not Used
BOUT2	CU-BOUT-02	Free slot	Not Used
BOUT3	Initialized	Controller is initialized	INITIALIZED (PAGE 640)
BOUT4	LCL/GEN Breaker Open	Opens GCB of all Gen-sets in Load Sharing	OPEN GCB IN LOAD SHAR (PAGE 645)
BOUT5	*Power High Limit	Mains power high limit	MAINS P HIGH LIMIT (PAGE 641)
BOUT6	*Power Low Limit	Mains power low limit	MAINS P LOW LIMIT (PAGE 641)
BOUT7	MCB On Coil	Command to close generator circuit breaker feedback	MCB ON COIL (PAGE 643)
BOUT8	MCB Off Coil	Command to open generator circuit breaker feedback	MCB OFF COIL (PAGE 642)
BOUT9	Common Alarm Active Level 1	Any level 1 alarm is active	COMMON ALARM ACTIVE LEVEL 1 (PAGE 627)
BOUT10	Common Alarm Active Level 2	Any level 2 alarm is active	COMMON ALARM ACTIVE LEVEL 2 (PAGE 628)
BOUT11	Load Switch #1	Low load switch 1 is reached	POWER SWITCH 1 (PAGE 646)
BOUT12	Load Switch #2	High load switch 2 is reached	POWER SWITCH 2 (PAGE 647)

* Power High and Low Limits are replaced in **Preconfigured** archive by Common High and Low limits (combination of all power and voltage limits - logic is preconfigured in the internal PLC).

5.3.3 Analog inputs

HW Name	Name	Configured sensor	Configured function
AIN1	*Load Control: System Baseload	4-20 mA active	LOAD CONTROL: SYSTEM BASELOAD (PAGE 654)
AIN2	*Load Control: Import/Export	4-20 mA active	LOAD CONTROL: IMPORT/EXPORT (PAGE 654)
AIN3	*PF Control: System Base PF	4-20 mA active	PF CONTROL: SYSTEM BASE PF (PAGE 655)
AIN4	*Q Control: System Base Q	4-20 mA active	Q CONTROL: SYSTEM BASE Q (PAGE 656)

*Analog inputs are configured only in the **Preconfigured** archive. There are not any connected functions in the default archive.

5.3.4 Analog Outputs

HW Name	Description	Output HW type	Configured source
AOUT1	Free slot	N/A	Not Used
AOUT2	Free slot	N/A	Not Used

5.4 General Functions

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5.4.1 3V3 Reference Voltage Measurement

The 3V3 reference voltage is critical for the right functionality of analog/digital converters (ADC). If the 3V3 reference is out of the limit (less than 3.2 V or more than 3.4 V) all voltage measurements will be distorted. In this case, the **LBO HW AC VOLTAGE MEASUREMENT ERROR (PAGE 639)** is activated. It is recommended to use this LBO to activate user protection which will unload the System to prevent any damage to the System, load, or mains.

The input value for the LBO is given by the average of all 3 measured reference voltages which increases the robustness of the protection. The reference voltage should be always fixed and within the limit. Wrong reference voltage might mean the controller unit is going to fail. The **LBO HW AC VOLTAGE MEASUREMENT ERROR (PAGE 639)** is deactivated immediately after the average value of the reference voltage is back within the limit. If the LBO is still being active, you can try to power off and power on the controller unit. If it doesn't help, it is recommended to contact the technical support.

5.4.2 Access lock

The Access lock function allows any user with Access level 1 and higher to Lock the controller configuration for other users. So, only the user who locked the controller will be able to use the controller buttons, change setpoints or write configuration into the locked controller. All LBIs will be still operable, using the PLC the **LBO ACCESS LOCKED (PAGE 625)** can be used to block any LBIs. The configuration can be unlocked only by the user who locked it or by the administrator. This function can be especially useful if more people are remotely connected to the same controller. The access lock works the same way for configuration via the IntelliVision display.

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

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



5.4.3 Alarm Management

Alarms purpose is to indicate occurrence of unwanted situation such as unexpected opening of breaker, generator 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 System control. Level 2 – red alarm – represents a critical situation, where an action must be taken to prevent damage of the System 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 122) with Fixed Protection States (page 657)**.
- Each alarm is written to the **Alarmlist (page 122)**.
- 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.

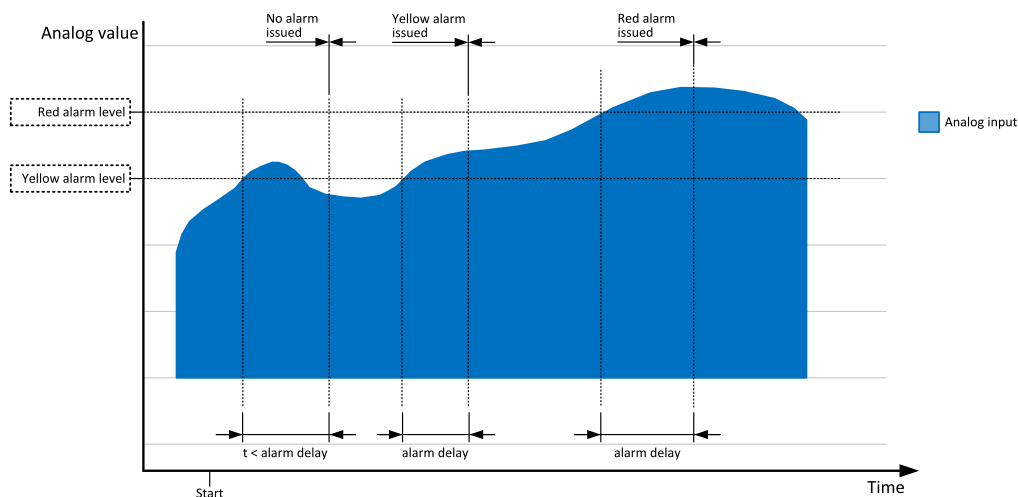


Image 5.54 Analog input alarm evaluation principle

Alarm states

An alarm can have following states:

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

*Sd ECU Communication Fail	Unconfirmed inactive alarm lvl 2
*ECU FC: 029953 (07501h) FMI:0; OC:0; ADR:0	Unconfirmed active ecu alarm
*ECU FC: 037888 (09400h) FMI:0; OC:0; ADR:0	Unconfirmed inactive ecu alarm
*Wrn Fuel Level	Unconfirmed inactive alarm lvl 1
*Wrn Coolant Temp	Unconfirmed active alarm lvl 1
Sd DISTIN 03	Confirmed active alarm lvl 2

Image 5.55 Alarm List

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

Alarm types

The controller recognize 3 basic types of the alarm. Each type of alarm is paired with specific types of **Protection types** (page 211).

Alarm Level 1

The level 1 alarm indicates that a value or parameter is out of normal limits, but has still not reached critical level. This alarm does not cause any actions regarding the System control. For whole list see **Alarms level 1** (page 706)

Alarm Level 2

The level 2 level alarm indicates that a critical level of the respective value or parameter has been reached. For whole list see **Alarms level 2** (page 757)

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

IMPORTANT: The System 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!

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 122). 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.

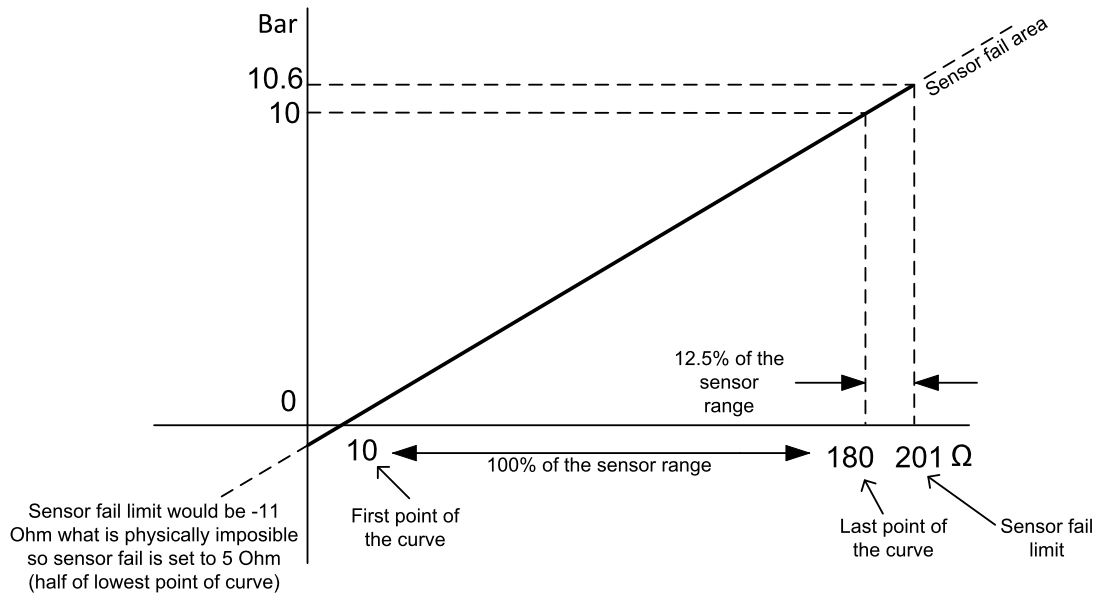


Image 5.56 Sensor fail detection principle

Remote alarm messaging

The controller can send emails at the moment when a new alarm appears in the **Alarmlist** (page 122) or new event is written in **Event History** (page 129). The message will contain a copy of the **Alarmlist** (page 122) or reasons from **Event History** (page 129). To enable this function, adjust setpoints **MPR Message** (page 384), **Wrn Message** (page 383), or **Event Message** (page 383) to ON. Also enter a valid email address to the setpoints, **E-mail Address 1** (page 385), **E-mail Address 2** (page 385), **E-mail Address 3** (page 385), or **E-mail Address 4** (page 386).

The list of all supported terminals shows the table below:

Terminal	Event email	Warning email	Mains Protection email
RS485	NO	NO	NO
USB	NO	NO	NO
Ethernet	YES	YES	YES

Alarmlist

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

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

Alarmlist contains three types of alarms:

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

Controller integrated protections

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

User configured protections

An alarm message in the alarmlist begins with a prefix, which represents the protection type (e.g. Wrn, Al, Hst, ALI). Protection type and alarm name are selected by user during the **Configuration of protections in IntelliConfig (page 218)**. Then the alarm name follows.

ECU alarms

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

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

5.4.4 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 **CAN2B (page 18)** which should be physically connected to the observed CAN. The **CAN2B (page 18)** 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.

5.4.5 CAN Intercontroller Communication

This function allows to share information between other ComAp controllers via CAN interface. This communication is always present on ⑧ **CAN2A (page 43)** and may be present on ⑦ **CAN2B (page 43)**. For better security of sharing information, you may use CAN Intercontroller Communication Redundancy function.

The communication can run in different modes. Select your required mode by setpoint **CAN Intercontroller Comm Mode (page 366)**. The mode is changed only during powering up of the controller and actual mode is stored in value **CAN Intercontroller Comm Mode (page 496)**. In case that there is a mismatch between the setpoint and the value, alarm **ALI CAN Mode Inconsistency (page 745)** is activated. Restart the controller to change the communication mode to selected mode by setpoint **CAN Intercontroller Comm Mode (page 366)**.

For easy detection of empty CAN you can set **CAN Intercontroller Empty Check (page 367)** to Enabled. **Wrn CAN2 Empty (page 711)** is activated every time when controller doesn't see any other controller connected via ⑧ **CAN2A (page 43)** and ⑦ **CAN2B (page 43)**.

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 Intercontroller Comm Mode (page 366) otherwise controller will not communicate with each other.

- Relevant setpoints
 - CAN Controller Address (page 362)
 - CAN Intercontroller Comm Mode (page 366)
- Usage
 - CAN Intercontroller Communication Redundancy (page 124)
 - Virtual modules (page 30)
 - Load Sharing, Var Sharing, and Shared signals

CAN Intercontroller Communication Redundancy

IMPORTANT: The function works only if CAN Intercontroller Comm Mode (page 366) = 64C CAN FD or 32C CAN FD or 8C CAN FD.

This function duplicates whole Intercontroller communication, which is on **CAN2A (page 18)** and sends it via **CAN2B (page 18)**.

The same wiring principles apply to **CAN2B (page 18)** as to **CAN2A (page 18)** (see **CAN bus wiring (page 68)**).

Step by step guide

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

1. Insert the **SW Key (page 273)** for CAN Intercontroller Redundancy
2. Restart the controller
3. Check the value **SW Key Feature List (page 499) - CAN Intercontroller Redundancy** has to be enabled
4. Switch the setpoint **CAN Intercontroller Comm Redundancy (page 365)** to Enabled
5. Restart the controller
6. Check that the value **CAN Intercontroller Comm Redundancy (page 496)** is Enabled

In case of mismatch between the value **CAN Intercontroller Comm Redundancy (page 496)** and the setpoint **CAN Intercontroller Comm Redundancy (page 365)**, alarm **ALI Redundant CAN Error (page 745)** is raised.

In case of inconsistency of data on ⑥ **CAN2A (page 43)** and ⑦ **CAN2B (page 43)** line, alarm **Wrn Redundant CAN inconsistency (page 738)** is activated

5.4.6 CAN1 ECU/IO Modules Splitting

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

In default configuration:

- **CAN1A** terminal is used for communication with ECU and IO Modules.
- **CAN1B** terminal is used for **Hot Swap Redundancy (page 141)**

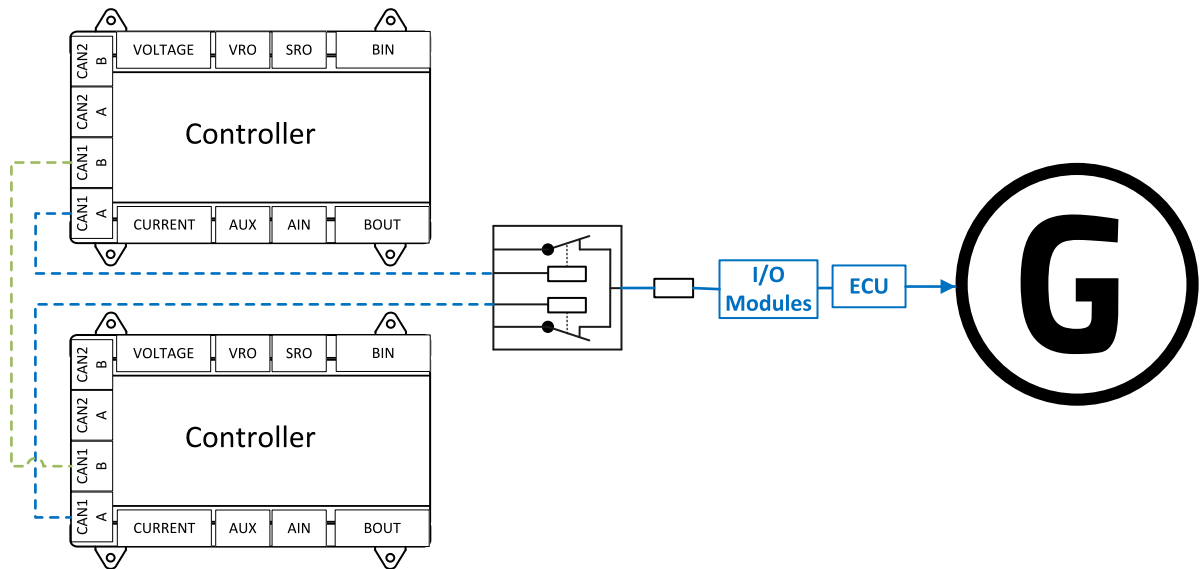


Image 5.57 Hot Swap Redundancy connection

If the setpoint **CAN1 ECU/IOModules Split (page 368)** is enabled, the behavior of CAN1A terminal is changed:

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

IMPORTANT: In case that **CAN1 ECU/IOModules Split (page 368)** is enabled, the **Hot Swap Redundancy (page 274)** is disabled (and vice versa).

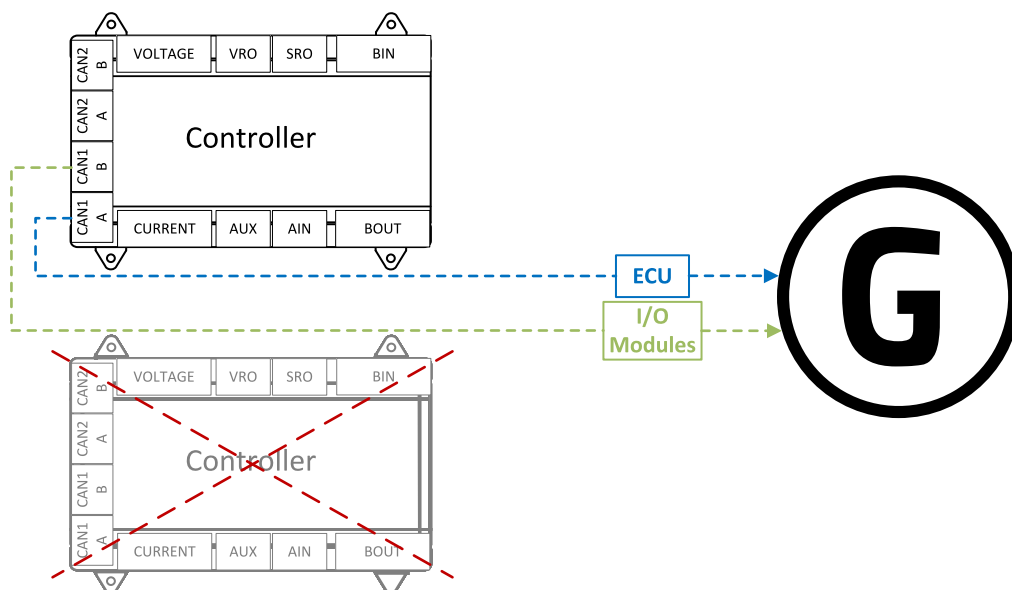


Image 5.58 CAN1 ECU/IO Modules Split connection

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

5.4.7 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.

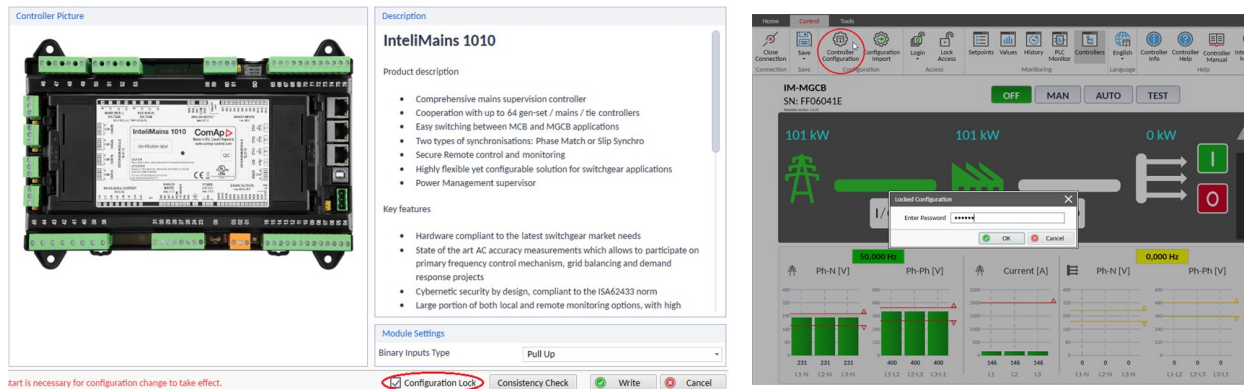


Image 5.59 Configuration lock

5.4.8 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 IntelliMains 1010 SC 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 IntelliMains 1010 SC
- Enable the DIP switch
- Restart the controller
- Connect to the controller via IntelliConfig
- Log-in as level 3 user
- Go to the Control and Import new configuration (button Configuration Import)
- Disable the DIP switch
- Restart the controller

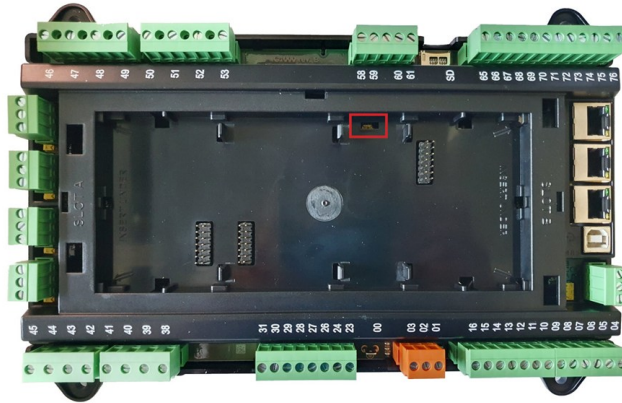



Image 5.60 Location of the DIP switch for Configuration override

5.4.9 Crash Dump

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

Collecting crash dump

To collect Crash Dump from the controller, you need to connect to the controller using IntelliConfig either via **USB** (page 110) or **Ethernet** (page 111).

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

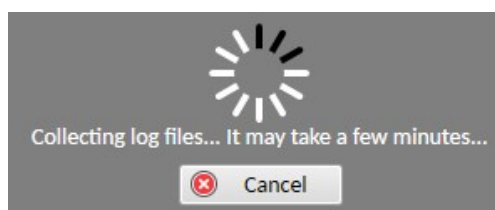


Image 5.61 Crash Dump Collection

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

IMPORTANT: This action may take significantly long period.

Contacting TSUP with crash dump

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

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

5.4.10 E-STOP

The E-Stop is 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 connected with the dedicated E-STOP Input (T04).

Note: There is no difference in the way of configuration of all binary outputs. Binary outputs BO1 and BO2 can be activated only while E-Stop is powered up with **Battery Voltage** (page 488).

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.

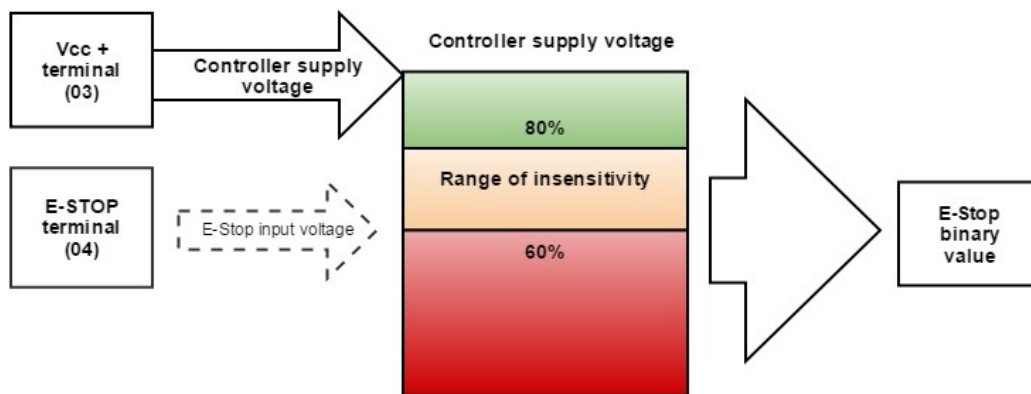


Image 5.62 SW principle of E-STOP

- 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 63**.

5.4.11 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, 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

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.

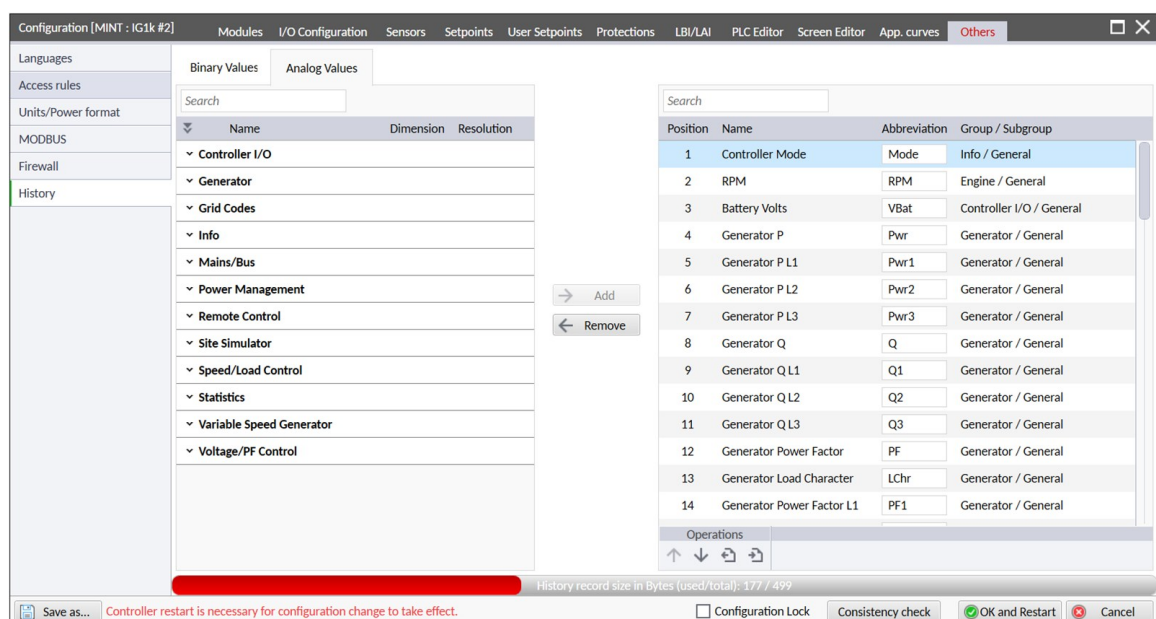


Image 5.63 Configurable history

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.

Default history columns

Category	Column Name	Value	Unit
Info	Mode	Controller Mode (page 494)	-
Controller I/O	VBat	Battery Voltage (page 488)	V
Mains	Pm	Mains Import P (page 448)	kW
	Pm1	Mains Import P L1 (page 448)	kW
	Pm2	Mains Import P L2 (page 448)	kW
	Pm3	Mains Import P L3 (page 448)	kW
	Qm	Mains Import Q (page 448)	kVAr
	Qm1	Mains Import Q L1 (page 449)	kVAr
	Qm2	Mains Import Q L2 (page 449)	kVAr
	Qm3	Mains Import Q L3 (page 449)	kVAr
	PFm	Mains Power Factor (page 450)	-
	LChm	Mains Load Character (page 450)	-
	PFm1	Mains Power Factor L1 (page 451)	-
	LChm1	Mains Load Character L1 (page 451)	-
	PFm2	Mains Power Factor L2 (page 451)	-
	LChm2	Mains Load Character L2 (page 451)	-
	PFm3	Mains Power Factor L3 (page 452)	-
	LChm3	Mains Load Character L3 (page 452)	-
	Frqm	Mains Frequency (page 453)	Hz
	Vm1	Mains Voltage L1-N (page 454)	V
	Vm2	Mains Voltage L2-N (page 454)	V
	Vm3	Mains Voltage L3-N (page 454)	V
	Vm12	Mains Voltage L1-L2 (page 454)	V
	Vm23	Mains Voltage L2-L3 (page 454)	V
	Vm31	Mains Voltage L3-L1 (page 455)	V
	Im1	Mains Current L1 (page 456)	A
	Im2	Mains Current L2 (page 456)	A
	Im3	Mains Current L3 (page 456)	A

Category	Column Name	Value	Unit
Bus	Frqb	Bus Frequency (page 466)	Hz
	Vb1	Bus Voltage L1-N (page 466)	V
	Vb2	Bus Voltage L2-N (page 466)	V
	Vb3	Bus Voltage L3-N (page 466)	V
	Vb12	Bus Voltage L1-L2 (page 466)	V
	Vb23	Bus Voltage L2-L3 (page 467)	V
	Vb31	Bus Voltage L3-L1 (page 467)	V
Load	PId	Load P (page 464)	kW
	QId	Load Q (page 464)	kVAr
	PFId	Load Power Factor (page 464)	-
	LChId	Load Character (page 464)	-
Controller I/O	Ain1	CU-AIN-01 (page 488)	-
	Ain2	CU-AIN-02 (page 488)	-
	Ain3	CU-AIN-03 (page 489)	-
	Ain4	CU-AIN-04 (page 489)	-
	BIN	Binary Inputs (page 489)	-
	BOUT	Binary Outputs (page 490)	-
Power Management	PFgs	Total Running Power Factor (page 483)	-
	LChgs	Total Running Load Character (page 484)	-
Info	FVST	Forced Value Status (page 498)	-

5.4.12 Exercise Timers

Mode Once	133
Mode Daily	134
Mode Weekly	135
Monthly mode	136
Mode Short period	138

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

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

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

- **TEST OnLd** - The binary output of the Timer is internally connected to the Remote TEST On Load binary input.
- **MFail Blk** - The binary output of the Timer is internally connected to the Mains Fail Block binary input.

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

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

See the list of related setpoints and LBOs below.

Related setpoints for choosing of the timer function:

- **Timer 1 Function** (page 417)
- **Timer 2 Function** (page 419)
- **Timer 3 Function** (page 421)
- **Timer 4 Function** (page 423)
- **Timer 5 Function** (page 425)
- **Timer 6 Function** (page 427)
- **Timer 7 Function** (page 429)
- **Timer 8 Function** (page 431)
- **Timer 9 Function** (page 433)
- **Timer 10 Function** (page 435)
- **Timer 11 Function** (page 437)
- **Timer 12 Function** (page 439)

Related setpoints for the timer setup:

- **Timer 1 Setup** (page 418)
- **Timer 2 Setup** (page 420)
- **Timer 3 Setup** (page 422)
- **Timer 4 Setup** (page 424)
- **Timer 5 Setup** (page 426)
- **Timer 6 Setup** (page 428)
- **Timer 7 Setup** (page 430)
- **Timer 8 Setup** (page 432)
- **Timer 9 Setup** (page 434)
- **Timer 10 Setup** (page 436)
- **Timer 11 Function** (page 437)
- **Timer 12 Setup** (page 440)

Related LBOs:

- | | |
|--------------------------------------|---------------------------------------|
| ➤ Exercise Timer 1 (page 633) | ➤ Exercise Timer 7 (page 635) |
| ➤ Exercise Timer 2 (page 633) | ➤ Exercise Timer 9 (page 636) |
| ➤ Exercise Timer 3 (page 634) | ➤ Exercise Timer 9 (page 636) |
| ➤ Exercise Timer 4 (page 634) | ➤ Exercise Timer 10 (page 636) |
| ➤ Exercise Timer 5 (page 634) | ➤ Exercise Timer 11 (page 636) |
| ➤ Exercise Timer 6 (page 635) | ➤ Exercise Timer 12 (page 637) |

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

Available modes of each timer:

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

Mode Once

Set-up via IntelliConfig

To set-up timer via IntelliConfig go to the setpoint ribbon, setpoint group scheduler and setpoint **Timer 1 Setup** (page 418).

Note: Setpoint **Timer 1 Setup** (page 418) is visible only if setpoint **Timer 1 Function** (page 417) has any other value than disabled.

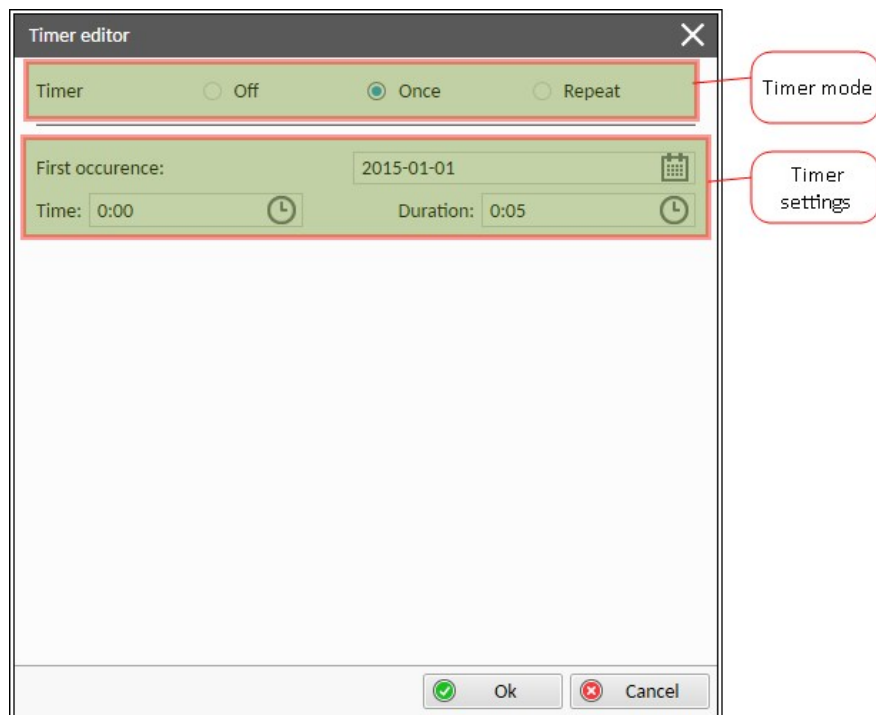


Image 5.64 Mode Once - IntelliConfig

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 (page 417)** setpoint. Then go to **Timer 1 Setup (page 418)** 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 (page 418)**

Note: Setpoint **Timer 1 Setup (page 418)** is visible only if setpoint **Timer 1 Function (page 417)** has any other value than disabled.

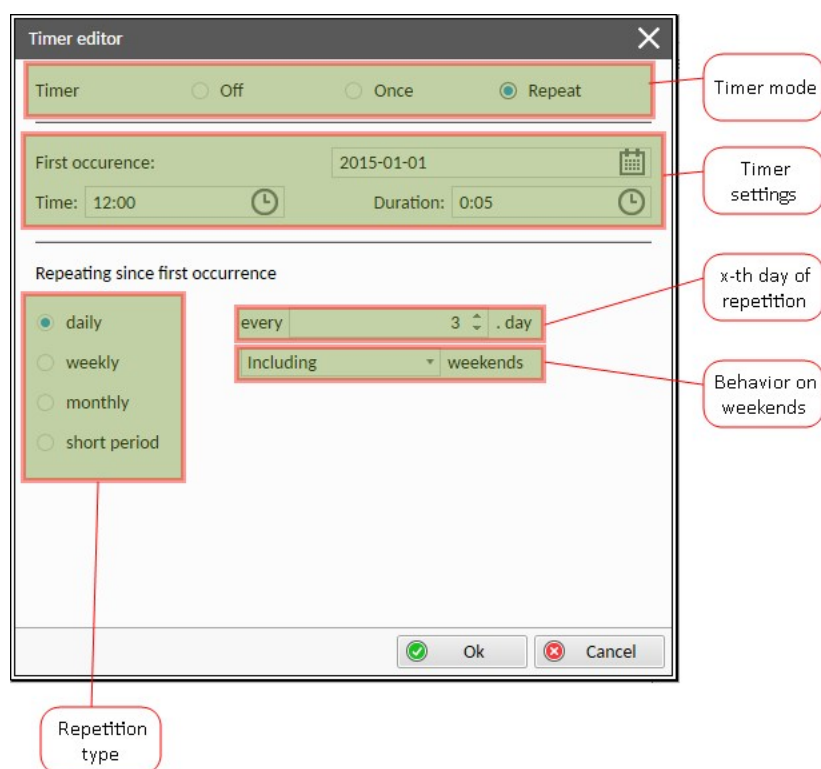


Image 5.65 Daily mode - IntelliConfig

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. Then 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 (page 417)** setpoint. Then go to **Timer 1 Setup (page 418)** 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.

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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 (page 418)**.

Note: Setpoint **Timer 1 Setup (page 418)** is visible only if setpoint **Timer 1 Function (page 417)** has any other value than disabled.

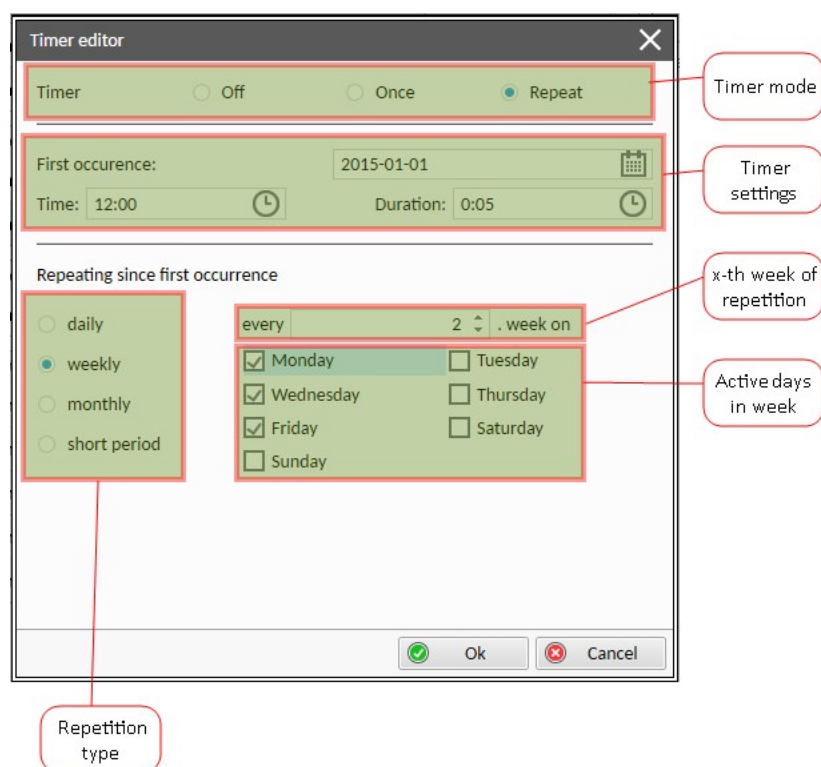


Image 5.66 Mode Weekly - IntelliConfig

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 (page 417)** setpoint. Then go to **Timer 1 Setup (page 418)** 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 (page 418)**.

Note: Setpoint **Timer 1 Setup (page 418)** is visible only if setpoint **Timer 1 Function (page 417)** has any other value than disabled.

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

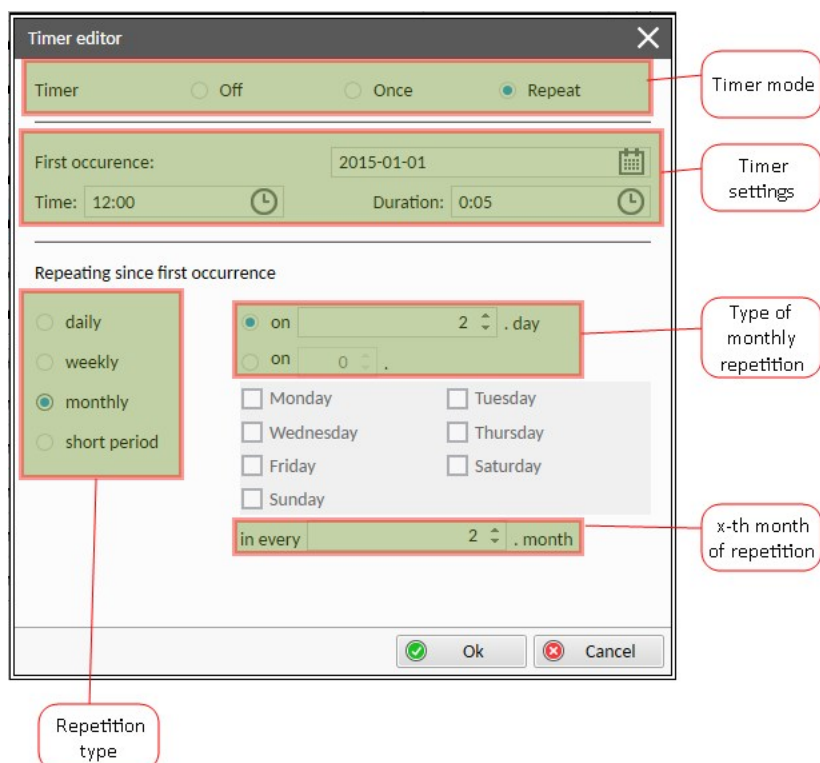


Image 5.67 Mode Monthly - IntelliConfig

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 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.

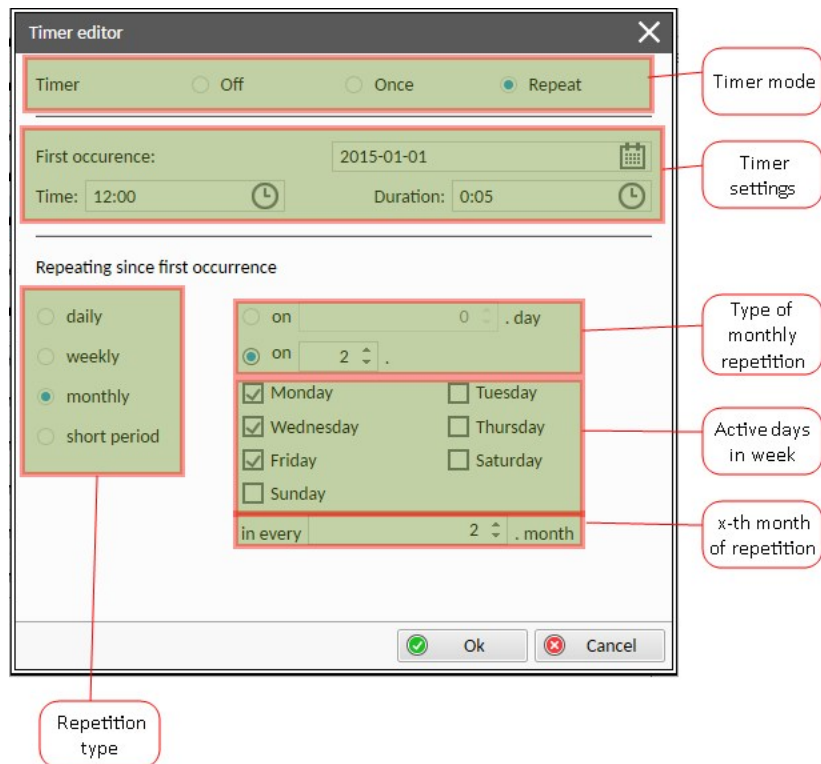


Image 5.68 Mode Monthly - Intelliconfig

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 (page 417)** setpoint. Then go to **Timer 1 Setup (page 418)** 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 (page 417)** setpoint. Than go to **Timer 1 Setup (page 418)** 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** (page 418).

Note: Setpoint **Timer 1 Setup** (page 418) is visible only if setpoint **Timer 1 Function** (page 417) has any other value than disabled.

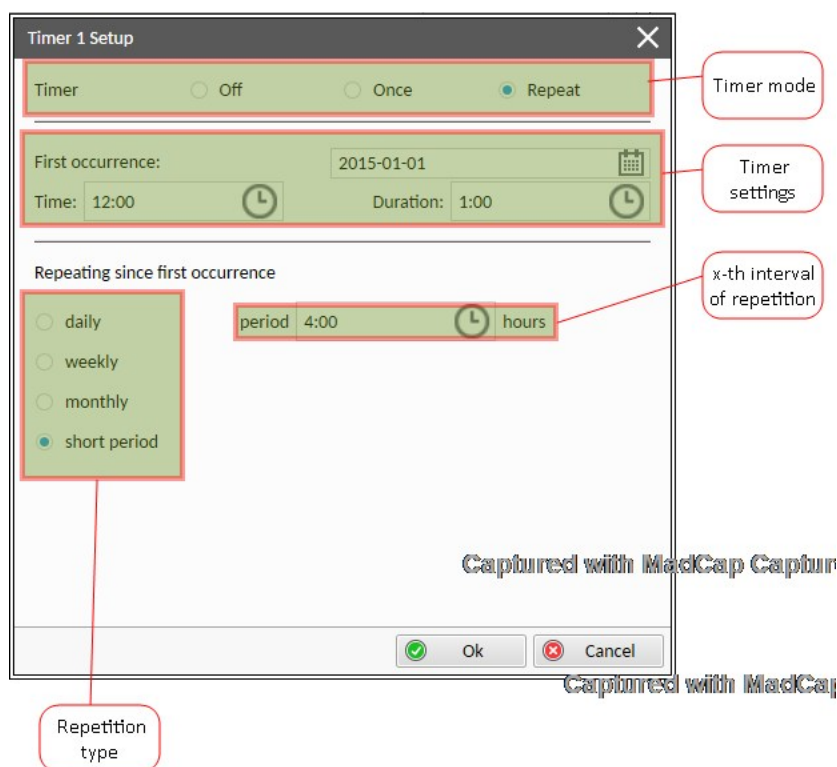


Image 5.69 Mode Short period - IntelliConfig

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. Then 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** (page 417) setpoint. Then go to **Timer 1 Setup** (page 418) 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.

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5.4.13 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 1 (page 18)** and **Ethernet 2 (page 19)** ports. The firewall can be enabled by the setpoint IP Firewall in the **Group: ETH Interface 1 - Trusted (page 372)** and **Group: ETH Interface 2 - Untrusted (page 377)**. 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.

5.4.14 Forced Value

This function allows forcing of preconfigured value into selected setpoints via activation of LBI. Each LBI can force only one value into one setpoint. There are 32 LBIs - **FORCED VALUE INPUT 01 (PAGE 605) ... FORCED VALUE INPUT 32 (PAGE 611)**. You can see current states of all LBIs in value **Forced Value Status (page 498)**. 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

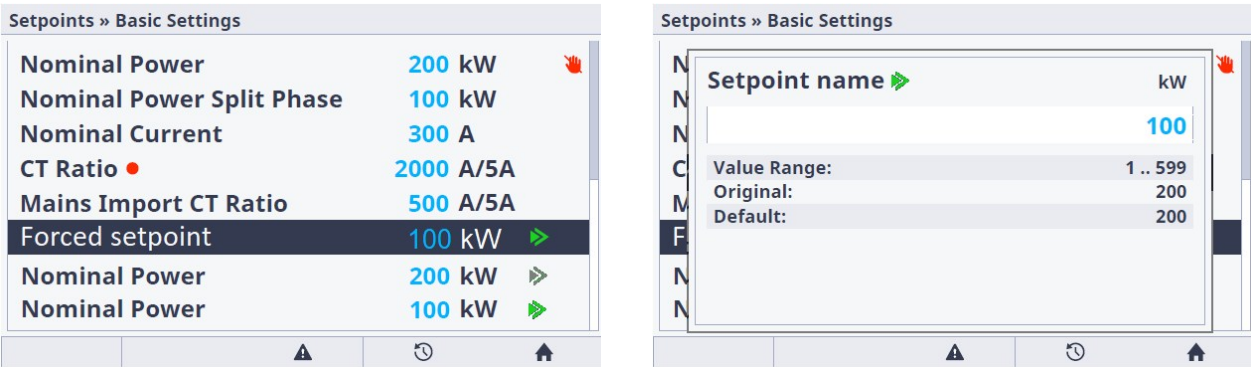


Image 5.70 : Force Value and Protected Setpoint Indication

InteliConfig



Image 5.71 : 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.

5.4.15 Hot Swap Redundancy

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

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

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

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

Essential signals and wiring diagram

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

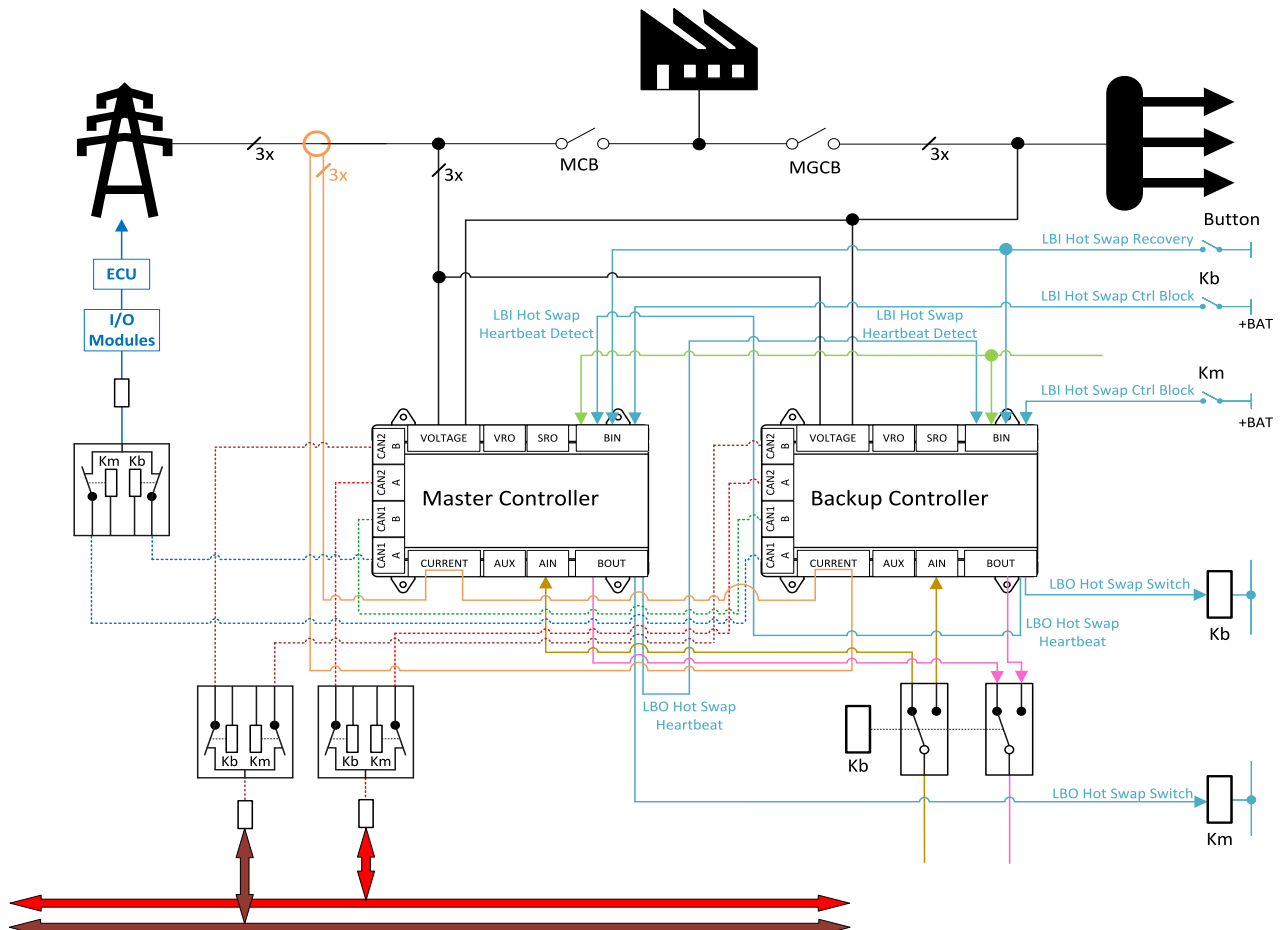


Image 5.72 Hot Swap Redundancy wiring diagram

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

Hot Swap Heartbeat and other control signals

- **Hot Swap Heartbeat** - The LBO **HOT SWAP HEARTBEAT (PAGE 638)** of MASTER controller must be interconnected with the LBI **HOT SWAP HEARTBEAT DETECT (PAGE 613)** of the pair BACKUP controller and vice versa.
- **Hot Swap Switch** - The function of Hot Swap necessarily requires the configuration of the LBO **HOT SWAP SWITCH (PAGE 639)** signal on the armature of relay Km / Kb , which ensures turn over or disconnection of technology inputs / outputs and communication lines. It is possible to use multiple pole relays and combine more control signals together or use a number of independent relays powered by a common physical output of the controller. Then it is necessary to keep the maximum permissible load of one output, or to divide the LBO **HOT SWAP SWITCH (PAGE 639)** function among several physical binary outputs. Alternatively use one central Hot Swap Switch relay designed to supply all other control relays.
- **The Hot Swap functionality necessarily requires** the configuration of the LBI **HOT SWAP CTRL BLOCK (PAGE 612)** input on both paired controllers. The input is to be handled by the LBO **HOT SWAP SWITCH (PAGE 639)** signal of the pair controller and ensures the switching of the controller that has been evaluated as defective to a state where it cannot effect the technology control.

IMPORTANT: It is recommended to use high speed relays (eg. SSR) with switching delays <1ms for disconnection of communication lines and technology inputs/outputs.

Interconnection of inputs and outputs of Hot Swap pair controllers

- Configuration of inputs to polarity "Pull Down" in combination, where inputs and outputs of controllers are interconnected further requires galvanic separation with optocouplers or connection of anti-series diodes to controller outputs. For more information see **Binary Inputs (page 61)** and **Binary Outputs (page 62)**.

Powering

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

Binary inputs

- The binary inputs (with the exception of the control binary inputs of the Hot Swap function) always lead to both pair controllers at the same time, in the same position without the need of separation by relays. It is recommended to separate the inputs by diodes to avoid wrong input activation when one controller is switched off - **see Binary Inputs on page 61**.
- The binary inputs must be set to "Pull Down" polarity on both controllers.

Binary outputs

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

Analog inputs

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

Analog outputs

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

Communication lines

- Technological lines CAN1A (ECU and I/O modules), CAN2A (Intercontroller Communication), CAN2B (Redundant Intercontroller Communication). These lines are recommended to be connected to both pair controllers via relays with disconnecting function. Relays have to be as close to the CAN terminals as possible, so the star connection of the CAN bus is avoided. See the illustrative picture for the Intercontroller CAN:

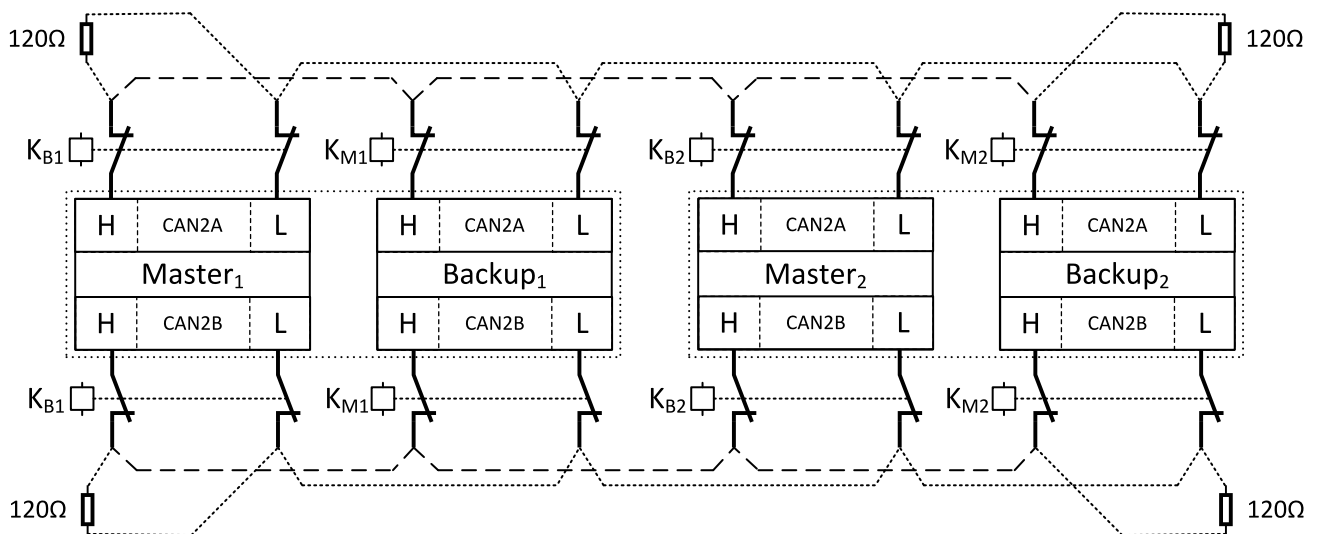


Image 5.73 Intercontroller CAN connection diagram.

Note: CAN bus have to be terminated on the relay level (see the image above), so the line is terminated correctly if any controller is disconnected from the bus.

- Ethernet 1, Ethernet 2 and Ethernet 3 are connected to both controllers in the classic way at the same time.
- RS485 (Modbus Server/Master communication) is connected to both controllers in the classic way at the same time. Both pair controllers has different device address on this line. In case of connection via RS485 there is no possibility to use hotswap. It is not possible to read from two devices and write at the same time.

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

Hot Swap Synchronisation Line

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

Display

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

Fault Reset

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

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

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

🔍 back to Hot Swap Redundancy

Hot Swap – step by step

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

The configuration and commissioning of the Hot Swap system:

1. **SW key**
 - a. The Hot Swap function is conditioned by software licence - SW Key. The appropriate SW Key must be inserted to the setpoint **SW Key (page 273)**.
2. **Base configuration**
 - a. Check that the signals **LBO HOT SWAP HEARTBEAT (PAGE 638)** and **LBI HOT SWAP HEARTBEAT DETECT (PAGE 613)** are properly configured – crosswired between MASTER and BACKUP.
 - b. It is also necessary to configure the **LBO HOT SWAP SWITCH (PAGE 639)** signal and the **LBI HOT SWAP CTRL BLOCK (PAGE 612)** signal to the corresponding binary output / input - again crosswired between MASTER and BACKUP.
 - c. These signals can be configured for any binary output and binary input of the controller (they must not be configured on peripheral or virtual modules). The binary inputs must be configured in "Pull Down" mode. This polarity must then be taken into account when designing the entire control system. Failure to comply with this configuration causes that the Hot Swap function is not working and it is Disabled.
 - d. If any mandatory LBI or LBO is not correctly configured the alarm **Wrn Hot Swap Configuration Incorrect (page 734)** is activated.
 - e. Power up both controllers at the same time.
3. **Setting of the setpoints**
 - a. Set the setpoint **Hot Swap Redundancy (page 274)** = Master on the controller that is to perform the MASTER role, and set this setpoint = Backup on the controller in the BACKUP role. MASTER and

BACKUP share the same address, set the setpoint **CAN Controller Address (page 362)** in the same way. Pay attention, changing the settings of all the above setpoints will not take effect until both controllers are power cycled. Verify the configuration and settings by setting the system to the "default state", ie the MASTER controls the system, the BACKUP is ready to take over the control.

- b. In case of using two sets of I/O modules (modules redundancy), set the setpoint **Hot Swap Redundancy (page 274)** = Master + Modules Redundancy for MASTER controller and Backup + Modules Redundancy for BACKUP controller. The rest stays the same as above.

4. From the point of view of the control system

We want the hot swap system to behave as one device - one control system. For this reason, we set the CAN Address on the Intercontroller CAN line Setpoint **CAN Controller Address (page 362)** on the MASTER and on the BACKUP controller identically. This ensures a smooth transition in terms of Load / Var sharing, Powermanagement and virtual peripherals. On the contrary, from the point of view of monitoring, it is necessary to distinguish both devices from each other. The address for Monitoring via RS485 is set using the setpoint **Terminal Comm Address (page 362)**. This communication line is therefore permanently connected to both controllers and it is not necessary to switch it over the pair controllers.

5. Resetting the Hot Swap System to the default state

It is possible to reset the system by power-cycling of both controllers. Disconnect the power supply from both pair controllers, first connect the power supply to the MASTER controller, then connect the power supply to the BACKUP controller. If the base configuration is OK, the alarmlist on the MASTER or BACKUP should not contain any alarm related to Hot Swap. Check the value **Hot Swap Redundancy Status (page 500)**, to confirm that the Hot Swap system is in the default state. The basic check of the default state can be easily performed by changing the Controller Mode on MASTER controller. Controller mode can be changed only from the MASTER controller. BACKUP then only reflects this state and it is not possible to change its Controller Mode directly.

6. Hot Swap Recovery

If the **Wrn Master Controller Failed (page 736)** or **Wrn Backup Controller Failed (page 710)** alarm is present in the Alarmlist of one of the controllers, it means that the pair controller was not detected correctly according to the Hot Swap Heartbeat signal. The cause is probably a faulty configuration or wrong wiring. Check the wiring and configuration of the **LBO HOT SWAP HEARTBEAT (PAGE 638)** and **LBH HOT SWAP HEARTBEAT DETECT (PAGE 613)** signals. If everything is OK, reset the Hot Swap system. This can be achieved without the need to restart both controllers using the **LBH HOT SWAP RECOVERY (PAGE 613)**. The LBH responds to the edge, so a pulse needs to be applied to inputs of the both controllers at one time.

Note: It is not possible to perform the recovery if any level 2 alarm is present in the alarm list.

7. Performing the Hot Swap function

If the Hot Swap system is in the default state, we will perform a Hot Swap function test. Interrupt the Hot Swap Heart Beat signal leading from the MASTER to BACKUP. The alarm **Wrn Master Controller Failed (page 736)** appears in the alarm list of the BACKUP controller and BACKUP actively takes over the control of the system. In all consequences it means that:

- a. BACKUP activates the **LBO HOT SWAP SWITCH (PAGE 639)**, which controls all relays according to the diagram. The MASTER is disconnected from all critical lines and signals and the other signals (Analog inputs and Analog Outputs) are switched to the BACKUP controller. At the same time, with this signal, the Master controller is switched to the so-called Listening Mode using its **LBH HOT SWAP CTRL BLOCK (PAGE 612)**. This mode ensures that the MASTER will be silenced on the CAN communication lines and thus will not collide with the data that is already being sent by BACKUP for this purpose.

- b. At this point, BACKUP switches from listening mode to Talking Mode, thus representing the Hot Swap system on CAN communication lines.
- c. Have a look at value Hot Swap Redundancy Status. The individual signals now correspond to a situation where the system has successfully entered a state where BACKUP is in the role of who controls the system.

Note: In case of using two sets of I/O modules (modules redundancy): Failure of one of the Master's CAN modules causes the Hot Swap – the Backup controller takes over the control of the system.

Failure of one of the Backup's CAN modules causes: Master considers Backup to be dead (therefore the Backup is no longer available for the Hot Swap function).

8. Smooth transition to Backup

When the System is running or is loaded while the MASTER controller fails, then the BACKUP should take over the control of the System smoothly without any bumps on the frequency, voltage and power values, even in dynamic states such as loading, unloading or ongoing synchronization. BACKUP will ensure a smooth transition in the following aspects:

- a. ECU communication
- b. Serving of CAN peripheral modules
- c. Serving of virtual peripheries - Distributed and Shared signals
- d. Communication on Intercontroller line - Load Sharing / Var Sharing

9. Hot Swap Synchronization Line

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

- a. **Wrn Hot Swap Data Synchro Fail (page 735)** - takes place on both the MASTER and the BACKUP controller in the event of a communication failure on this line. This status is also indicated in the Hot Swap Redundancy Status value.

10. Shared setpoints

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

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

IMPORTANT: Ensuring the synchrony of shared setpoints must be ensured by the operator!

11. Time synchronization

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

back to Hot Swap Redundancy

5.4.16 I/O Configuration

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Protections Configuration	150
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Remove I/O Configuration	151

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

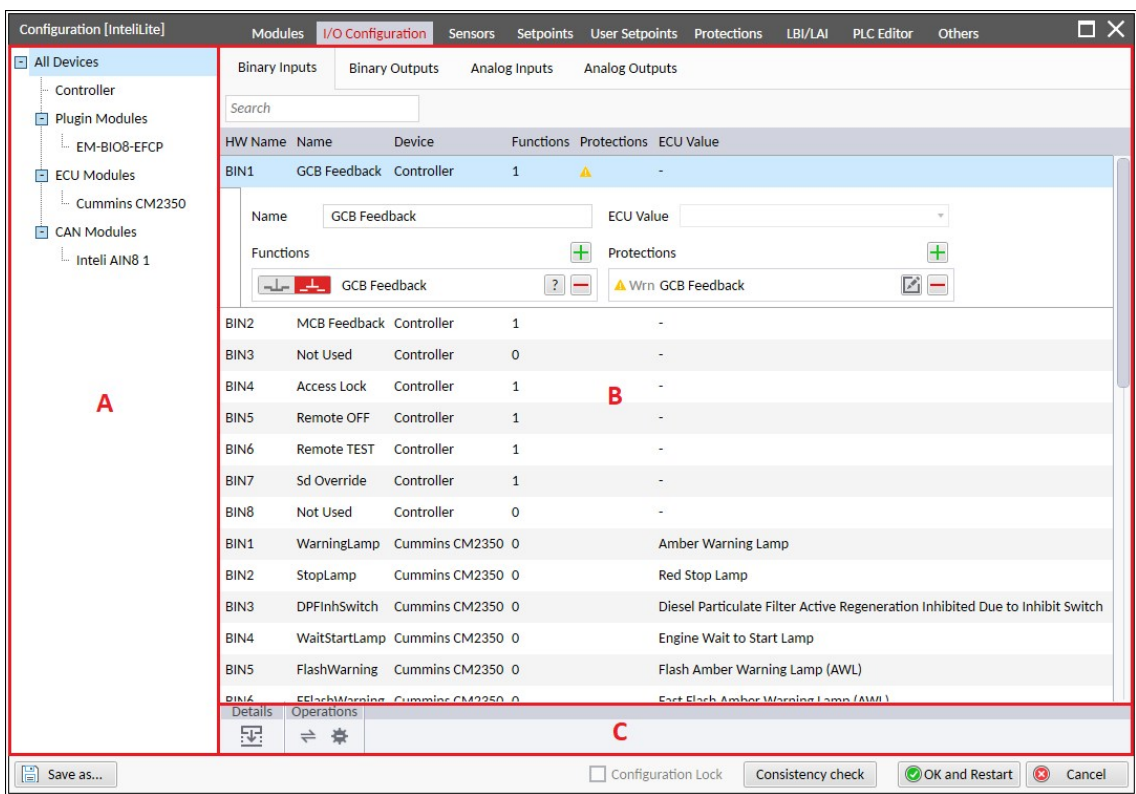


Image 5.74 I/O Configuration window

- 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 150
 - > **Remove IO Configuration** - see Remove I/O Configuration on page 151

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 150**
4. **Protections** - the set of protections **see Protections Configuration on page 150**

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

Name:

ECU Value:

Functions

Protections

Image 5.75 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 150**

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 5.76 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 171**
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 150**
12. **Protections** - the collection of protections **see Protections Configuration on page 150**

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 5.77 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 5.78 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 5.79 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 **Bus Frequency (page 466)** (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

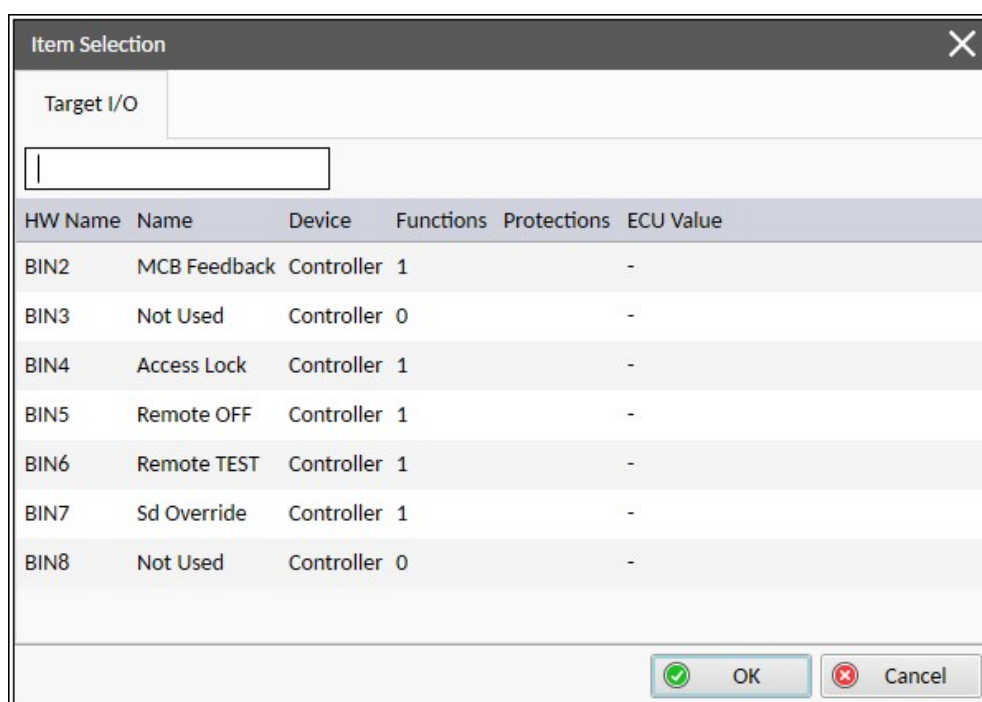
For more information about protections see **Protections on page 210**

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.

5.4.17 Modbus Client (Master)

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

The Controller IntelliMains 1010 SC is equipped by the function of Modbus Client (Master). Actually it means that controller can play the role of the device which initiate the modbus communication, i.e. controller can ask and command other devices being in role of modbus server (slave). In standard terms role of modbus client (master) on modbus TCP or RTU. The communication protocol with server device is a matter of configuration.

Modbus Client (Master) configuration step by step

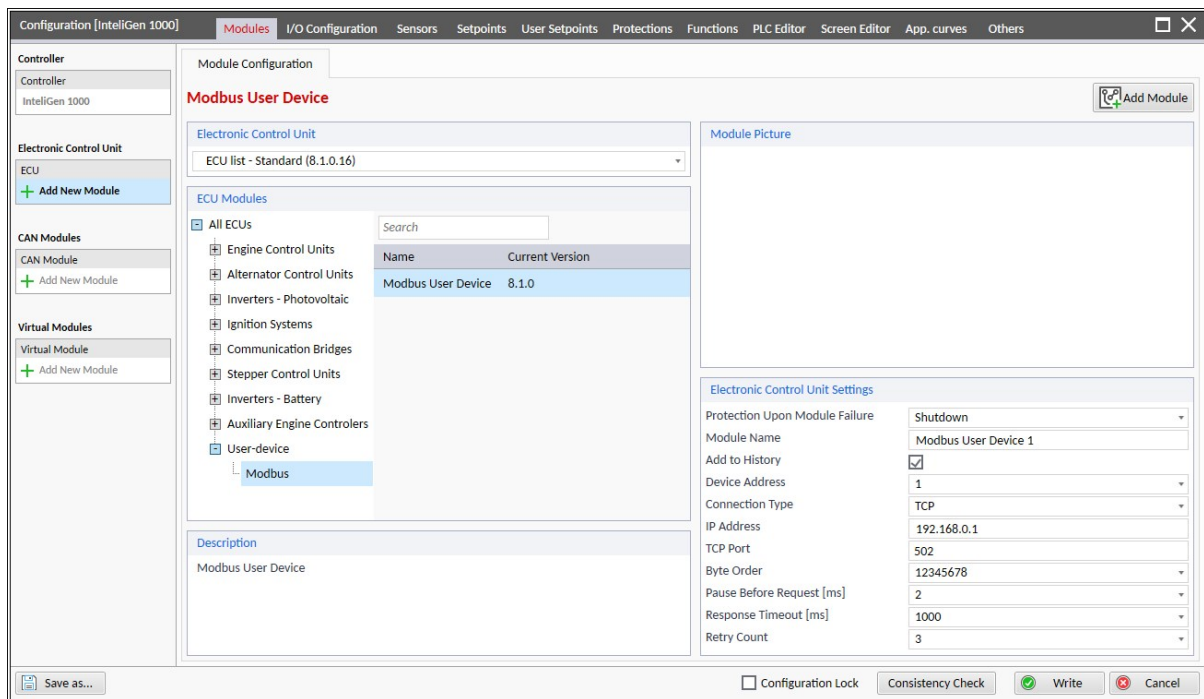
Controller is able to communicate with up to 16 devices at one time. The modbus server device is configured like the ECU module, it is part of Multi ECU configuration. Modbus server devices uses the same pool (resources) for the inputs and outputs as standard ECUs.

The Modbus Client/Master function is conditioned by software license - SW Key which must be inserted in the setpoint **SW Key (page 273)**. If the key is not inserted the function is available only for two modbus registers (inputs or outputs). When more than these two registers are used in the configuration, no registers will be communicated at all and the alarm **ALI SW Key Modbus Master Error (page 747)** is activated.

User defined Modbus Server Devices

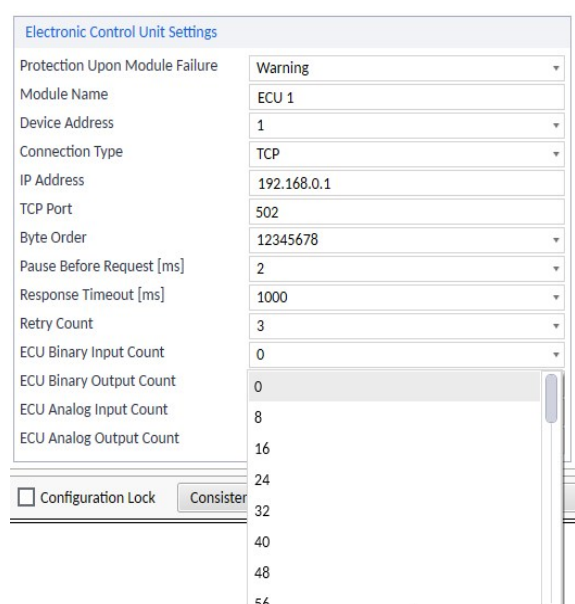
1. Adding Modbus Server Device

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

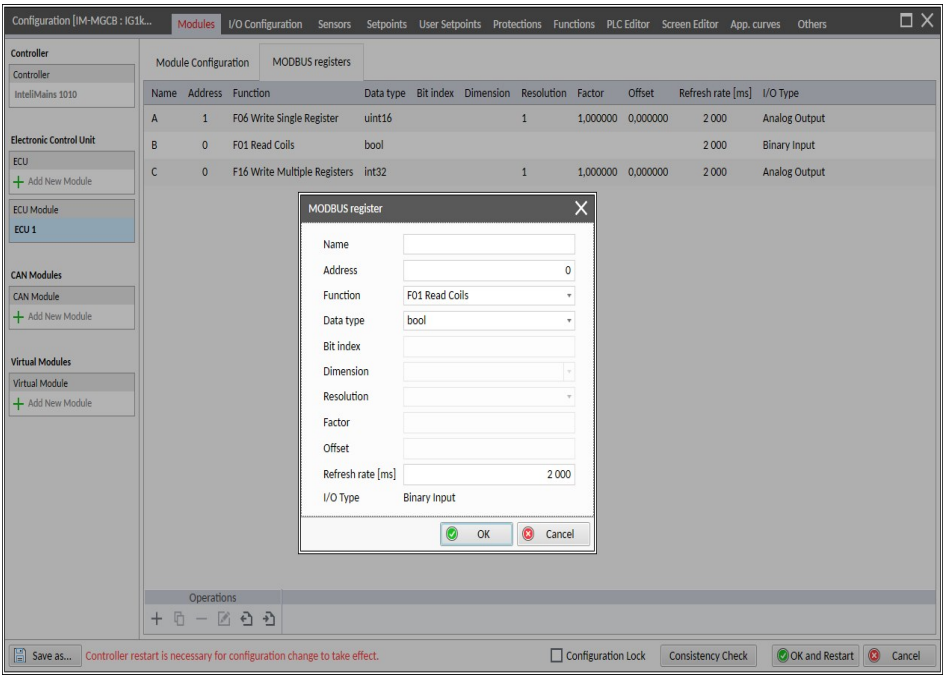
Once the device was added into the configuration you need to edit its setting such as number of each type of Inputs/Outputs, Device Address, etc. Keep in mind that all devices uses inputs and outputs from the limited pool common with ECU. Inserting the "Device address" is required for both Connection Types (Modbus RTU or Modbus TCP).



3. MODBUS Registers

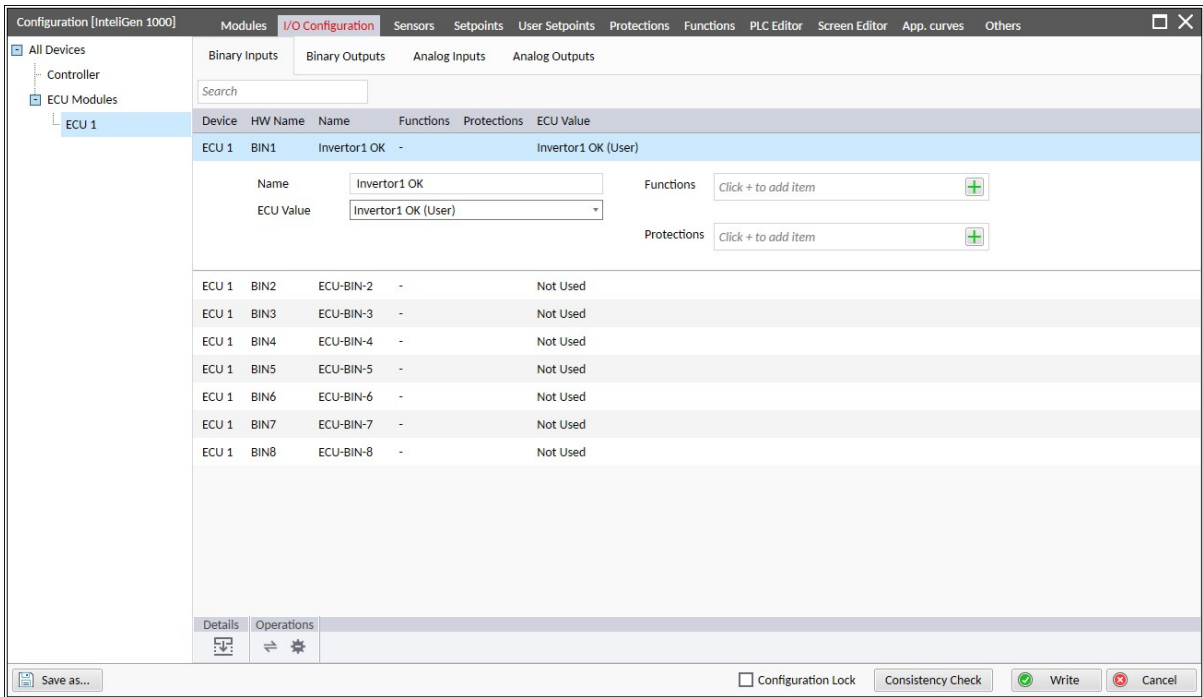
Open the section **MODBUS registers** for editing or creating new registers (datapoints). The list of registers is actually a set of definitions belonging to your specific device and has no direct connection to specific control signals in the controller. So, you can create large set of registers without 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.



4. Configuration of Inputs And Outputs

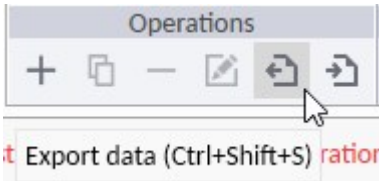
Now, when the definition of your Modbus Server Device was created, go to section **I/O Configuration** and assign the specified registers to inputs and outputs. Then assign the functions for inputs and outputs. You can select from the list of standard logical signals or use your inputs and outputs in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



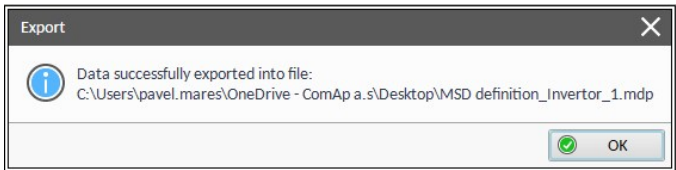
5. Clonning of The Modbus Server Device

When using more then one instance of a specific Modbus Server Device in one configuration, or when needed the Modbus Server Device definition for configuration of another controller, there is a way how to

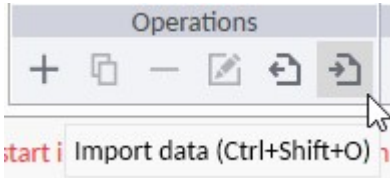
Export and Import the definitions. Go to section **MODBUS registers** in **Modules** and select the icon for exporting data.



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



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



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

5.4.18 Multiple ECU

InteliMains 1010 SC allows you to configure, monitor and control multiple Electronic Control Units (ECUs), such as Breakers and Modbus modules. At this moment there are 16 ECU slots available, each slot can contain one ECU/Modbus Master which settings can be separately configured. ECU can be configured via InteliConfig (Control → Configuration → Modules → Electronic Control Unit).

In order to ensure proper functionality you shall pay extra attention to the ECU settings. ECU address has to be always unique whereas Controller address is required to be set to the same value as **CAN Controller Address (page 362)** of the Controller Unit that sends commands frames to this ECU. Aftertreatment can be enabled only for one ECU, enable it by using a check box.

ECU I/O can be configured in I/O Configuration.

Controller objects related to ECU

ECU Slot	LBI	LBO	Alarm
1	ECU COMMUNICATION FAIL BLOCK 1 (PAGE 601)	ECU 1 COMM FAIL (PAGE 630)	Wrn ECU 1 Comm Fail (page 729)
2	ECU COMMUNICATION FAIL BLOCK 2 (PAGE 601)	ECU 2 COMM FAIL (PAGE 630)	Wrn ECU 2 Comm Fail (page 729)

3	ECU COMMUNICATION FAIL BLOCK 3 (PAGE 601)	ECU 3 COMM FAIL (PAGE 630)	Wrn ECU 3 Comm Fail (page 729)
4	ECU COMMUNICATION FAIL BLOCK 4 (PAGE 601)	ECU 4 COMM FAIL (PAGE 631)	Wrn ECU 4 Comm Fail (page 729)
5	ECU COMMUNICATION FAIL BLOCK 5 (PAGE 602)	ECU 5 COMM FAIL (PAGE 631)	Wrn ECU 5 Comm Fail (page 730)
6	ECU COMMUNICATION FAIL BLOCK 6 (PAGE 602)	ECU 6 COMM FAIL (PAGE 631)	Wrn ECU 6 Comm Fail (page 730)
7	ECU COMMUNICATION FAIL BLOCK 7 (PAGE 602)	ECU 7 COMM FAIL (PAGE 631)	Wrn ECU 7 Comm Fail (page 730)
8	ECU COMMUNICATION FAIL BLOCK 8 (PAGE 602)	ECU 8 COMM FAIL (PAGE 631)	Wrn ECU 8 Comm Fail (page 731)
9	ECU COMMUNICATION FAIL BLOCK 9 (PAGE 602)	ECU 9 COMM FAIL (PAGE 631)	Wrn ECU 9 Comm Fail (page 731)
10	ECU COMMUNICATION FAIL BLOCK 10 (PAGE 603)	ECU 10 COMM FAIL (PAGE 632)	Wrn ECU 10 Comm Fail (page 731)
11	ECU COMMUNICATION FAIL BLOCK 11 (PAGE 603)	ECU 11 COMM FAIL (PAGE 632)	Wrn ECU 11 Comm Fail (page 731)
12	ECU COMMUNICATION FAIL BLOCK 12 (PAGE 603)	ECU 12 COMM FAIL (PAGE 632)	Wrn ECU 12 Comm Fail (page 732)
13	ECU COMMUNICATION FAIL BLOCK 13 (PAGE 603)	ECU 13 COMM FAIL (PAGE 632)	Wrn ECU 13 Comm Fail (page 732)
14	ECU COMMUNICATION FAIL BLOCK 14 (PAGE 603)	ECU 14 COMM FAIL (PAGE 632)	Wrn ECU 14 Comm Fail (page 732)
15	ECU COMMUNICATION FAIL BLOCK 15 (PAGE 604)	ECU 15 COMM FAIL (PAGE 632)	Wrn ECU 15 Comm Fail (page 733)
16	ECU COMMUNICATION FAIL BLOCK 16 (PAGE 604)	ECU 16 COMM FAIL (PAGE 633)	Wrn ECU 16 Comm Fail (page 733)

For each ECU there is LBO which gets activated when communication issue with respective ECU is detected. For easier detection whether all configured ECUs are communicating, there is LBO **ECU COMM OK (PAGE 633)**. During detected communication issue an alarm is issued for respective ECU. This alarm and all user protections related to respective ECU can be suppressed by appropriate LBI. To suppress all protections of all ECUs use LBI **ECU COMMUNICATION FAIL BLOCK (PAGE 601)**. See table above to find relative LBO, LBI and alarm to respective ECU slot.

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.

5.4.19 PLC - Programmable Logic Controller

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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

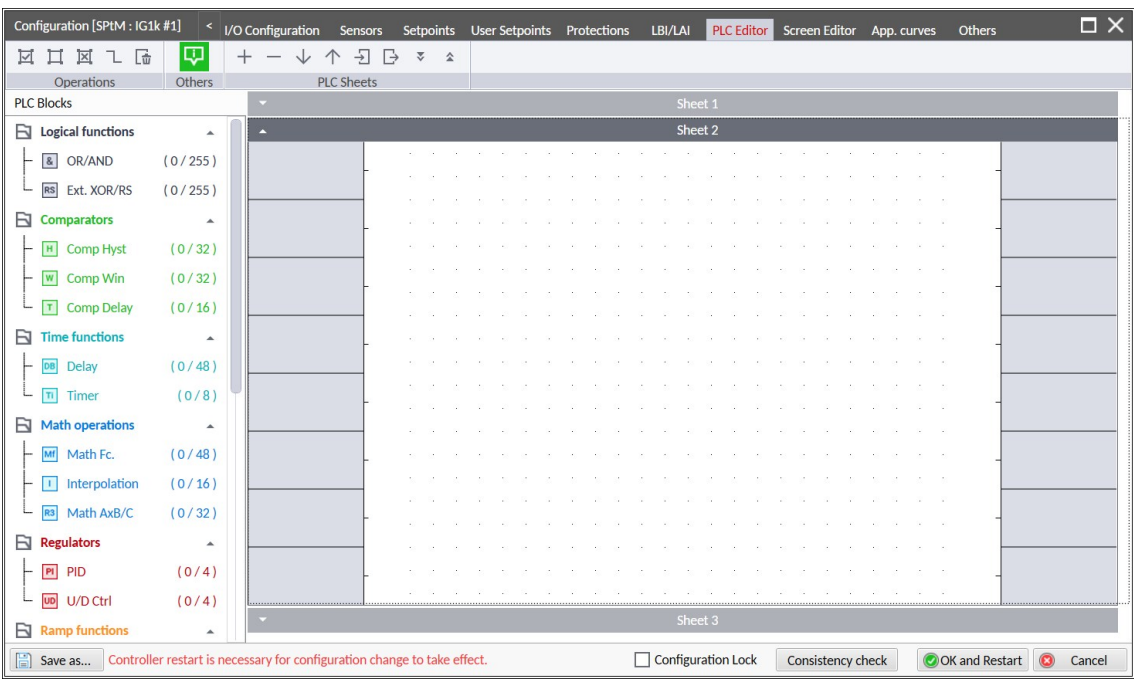


Image 5.81 PLC Editor - main page

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 (page 666)	128
	XOR/RS (page 668)	128
Comparators	Comp Delay (page 669)	8
	Comp Hyst (page 670)	16
	Comp Win (page 671)	16
Time functions	Delay (page 672)	16
	Timer (page 674)	4
Math Operations	Interpolation (page 676)	8
	AxB/C±D (page 677)	4
	Math Fc. (page 678)	16
Regulators	PID (page 680)	4
	Up/Down Ctrl Block (page 685)	4
Ramp functions	Inc/Dec (page 687)	2
	Mov Avg (page 688)	2
	Ramp (page 689)	4
	Up/Down (page 690)	4
Others	Analog Switch (page 692)	8
	Analog Switch 8 (page 693)	8
	Circuit Breaker (page 695)	1
	Comp. 4 (page 697)	8
	Convert (page 698)	16
	Counter (page 700)	4
	Decomp. 4 (page 701)	8
	Hold (page 703)	4
	Validator (page 704)	4

For more information about PLC blocks go to the chapter **PLC (page 665)**

[🔍 back to PLC - Programmable Logic Controller](#)

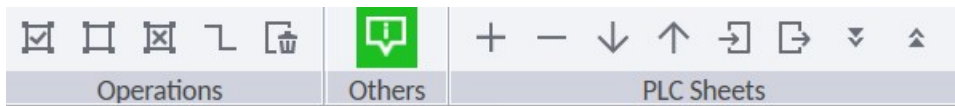
PLC Editor

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The PLC Editor is available in IntelliConfig Control tab: use Control → Controller Configuration → PLC Editor.

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

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.

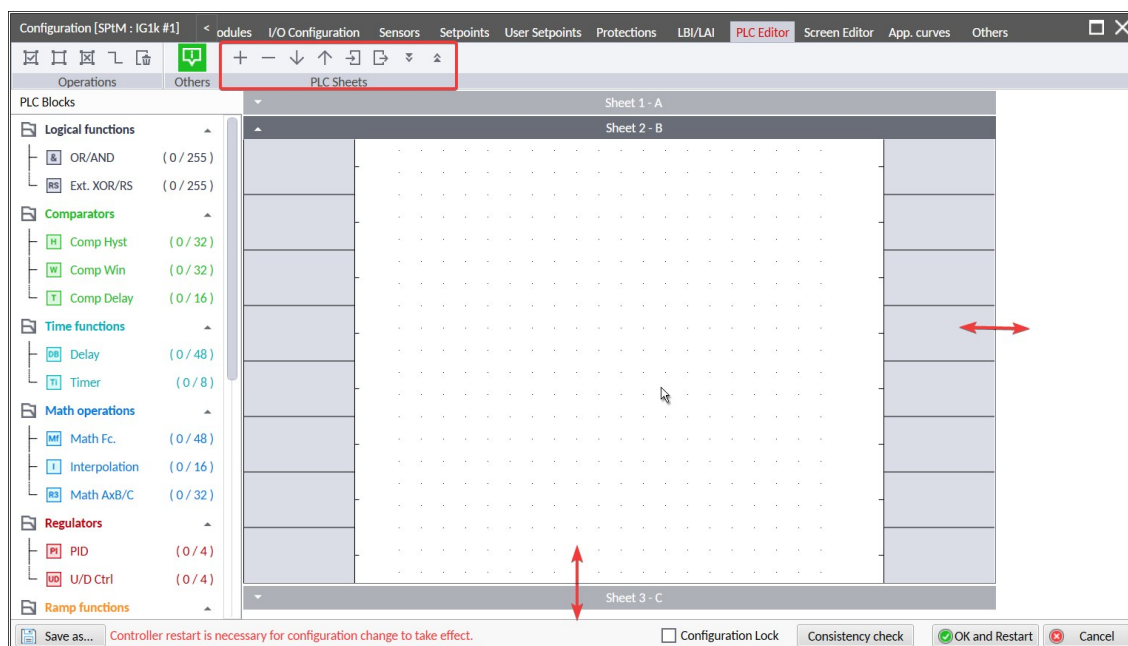


Image 5.82 Adjusting PLC sheet

back to PLC Editor

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.

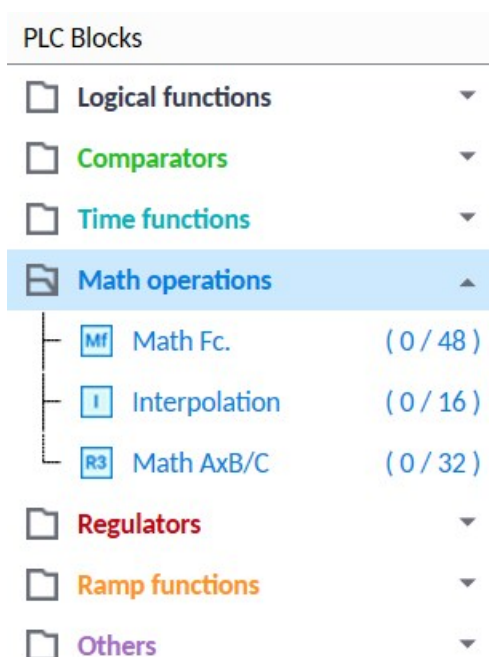


Image 5.83 Blocks selection tree

back to PLC Editor

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.

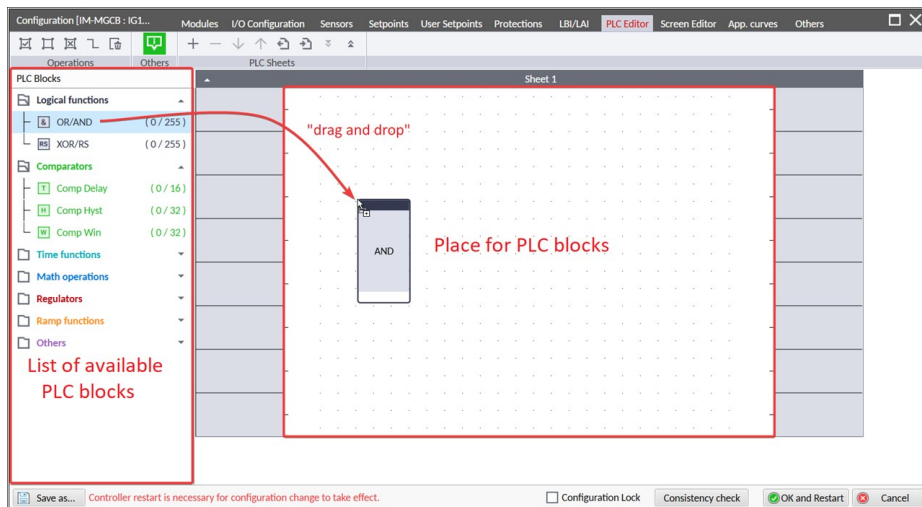
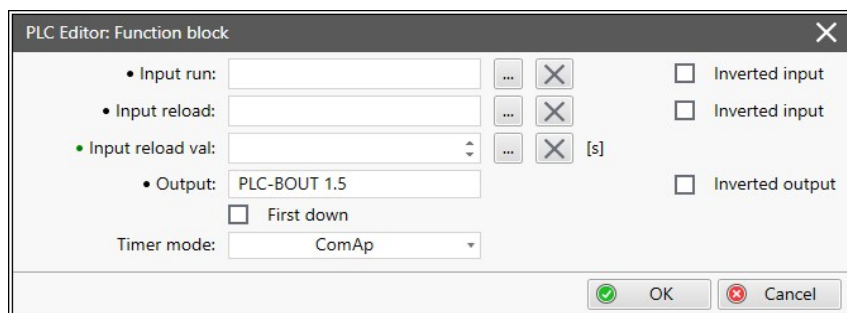
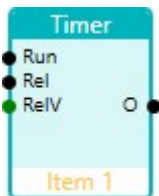


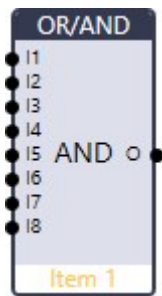
Image 5.84 Adding PLC blocks

🔍 back to PLC Editor

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 (page 665)** 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: ☐ Inverted output

Function type:

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

Define inputs and outputs

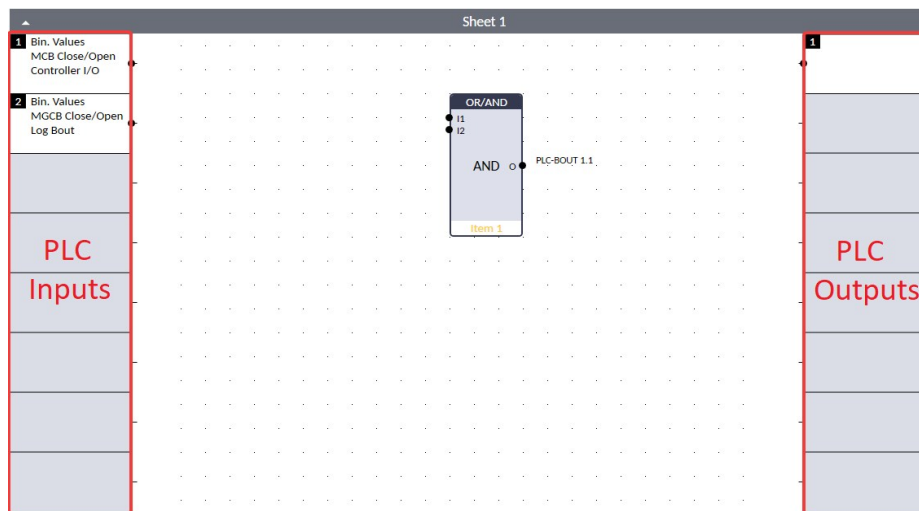


Image 5.85 PLC Inputs and Outputs

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.

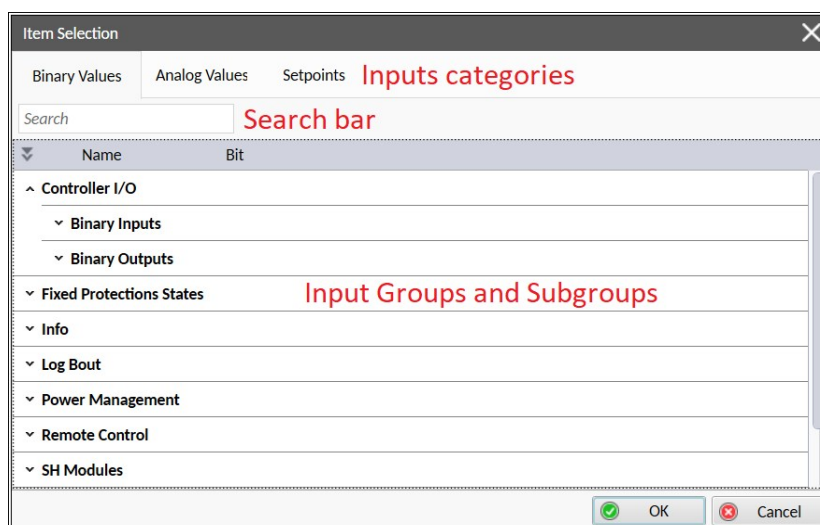


Image 5.86 PLC Inputs

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.

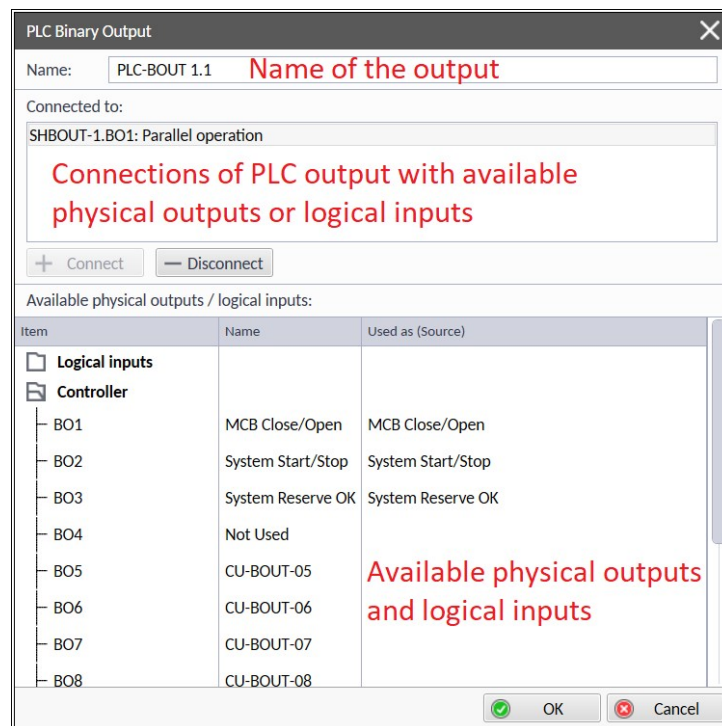


Image 5.87 PLC Outputs

back to PLC Editor

Creating wires

Wires can be created between PLC inputs and PLC block inputs, PLC block outputs nad 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.

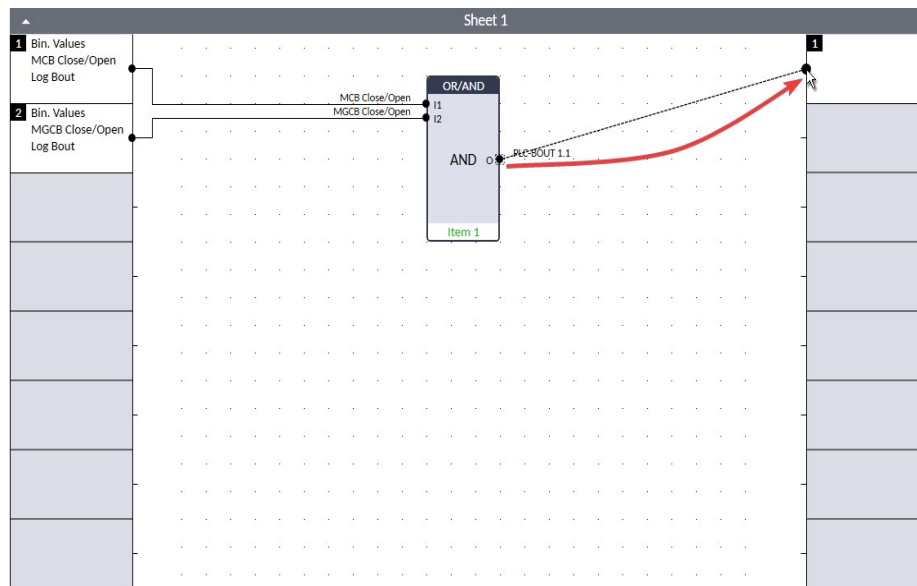


Image 5.88 Wiring PLC blocks

⬅ back to PLC Editor

⬅ back to PLC - Programmable Logic Controller

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.

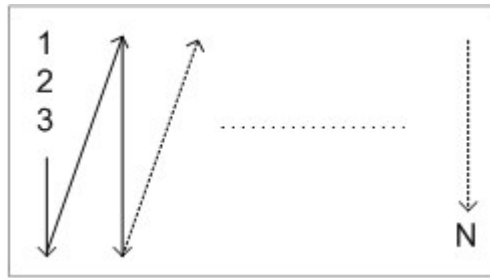
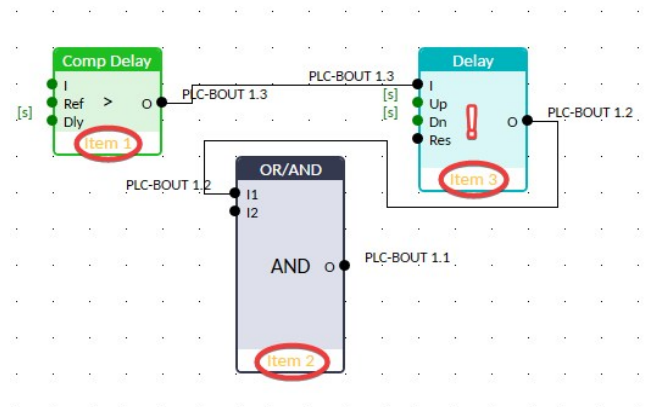
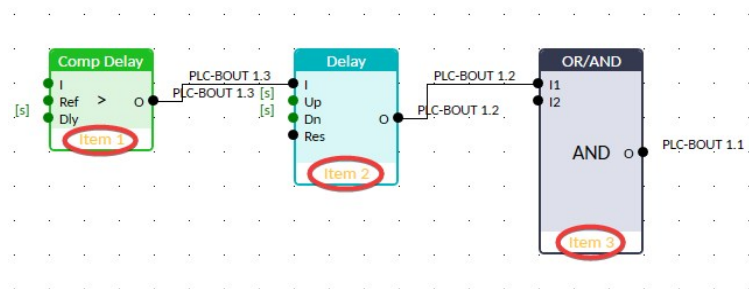


Image 5.89 PLC execution logic

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.

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.

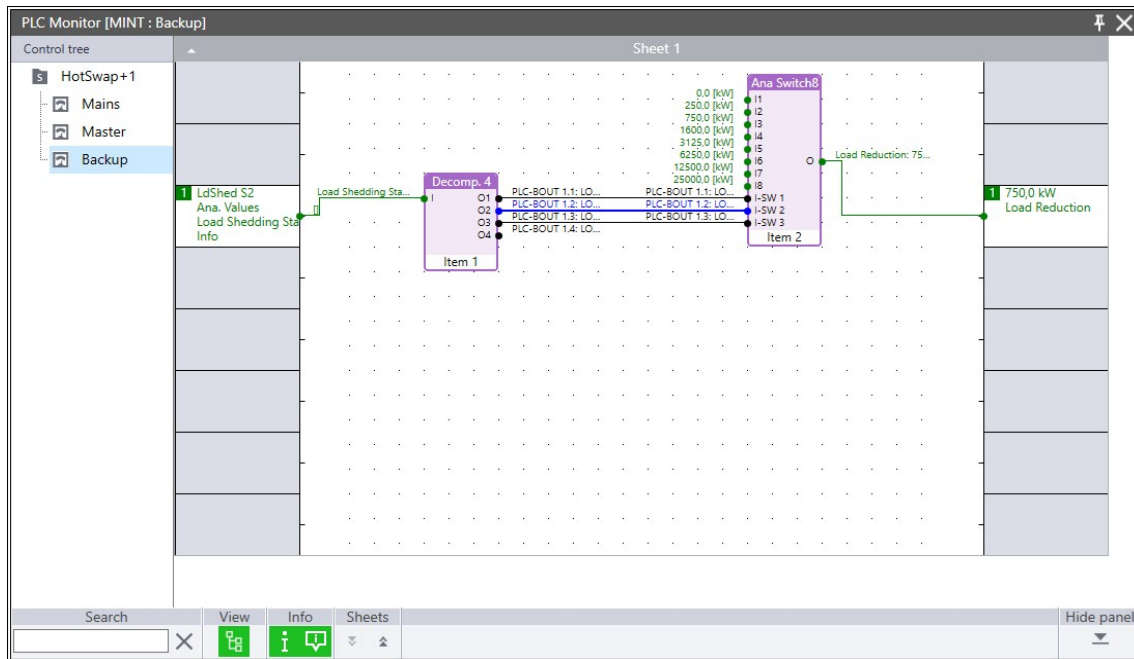


Image 5.90 PLC Monitor panel with multiple controllers

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.

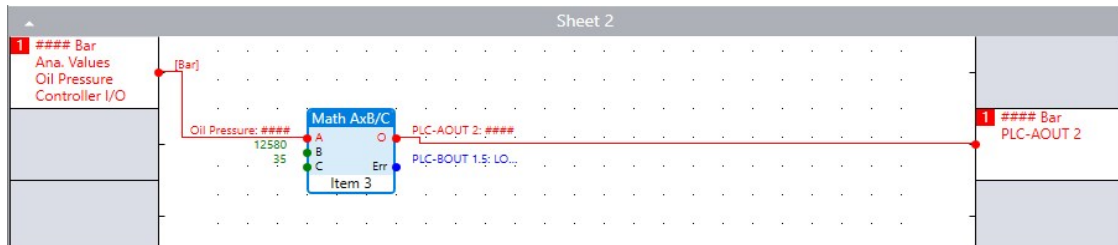


Image 5.91 PLC Monitor sheet with invalid value

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.

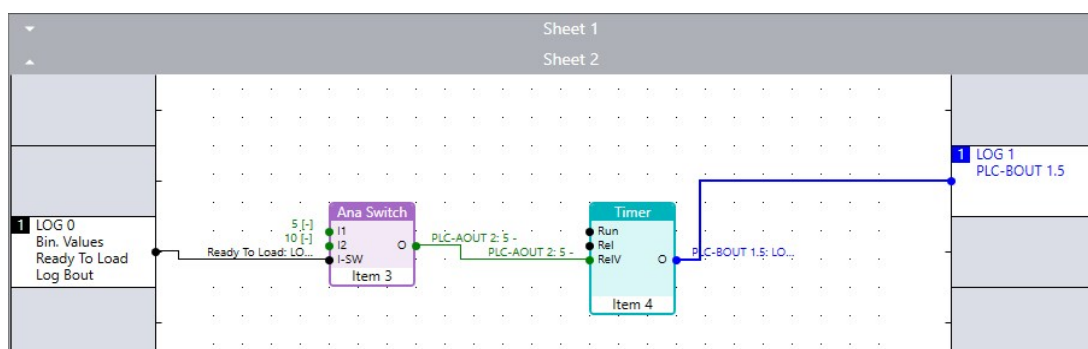


Image 5.92 PLC Monitor with multiple sheets

⬅ back to PLC - Programmable Logic Controller

Other functions

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

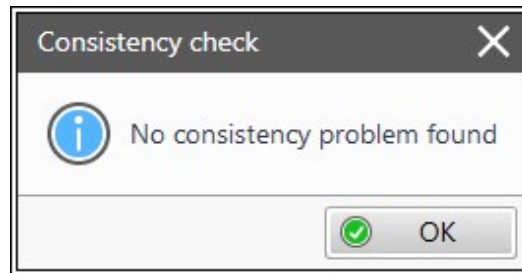


Image 5.93 Consistency Check valid output

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.

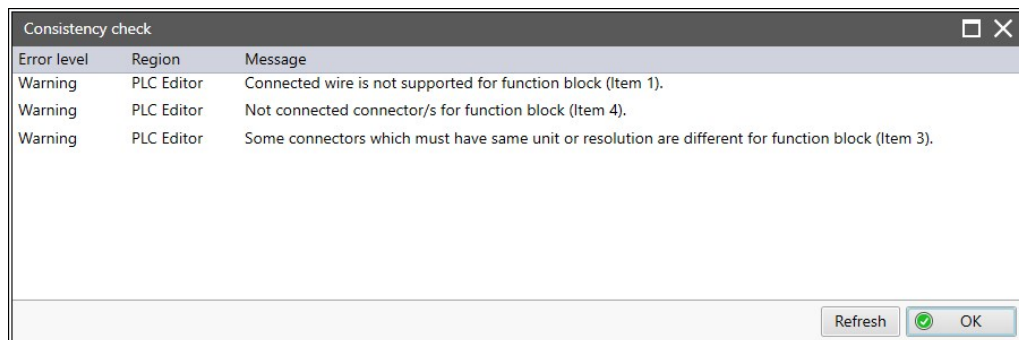


Image 5.94 Consistency Check report output

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.

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)!

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".

5.4.20 Power Formats And Units

InteliMains 1010 SC allows users to choose from several Power Formats that affect dimensions in which values and some setpoints are interpreted or adjusted. Power formats and units can be changed with InteliConfig in the following way. Control tab → Controller configuration → Others tab → Units/Power format

Power formats are available in decimal and non decimal format. Units can be changed to metric or US units.

Units

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

Power Format

Small	0.1 kW / kVA / kVA _r	1 V
Standard	1 kW / kVA / kVA _r	1 V
Large HV	0.01 MW / MVA / MVA _r	0.01 kV
Large LV	0.01 MW / MVA / MVA _r	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.

5.4.21 Pulse Counters

InteliMains 1010 SC has 4 internal counters 2 of them are physically configured to the specific binary inputs which makes them faster than another 2 "slow" pulse counters which are using LBIs. Value of the each pulse counter is increased by one step whenever the number of pulses counted reaches the value of setpoint Conversion Coefficient Pulse. The fast pulse counters are able to count reliably pulses longer than 10 ms ON / 10 ms OFF whereas the "slow" pulse counters are able to count reliably pulses longer than 200 ms ON / 200 ms OFF.

Conversion setpoint	Value	Binary Input
Conversion Coeff. Fast Pulse 1 (page 415)	Fast Pulse Counter 1 (page 492)	BI9
Conversion Coeff. Fast Pulse 2 (page 415)	Fast Pulse Counter 2 (page 492)	BI10
Conversion Coefficient Pulse 1 (page 416)	Pulse Counter 1 (page 493)	PULSE COUNTER 1 (PAGE 620)
Conversion Coefficient Pulse 2 (page 416)	Pulse Counter 2 (page 493)	PULSE COUNTER 2 (PAGE 620)

Note: Value of the internal counters remains even if the controller is unplugged from power.

Note: Counter counts leading edges.

5.4.22 SD Card Storage

IMPORTANT: Only *SanDisk Industrial XI microSD Cards* (vendor order codes *SDSDQAF3-xxxG-XI*) are currently supported.

Note: 16 GB Industrial memory card is also available in ComAp portfolio (ComAp product number OT1C16GBXQX)

The controller is equipped with a  **SD Card (page 43)** slot for a possibility of storing large amount of data.

Formatting process

IMPORTANT: It is strongly recommended to perform the formatting of SD Card in OFF mode.

Alarm **ALI SD Card Formatting/Mounting (page 746)** is displayed during the formatting process.

After changing the setpoint **SD Card File System (page 367)** to Format, the controller checks whether the inserted SD card is supported - **ALI SD Card Not Compatible (page 745)** alarm is displayed if it is not. If the formatting is not successful, the value **SD Card Status (page 497)** shows Formatting Failed, the alarm **ALI SD Card Not Compatible (page 745)** is activated, and controller will not try formatting process again **SD Card File System (page 367)** is automatically set to Mounted).

If the formatting is successful, the **SD Card File System (page 367)** is automatically changed to Mounted and the card is ready for operation.

Mounting the SD Card

For enabling the SD card functions, setpoint **SD Card File System (page 367)** has to be set to option Mount.

IMPORTANT: It is strongly recommended to perform the mounting of SD Card in OFF mode.

Alarm **ALI SD Card Formatting/Mounting (page 746)** is displayed during the mounting process.

In case that it is not possible to read or write to the SD Card, alarm **Wrn SD Card Failed (page 738)** is activated. The alarm is also activated in case the SD card is not inserted. See the value **SD Card Status (page 497)** for further information about the fail.

Alarm **ALI SD Card Full (page 746)** is displayed if value SD Card Free Space drops below 10 %.

In case that the card has a wrong file system, alarm **Wrn SD Card File System Failed (page 738)** is displayed. Therefore formatting process should be performed again.

Unmounting the SD Card

If the setpoint **SD Card File System (page 367)** is set to Unmount, the controller is able to detect the SD card, but it will not do any reading or writing of the data. The **SD Card Status (page 497)** will show Unmount, and in case the card is still in the slot, the alarm **ALI SD Card In Slot (page 746)** is issued.

Long term history

If an SD Card is successfully mounted, the controller is able to store history records onto the SD Card. This function is activated by adjusting setpoint **Long Term History (page 368)** to Enabled.

Long Term History data are stored in folder named "HISTORY_SN" when SN is serial number of respective controller that stored the data. Inside this folder there is another folder named "YYMMDDhhmmss" which is created at the moment of switching the setpoint **Long Term History (page 368)** to Enabled. Inside this folder you may find two files:

- SN_YYMMDDhhmmss.hist - which contains history records.
- SN_YYMMDDhhmmss.cfg - which contains important related data required in order to elaborate history records.

Reading the data

1. Download the history records files from your SD card into the PC.
2. Open the IntelliConfig, go to Tools and select Long Term History.
3. In the opened window choose the Input directory (destination of the SN_YYMMDDhhmmss.hist file) and Output directory.
4. Choose Delimiter parameter and press Start.
5. The file containing the readable data should be created at the Output directory when conversion is finished.

5.4.23 Sensor Curves

Default sensor curves

There are 16 default resistive curves available. The following table provides information on minimum/maximum values of respective sensors. Actual values especially of temperature curves may differ.

Curve	Min X [Ω]	Max X [Ω]	Min Y	Max Y	Units Y
General line 1	0	1	0	1	Ω
General line 2	0	1	0	1	Ω
General line 3	0	1	0	1	Ω
General line 4	0	1	0	1	Ω
General line 5	0	1	0	1	Ω
General line 6	0	1	0	1	Ω
General line 7	0	1	0	1	Ω
General line 8	0	1	0	1	Ω
General line 9	0	1	0	1	Ω
General line 10	0	1	0	1	Ω
General line 11	0	1	0	1	Ω
General line 12	0	1	0	1	Ω
General line 13	0	1	0	1	Ω
General line 14	0	1	0	1	Ω
General line 15	0	1	0	1	Ω
General line 16	0	1	0	1	Ω

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

Sensor curve HW configuration

InteliMains 1010 SC analog inputs allows you to select Input HW type. Three HW configuration options are available:

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

Setup controller analog input in this way to use other than the default HW configuration (0-15 kΩ):

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

	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.

5.4.24 SW Key Features

The controller offers premium features which are unlocked by software key.

The SW key is stored in setpoint **SW Key (page 273)** which is protected against rewriting during configuration update. Value **SW Key Feature List (page 499)** contains actual list of features which requires SW key in order to be used. When there is logical 1 respective function is unlocked and can be used without of limitation.

Note: Each SW Key is unique and valid only for specific serial number of a controller.

Using of SW Key

- Insert your SW Key into setpoint **SW Key (page 273)**
- Restart the controller
- Check value **SW Key Feature List (page 499)** whether functions were unlocked

Note: Please contact technical support in case that functions which were supposed to get unlocked after inserting the SW key did not get unlocked

List of SW Key Features

SW Key Feature	Chapter in the manual	Order Code
Modbus client	Modbus Client (Master) (page 151)	SKMODBCLI01
Hot Swap Redundancy	Hot Swap Redundancy (page 141)	SKHOTSWAP01

5.4.25 User Buttons

User Buttons can be used to assign function of user's choice to button on the **External display (page 77)** or like remote switch. There are 32 user buttons and the behavior of each of them can be adjusted by it's relative setpoint.

Each setpoint has these options:

Option	Description
COMMAND	The relative User Button is controlled by command from External display (page 77) .
MAN OFF	The relative User Button is controlled manually via the setpoint. Value of the user button is still 0.
MAN ON	The relative User Button is controlled manually via the setpoint. Value of the user button is still 1. Note: You should always switch from MAN ON to MAN OFF before switching to COMMAND, otherwise value of the User Button will be 1 until command is received.

Commands

If relative setpoint is set to COMMAND, the User Button will react to commands sent via button from **External display (page 77)**. Type of command is selected during controller configuration in Screen Editor.

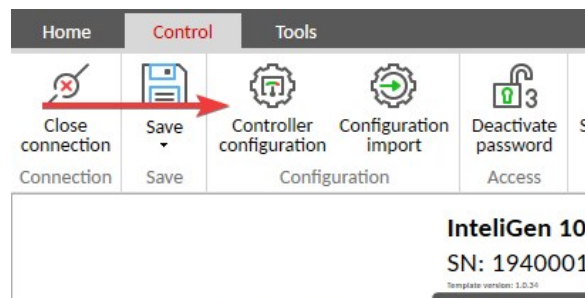
There are following commands:

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

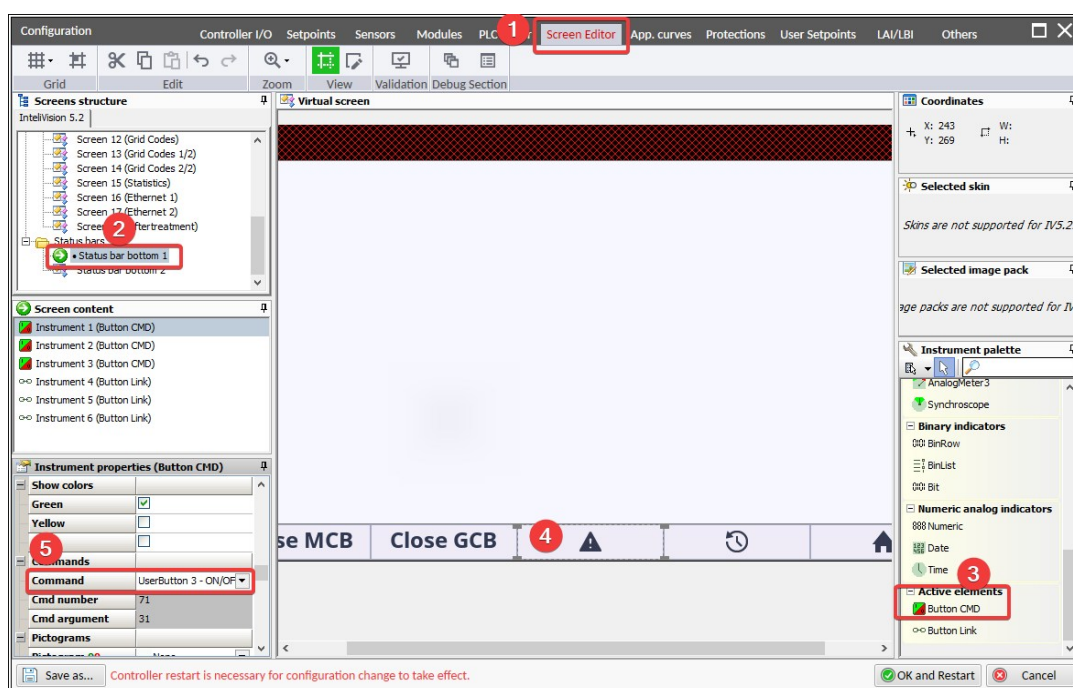
See list of MODBUS comands in chapter **List of commands and arguments (page 240)**.

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



5.4.26 User Management And Data Access Control

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- 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 access level of the user who is currently logged-in must be higher or equal to the access level required for the particular task.
- User must have user account defined by the administrator of the controller before the user can log-in into the controller and perform monitoring, control or configuration tasks.

Types of interfaces

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

Trusted

- Are **USB Type B** (page 18) and in the default configuration **Ethernet 1** (page 18) terminals.
- It is expected that these interfaces are operated locally inside a closed environment / infrastructure where additional measures against misuse or attack take place (e.g. physical access limitation).
- Due to nature of this interface less strict cyber-security rules apply at it and that is why Implicit account is introduced here to make working with the controller simpler.

Untrusted

- Is in the default configuration **Ethernet 2 (page 19)** terminal.
- This interface is a general-purpose one and it is expected that it may be exposed to public networks, such as Internet, which are not under control of the entity operating the controller.
- Thus, strict cyber-security rules apply for this type of interface.
- The correct user account with password has to be used in order to connect to the controller.
- This interface can be also used for SMTP and SNMP protocols.

Modbus

- Is in the default configuration **Ethernet 3 (page 19)** terminal.
- This interface is used for **Modbus Client (Master) (page 151)** or server.
- It is expected that this interface is operated locally inside a closed environment / infrastructure where additional measures against misuse or attack take place (e.g. physical access limitation).
- Due to nature of this interface and fact that it is not possible to use it for connection to the controller, less strict cyber-security rules apply at it.

Connections to ethernet interfaces

Either ComAp clients (InteliConfig, WebSupervisor, WinScope, InteliVision displays, etc.) or Modbus clients can connect to the controller's ethernet interfaces. Number of possible connections is listed in the table below.

Type of interface	ComAp clients	Modbus clients
Trusted	6	3
Untrusted	8	3
Modbus	0	3

Example: If **Ethernet 1 (page 18)** = Trusted, **Ethernet 2 (page 19)** = Trusted, **Ethernet 3 (page 19)** = Trusted, then it is possible to connect 6 ComAp clients and 3 Modbus clients on all three ports in sum.

Example: If **Ethernet 1 (page 18)** = Trusted, **Ethernet 2 (page 19)** = Untrusted, **Ethernet 3 (page 19)** = Modbus client, then 6 ComAp clients and 3 Modbus clients can be connected to **Ethernet 1 (page 18)**, 8 ComAp clients and 3 Modbus clients can be connected to **Ethernet 2 (page 19)** and 3 Modbus clients can be connected to **Ethernet 3 (page 19)**.

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User accounts

User account must be created in the controller by administrator before the particular user can login to the controller.

Note: User accounts must be created for each controller separately and manually. It is not possible to transfer the accounts from one controller to another.

User account has following properties:

Username	Consists of 6-15 alphanumeric characters, must contain at least 1 letter. This is the main identifier of the particular user account.
Password	Consists of 6-15 alphanumeric characters, must contain at least 1 letter and 1 digit. This is the password that is used together with user name to authenticate (log-in).
User identifier (UID)	Optional 4-digit identification string which can be used for simplified login at trusted interfaces (e.g. from IntelliVision display when connected via Ethernet 1 (page 18)).
PIN	4-digit “password” to be used together with UID.
Access level	Determines Access to controller data (page 181)

User login

To login to the controller the **username and password must be provided into the login form** of the application (**InteliConfig** (page 21), **WebSupervisor** (page 21), **External display** (page 77) 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** (page 180)

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

The controller has an implicit account with **access level 0**. This account is **automatically logged at a trusted interface** when a connection is established and there is not any other user logged. In practice it means e.g. that IntelliVision can **display measured values and allow changing selected setpoints without an operator needs explicitly to login**.

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>

When the controller is being configured for operation the desired user accounts including the administrator account should be created and then the factory default account must be deleted.

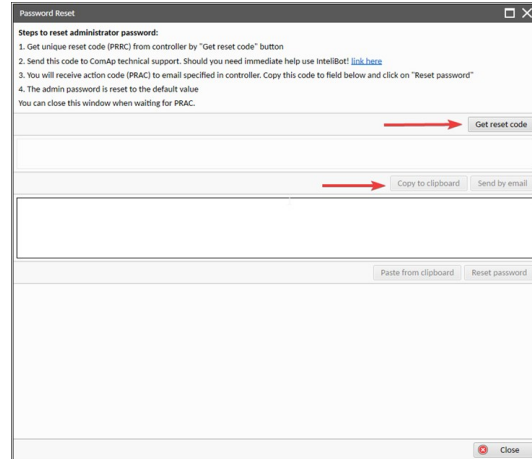
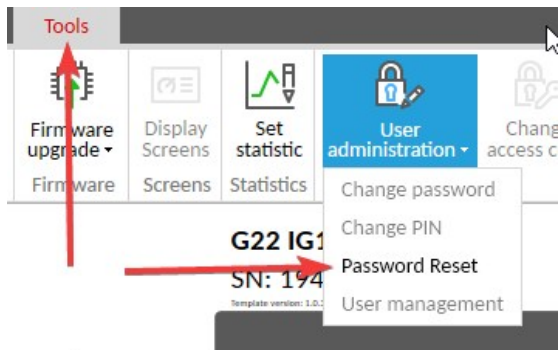
IMPORTANT: Adjust the backup e-mail address before you delete the default administrator account. This address is used **as second authentication factor** in password reset request and the password reset action code will be sent to this and only this e-mail address.

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

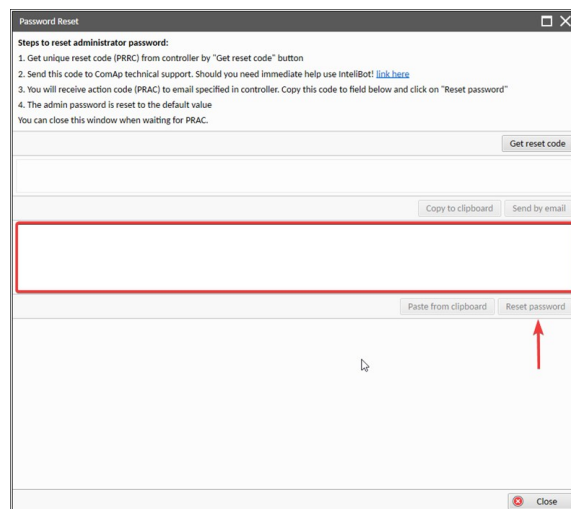
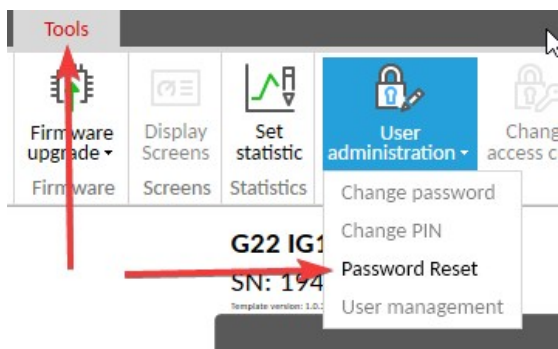
Reset accounts to factory default

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 IntelliConfig to the controller
2. Read the Password Reset Request Code (PRRC)



3. You may disconnect from the IntelliConfig now
4. Put the PRRC code into the “IntelliBot” application at <https://www.comap-control.com/support> or e-mail the code to support@comap-control.com.
5. A unique, one-time Password Reset Action Code (PRAC) will be sent to the backup e-mail address adjusted in the controller.
6. Connect via IntelliConfig to the controller again
7. Enter the Password Reset Action Code into the appropriate form



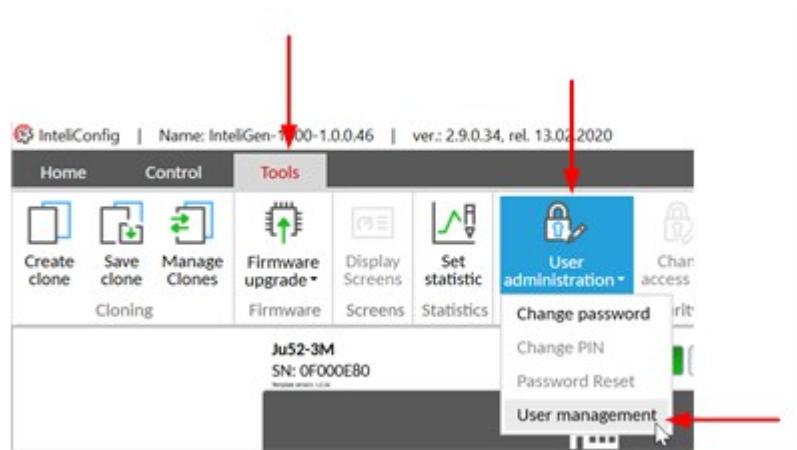
8. Now the user accounts are in factory default state

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Managing accounts

User accounts can be managed from IntelliConfig while an online connection to the controller is established. An user with administrator level must be logged with username/password and is prompted to re-enter accounts password before the user management dialog is opened.

IMPORTANT: The total available number of accounts in the controller is 30.



Adding account

Click on “+” button in the lower left corner of the user management window, then provide the account properties as described in **User accounts (page 176)**.

Note: Rules for the User accounts (page 176) credentials apply and some items are optional



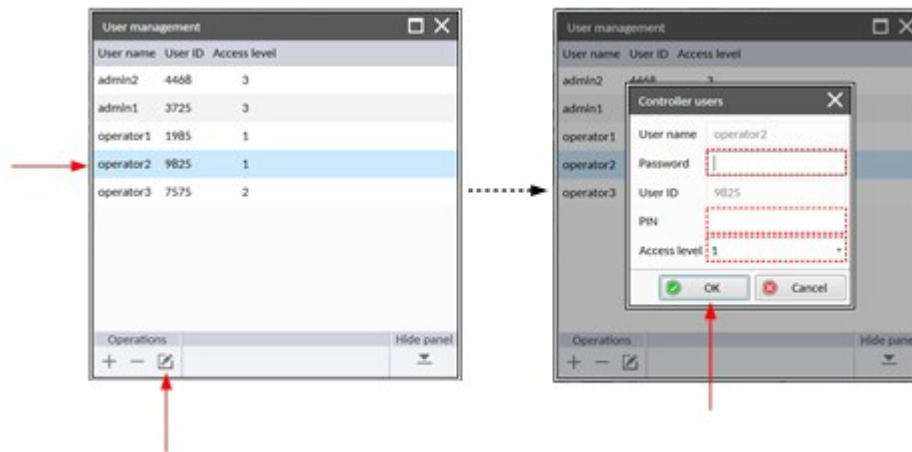
Deleting account

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.

Deleting account properties

Select the account that has to be deleted and click on “-” 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.

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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 (page 710)** 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. **Ethernet 1 (page 18)**) 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.

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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 level higher or equal to the access level defined for the particular object and operation.**

There are 4 access levels available (level 0 to level 3). **The level 3 is administrator level** and users who have this level have full control over the controller.

Reading data

The access level required for reading data from controller is fixedly adjusted to 0. That means **reading of data** (except some system objects) **is available for any user.**

Writing data

The access level required to **write** (modify) **application setpoints or invoke application commands is configurable** via IntelliConfig.

Special situations

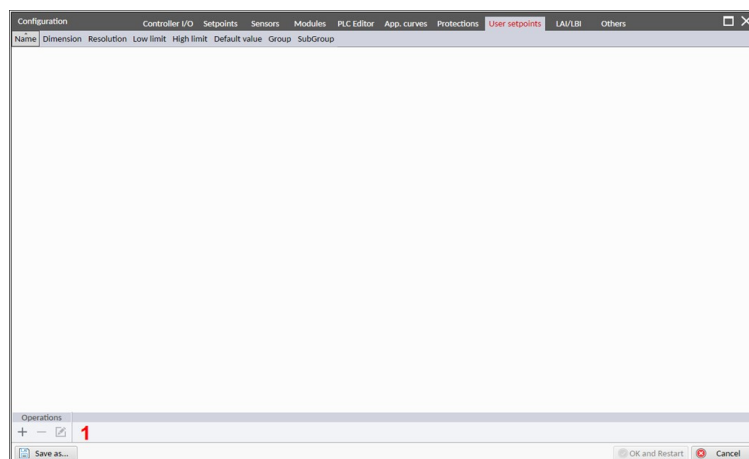
There are several operations that require administrator level:

- Programming firmware
- Programming configuration
- Managing user accounts

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5.4.27 User Setpoints

Controller allows user to create their own setpoints, edit and delete the created setpoints and choose a group in which the setpoint will be located. Number of setpoints created by user is limited to 2047. All setpoints created by user are located in setpoint group "User setpoints". 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 User setpoint



1

Delete selected User setpoint



Edit selected User setpoint



Image 5.95 User setpoints tab in IntelliConfig

Image 5.96 Setting parameters of an user setpoint

Contents of the user setpoint

Name	<p>Max. 32 characters</p> <p>Note: Does not consider duplicities (It is possible to have setpoints with the same name, but it is not recommended.)</p>
Dimension	<p>Can be chosen from a list or</p> <p>User can create their own with a limit of 32 characters.</p>
Resolution	Max. 4 decimal place
Low Limit	Range of the data type INT32 (restricted by resolution).

	Value is set as a constant (can not be set as setpoint). Max. value cannot exceed High Limit.
High Limit	Range of the data type INT32 (restricted by resolution). Value is set as a constant (can not be set as setpoint). Min. value cannot be lower than Low Limit.
Default value	Must be in range between Low and High Limit (restricted by resolution).
Group	Group in which setpoint will be shown.
Subgroup	SubGroup in which setpoint will be shown.

Available groups and subgroups

The user setpoint can be put into some selected groups and subgroups.

Note: Setpoint is always added as last in selected subgroup.

List of available groups and it's subgroups:

Group	Subgroup
Process control	User setpoints
Basic Settings	User setpoints
Mains Settings	User setpoints
Protections	User setpoints
Bus Settings	User setpoints
Grid Codes	User setpoints
Power Management	User setpoints
User setpoints	User setpoints

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5.5 Application related functions

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

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5.5.1 System Operation Area

It is possible to adjust the System operation area in more details, using application curves. The curves represent inductive and capacitive halves of the PQ diagram.

- Inductive operation area is adjusted by **CAPABILITY L (PAGE 596)** and if the required **Total Running Power Factor (page 483)** with **Total Running Load Character (page 484) = L** are behind the limit, **LBO GENERATOR CAPABILITY L LIMIT (PAGE 637)** is closed and actual power factor stays on the edge of the curve.
- Inductive operation area is adjusted by **CAPABILITY C (PAGE 597)** and if the required **Total Running Power Factor (page 483)** with **Total Running Load Character (page 484) = C** are behind the limit, **LBO GENERATOR CAPABILITY C LIMIT (PAGE 637)** is closed and actual power factor stays on the edge of the curve.

IMPORTANT: The both Capability C and L curves have to be setup according to the Capability curves of the worst (weakest) System in order to ensure right functionality of the whole system.

5.5.2 AMF Function

The "AMF function" represents the automatic mains failure detection and breaker open.

Mains failure detection

The mains is considered as faulty when one or more of the following conditions are valid:

- The mains voltage is out of the limits given by the setpoints **Mains <V (page 317)** (**Mains <<V (page 319)**) and **Mains >V (page 313)** (**Mains >>V (page 315)**) for a time period longer than **Mains <V Delay (page 318)** respectively **Mains >V Delay (page 314)** (**Mains <<V Delay (page 319)**, **Mains >>V Delay (page 315)**).
- The mains voltage unbalance is out of limit given by setpoint **Mains V Unbalance (page 320)** for a time period longer than **Mains V Unbalance Delay (page 321)**.
- The mains frequency is out of the limits given by the setpoints **Mains <f (page 323)** (**Mains <<f (page 324)**) and **Mains >f (page 321)** (**Mains >>f (page 322)**) for a time period longer than **Mains <f Delay (page 323)** respectively **Mains >f Delay (page 321)** (**Mains <<f Delay (page 324)**, **Mains >>f Delay (page 322)**).
- The MCB close command was not successful and the alarm **Hst MCB Fail (page 753)** is present in the alarmlist.
- Alarm **ALI Mains Ph Rotation Opposite (page 744)** is active.

Healthy mains detection

The mains is considered to be healthy when all of following conditions are valid:

- The mains voltage is within the limits given by the setpoints **Mains <V (page 317)** (**Mains <<V (page 319)**) and **Mains >V (page 313)**(**Mains >>V (page 315)**).
- The mains voltage unbalance is within the limits given by the setpoint **Mains V Unbalance (page 320)**.
- The mains frequency is within the limits given by the setpoints **Mains <f (page 323)** (**Mains <<f (page 324)**) and **Mains >f (page 321)** (**Mains >>f (page 322)**).
- The alarm **Hst MCB Fail (page 753)** is not present in the alarmlist.
- Alarm **ALI Mains Ph Rotation Opposite (page 744)** is not active.

5.5.3 Breaker Control

The following power switches are controlled by the controller:

- The Mains Circuit Breaker or contactor – MCB (see the chapter **MCB special requirements (page 188)**)

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 time defined by setpoint **Waiting For Breaker Feedback (page 289)** to a close and open command. Special attention should be paid to opening of motorized circuit breakers, as it could take more than 2 seconds on some types. In such cases it is necessary to use an undervoltage coil for fast opening.
- After opening the breaker, there is internal delay for another closing of breaker. Delay is 6 seconds - 5 seconds for OFF coil and 1 second for UV coil. After these 6 seconds, breaker can be closed again. For opening of breaker there is no delay.

Breaker control outputs

Close/Open	An output for control of a contactor. Its state represents the breaker position requested by the controller. The breaker must react within time defined by setpoint Waiting For Breaker Feedback (page 289) to a close or open command, otherwise an alarm is issued.
ON coil	An output giving a pulse (given by setpoint Waiting For Breaker Feedback (page 289)) in the moment the breaker has to be closed. The output is intended for control of close coils of circuit breakers.
OFF coil	An output giving a pulse in the moment the breaker has to be opened. The pulse lasts until the feedback deactivates, but at least for time given by setpoint Waiting For Breaker Feedback (page 289) . The output is intended for control of open coils of circuit breakers.
UV coil	The MCB UV coil output is active when the controller is switched on. The output is deactivated for at least 2 seconds in the moment the breaker has to be switched off. The output is intended for control of undervoltage coils of circuit breakers.

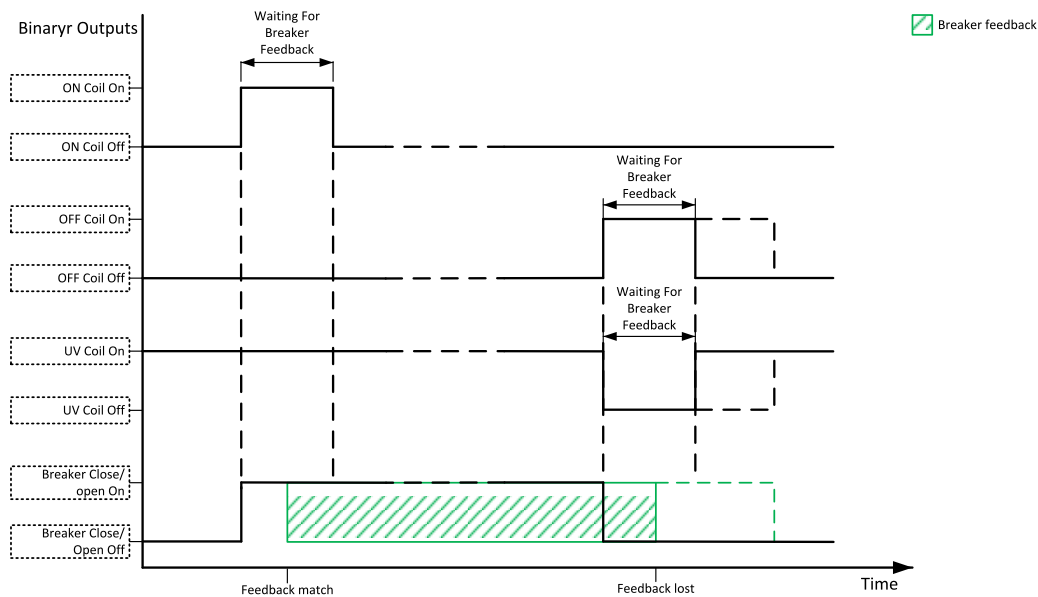


Image 5.97 Breaker control outputs

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 when 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 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. Except opening of MCB.

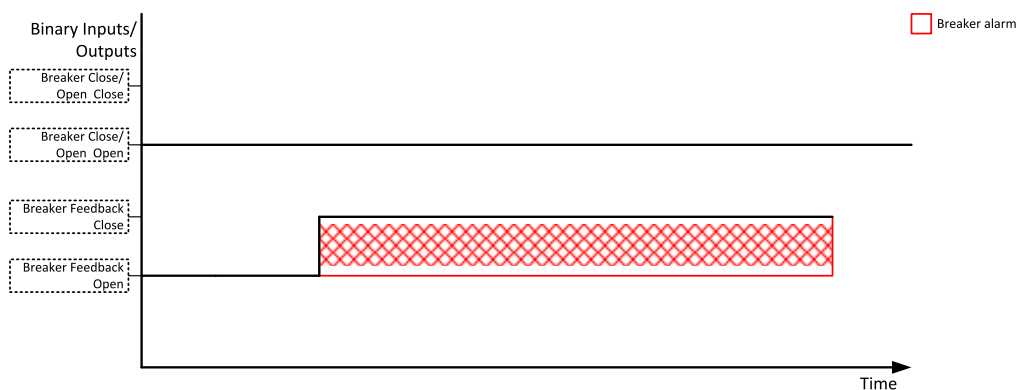


Image 5.98 Breaker fail - breaker close/open in steady position - open

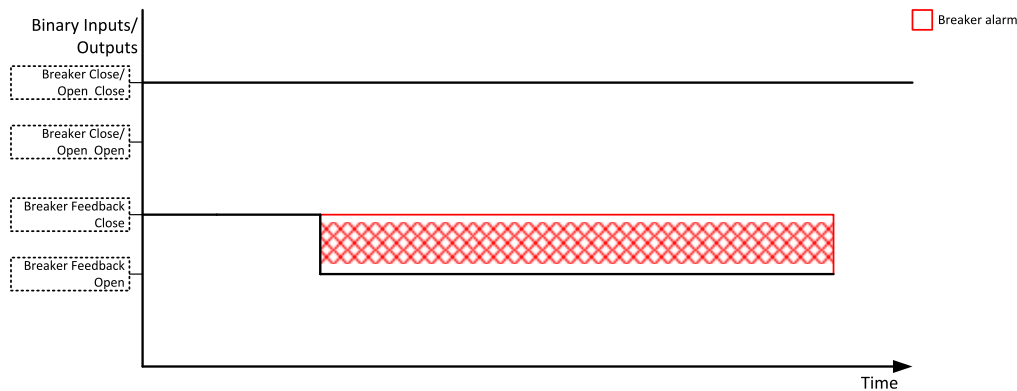


Image 5.99 Breaker fail - breaker close/open in steady position - close

- When binary output breaker close/open is opened, there is waiting time for feedback defined by setpoint **Waiting For Breaker Feedback (page 289)**. If feedback doesn't match, the alarm **Hst MCB Fail To Open (page 755)** is issued.

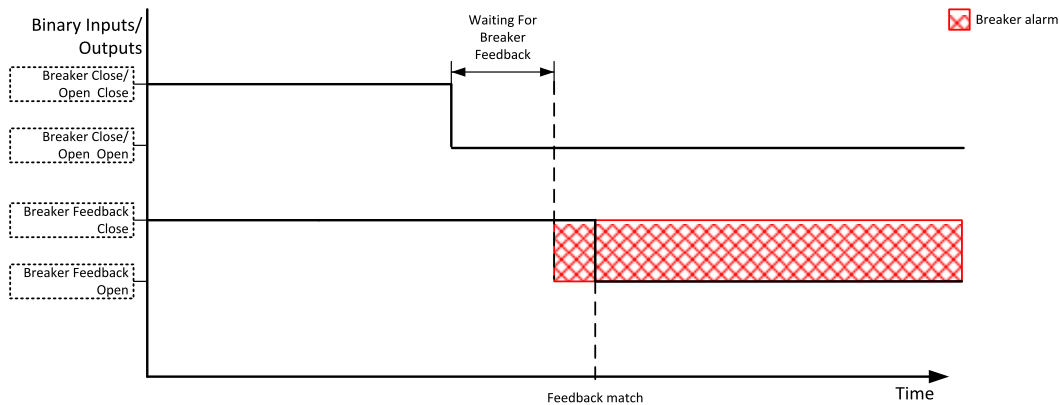


Image 5.100 Breaker fail - breaker close/open opens

- When binary output breaker close/open is closed there is waiting time for feedback defined by setpoint **Waiting For Breaker Feedback (page 289)**. If the feedback doesn't match the output, close/open is opened and closed again after delay defined by setpoint **Delay Between Closing Attempts (page 288)**. If feedback doesn't match after number of tries defined by setpoint **Attempts To Close Breaker (page 288)** and **Waiting For Breaker Feedback (page 289)** delay elapsed, the alarm **Hst MCB Fail To Close (page 754)** is issued.

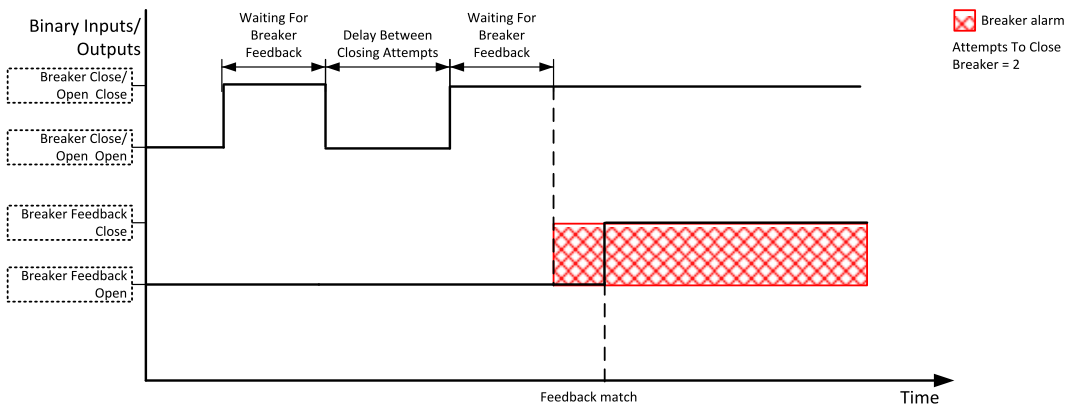


Image 5.101 Breaker fail - breaker close/open closes

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.

MCB special requirements

- If a contactor is used on the MCB position, it is recommended that the wiring be provided in such a way that the contactor will be normally closed and will open if the logical binary output **MCB CLOSE/OPEN (PAGE 641)** closes. This behavior is called "negative logic" and can be adjusted by the setpoint **MCB Contactor Logic (page 286)**. The negative logic will prevent accidental opening of the MCB when the controller is switched off.
- If a contactor is used on the MCB position, it will open itself immediately after the mains have failed, because it will lose power for the coil. That is why the following adjustment is necessary to prevent triggering the **Hst MCB Fail (page 753)** alarm: **MCB Opens On (page 287) = Mains Fail**.
- If a 230 V motor driven circuit breaker is used on the MCB position and an undervoltage coil is not fitted, it is not possible to open the breaker after the mains have failed, because there is no power for the motor drive until the System is started and providing voltage. Adjusting the setpoint **MCB Opens On (page 287) = Gen Run** will prevent triggering the **Hst MCB Fail (page 753)** alarm.

5.5.4 Connecting To Load

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Connecting to load depends on the state of **MCB FEEDBACK (PAGE 616)** 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 (page 188)** is applied, in other case the **Synchronization (page 188)** process is needed.

Connecting Mains to Load

Connecting To Dead Bus

MCB

- There is no circuit breaker between the Bus (Gen-sets) and the Load. The Load is powered immediately from the Bus once Gen-sets are started (their GCB are closed) or Bus is powered by another way.
- Mains is connected to the Load by closing MCB if Mains voltage and frequency are within limits.

Synchronization

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Synchronization Commands

There are 3 synchronization commands called Run, Permissive, and Check, each one has its own LBI for the activation. If more than 1 command is activated while breaker is opened, the synchronization will be blocked and alarm appear in the alarm list. Synchronization is also blocked if any synchronization command is activated together with the LBI **UTILITY UNLOAD (PAGE 622)**.

Check and Run commands are influenced by the setpoint **Voltage Matching (page 282)**. The voltage matching can be used to block voltage regulation loop during synchronization so only frequency is regulated to match the window.

Permissive and Run commands are influenced by the setpoint **Auto Re-synchronize (page 282)** which can be used to enable automatic synchronization activation (breaker closure) after breaker is externally opened while synchronization command is still active. If this option is disabled the synchronization command must be deactivated and activated again.

Synchronization commands are used only for breaker closing, if the command is deactivated after breaker closure the breaker will remain closed. To open a breaker you must activate **LBI UTILITY UNLOAD (PAGE 622)**. If **UTILITY UNLOAD (PAGE 622)** was not activated yet (Gen-set i running in Minimal Power), the **UTILITY UNLOAD (PAGE 622)** must be cycled (activated and deactivated) to open breaker.

Synchronization Check

Check synchronization is activated via LBI **SYNCHRONIZATION CHECK (PAGE 621)**. This synchronization will only regulate frequency and voltage to match the window but it will not send command to close the breaker. This synchronization can be used for test purposes.

Synchronization Permissive

Permissive synchronization is activated via LBI **SYNCHRONIZATION PERMISSIVE (PAGE 621)**. This is a passive synchronization so regulation loops are not used to get frequency and voltage to match the window. The **Rated Change** can be used to manually regulate voltage and frequency to match the synchronization window. When the synchronization window is matched the breaker is automatically closed.

Synchronization Run

Run synchronization is activated via LBI **SYNCHRONIZATION RUN (PAGE 621)**. This is a standard synchronization which will regulate frequency and voltage to match the window and close the breaker. Synchronization process is described in the following chapter.

Synchronization Process

It is possible to influence the behavior of the controller and limit the process of synchronization. Following setpoints have influence to synchronization process:

- > **Voltage Matching (page 282)**
- > **Auto Re-synchronize (page 282)**
- > **Mains Coupling (page 289)**

Voltage match 321

This value consists of 3 bits which are filled separately with logical 0 or logical 1 based on Mains Voltage and Bus Voltage of respective phases during synchronization.

Note: Based on **Connection type (page 265)** this value may either relates to Ph-N or to Ph-Ph values.

Connection type (page 265)	Relates to
3Ph4Wire	Ph-Ph
High Leg D	
3Ph3Wire	
SplitPhase	Ph-N
MonoPhase	

➤ 1st Bit, logical 1 when:

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

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

➤ 2nd Bit, logical 1 when:

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

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

➤ 3rd Bit, logical 1 when:

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

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

IMPORTANT: Bits are counted from right to left!

Synchronization via MCB

Bus synchronization to the Mains via Mains Circuit Breaker.

- If there is Bus voltage present from another Mains, the MCB will be closed in case the setpoint **Mains Coupling (page 289)** is switched to ENABLE.
- If there is Bus voltage present from Gen-sets, the MCB will try to synchronize Gen-sets to Mains.
- If the Mains voltage or frequency gets out of the limits during synchronization, then the synchronization process is interrupted and can continue again when Mains parameters gets restored.
- If the Bus (Gen-sets) voltage or frequency gets out of the limits during the synchronization, the synchronization process continues until the Bus (Gen-sets) parameters fail is confirmed.
- If the MCB synchronization timeout gets elapsed the **Hst Synchronization Fail (page 755)** protection gets active, Gen-sets MGCb stays closed and synchronization is stopped.

🔍 back to Synchronization

Synchronization Types

There are two types of synchronization. Type of synchronization is adjusted via setpoint **Synchronization Type (page 281)**.

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 (page 283)**. If the synchronization is not successful within this period of time, the **Hst Synchronization Fail (page 755)** alarm will be issued.

Voltage matching

The Bus voltage is regulated to match the Mains voltage with tolerance given by the setpoint **Voltage Window (page 283)**. The regulation is adjusted by the setpoints **Voltage Gain (page 307)** and **Voltage Int (page 307)**.

Frequency/angle matching

The Bus frequency is regulated to match the Mains frequency first. The frequency regulation loop is active (setpoints **Frequency Gain (page 294)** and **Frequency Int (page 294)**). Once the frequency is matched, the regulation loop is switched to match the angle (setpoint **Angle Gain (page 295)**). When the angle is matched with tolerance \pm **Phase Window (page 284)** for a time given by the setpoint **Dwell Time (page 284)** and the voltage is matched too, then the MCB is closed.

Note: The matching loop will continue to run even if the MCB close command has been already issued until the controller receives **MCB FEEDBACK (PAGE 616)** or **Hst MCB Fail To Close (page 754)** 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 (page 283)**. If the synchronizing is not successful within this period of time, the **Hst Synchronization Fail (page 755)** alarm will be issued.

The Bus frequency is regulated to match the Mains frequency + **Slip Frequency (page 285)** value and the window is set by setpoint **Slip Frequency Window (page 285)**. When the Busfrequency reaches (Mains Frequency + Slip frequency) value regulation loop is stopped (output is frozen at the actual value). If the Bus frequency remains inside the window for the time longer than setpoint **Dwell Time (page 284)** the controller will allow MCB closing. The controller calculates periodically so called preclosing angle (based on the actual value **Slip Frequency (page 457)** and CB closing delay given by the setpoint **MCB Latency (page 286)**). 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).

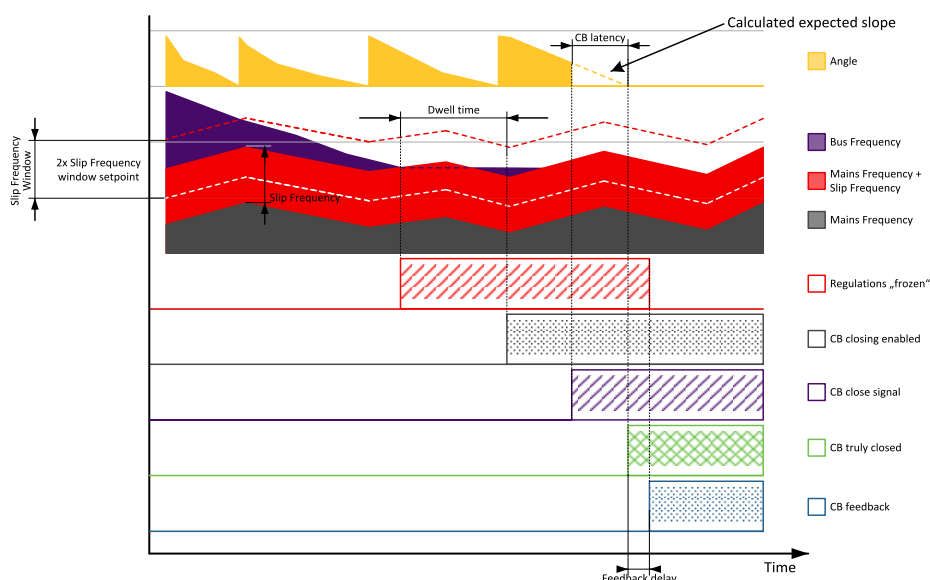


Image 5.102 Slip synchronization

Whenever the **Bus Frequency (page 466)** leaves off the **Slip Frequency Window (page 285)** (either because of **Bus Frequency (page 466)**, **Mains Frequency (page 453)** or setpoint **Slip Frequency Window (page 285)** changes) the controller will reactivate frequency regulation loop and try to reach the target value again. The **Synchronization Timeout (page 283)** timer runs regardless of this while whole slip synchronization process is repeated. If the **Bus Frequency (page 466)** reaches the target frequency again the regulations are frozen and if

the **Bus Frequency (page 466)** remains in the window for the time longer than setpoint **Dwell Time (page 284)** the controller will continue in the standard sequence as seen in the previous case. *If the **Synchronization Timeout (page 283)** elapses the controller will immediately stop synchronization and issue alarm **Hst Synchronization Fail (page 755)**.

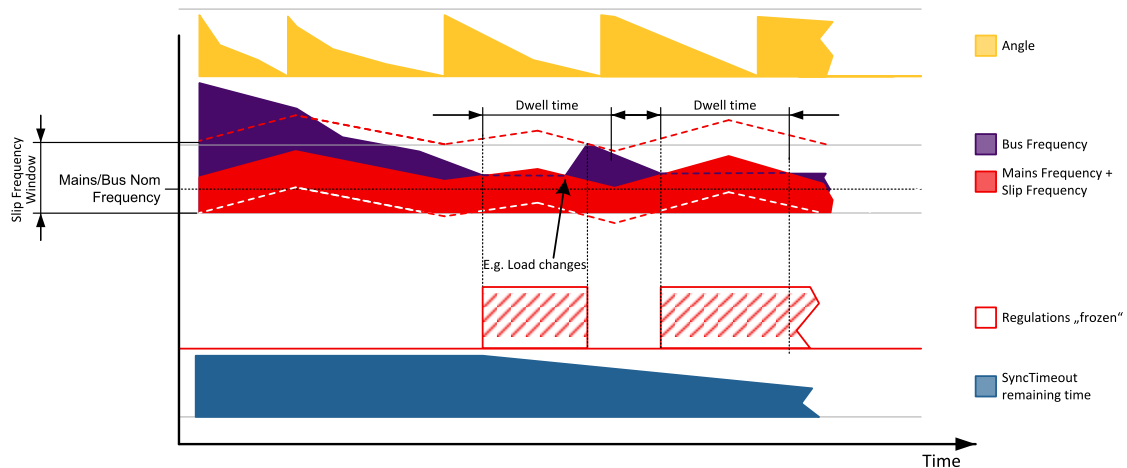


Image 5.103 Slip synchronization

The window is limited by the actual measured **Mains Frequency (page 453)** if one of the window limits is below this value (e.g. for setting where setpoint **Slip Frequency (page 457)** is set to 0.1Hz and setpoint **Slip Frequency Window (page 285)** is set to 0.5Hz).

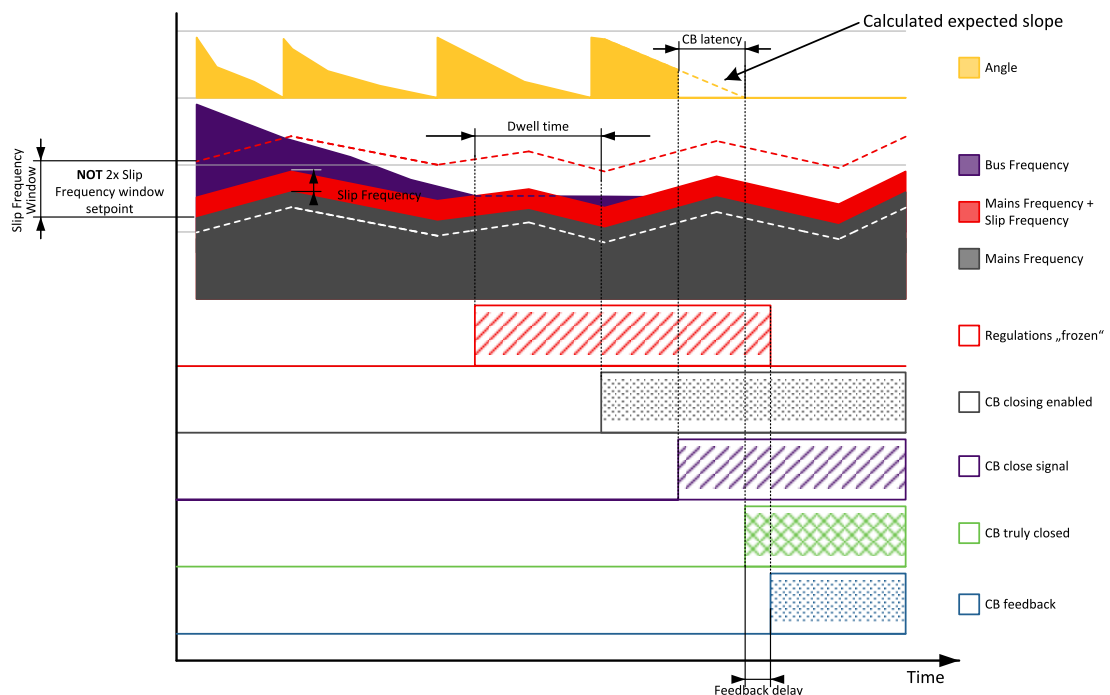


Image 5.104 Slip synchronization

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.

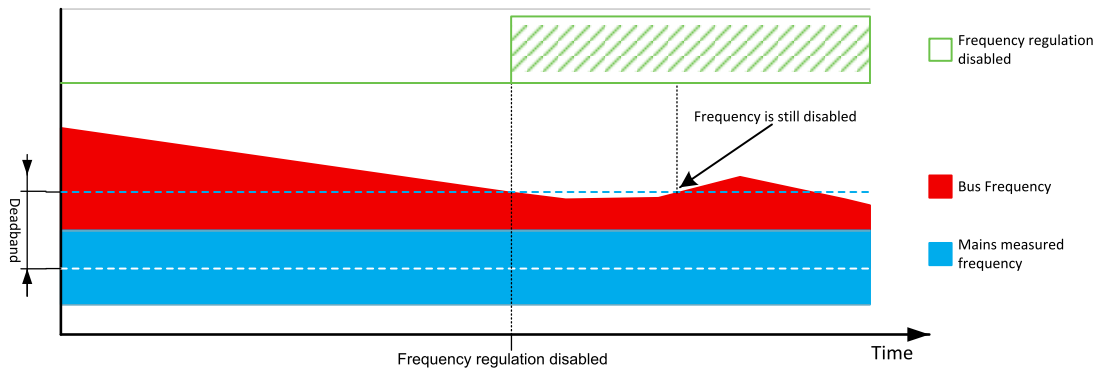
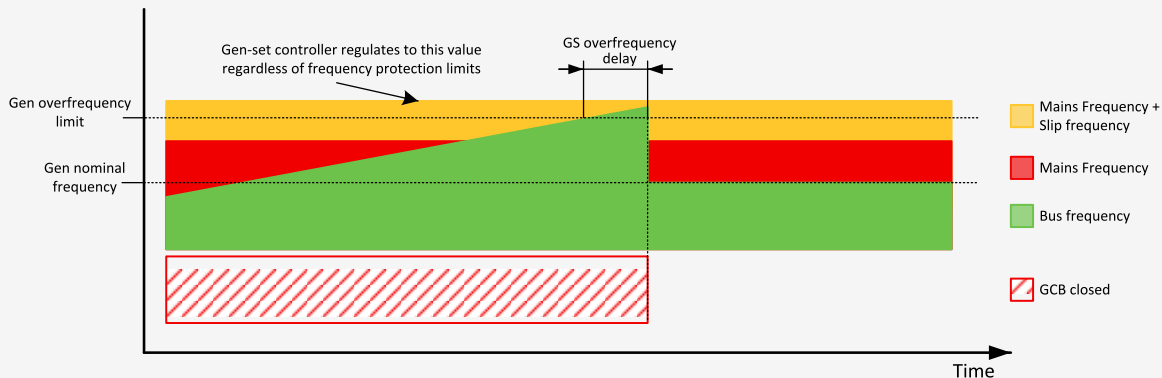


Image 5.105 Slip synchronization - deadband

Note: Due to the nature of this function it is possible that in limit cases the controller will regulate the Bus frequency outside of protection limits. Example: Mains frequency is high but within its protection limits (e.g. 50.9 Hz, limit is 51 Hz). **Slip Frequency (page 285)** is set to 0.5Hz. This will cause regulation loop of the controller can push the Bus frequency to 51.4 Hz and eventually the controller will issue overfrequency alarm. It is recommended to set the setpoint **Slip Frequency (page 285)** as low as possible that still enables successful synchronization. This minimizes the risk of this problem happening. Furthermore when slip synchronization is used it is recommended to set Mains Frequency protection limits to more rigid values than the Bus frequency protection limits. In this case the setpoint **Slip Frequency (page 285)** can be set to 0.1Hz and the Mains 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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5.5.5 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 (page 276)** Control Group in related non BTB controllers. 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** (page 276) and **Group Link R** (page 277).
- Controller sends via **CAN2A** (page 18) (**CAN2B** (page 18)) 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** (PAGE 612) is activated the controller will send information to all controllers on CAN that the groups defined by setpoints **Group Link L** (page 276) and **Group Link R** (page 277) 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 one of the groups.

- All controllers in linked groups cooperate with each other and perform 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.

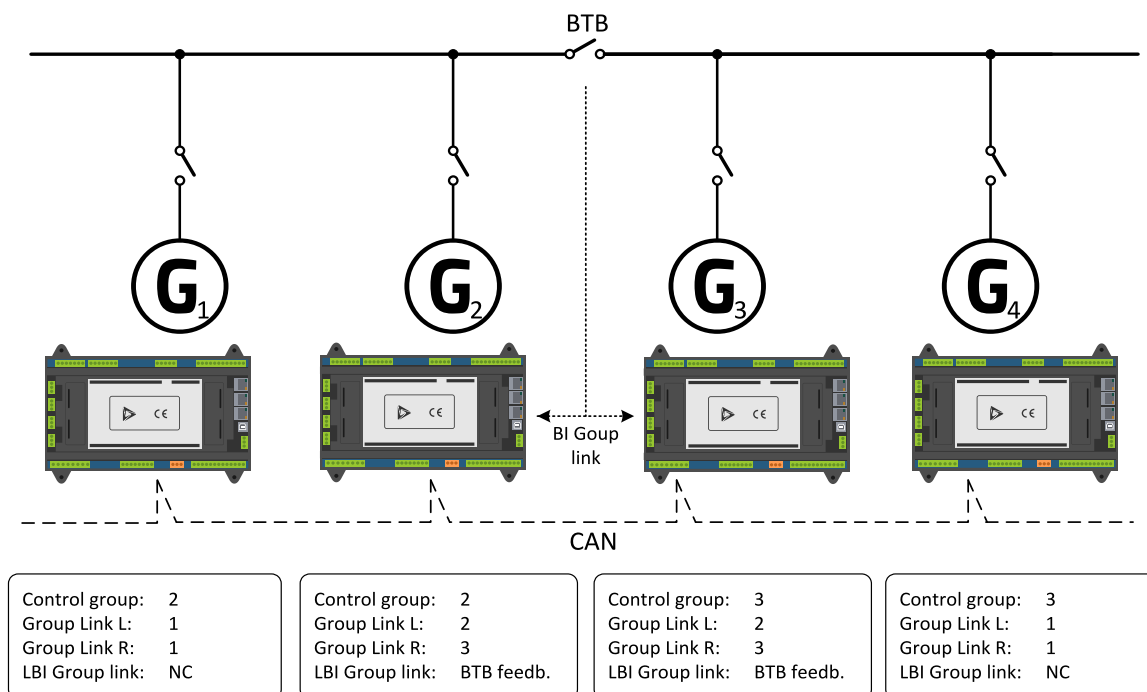


Image 5.106 Example of control groups

Once the BTB breaker is closed, the control groups 2 and 3 become new group 2+3. Load sharing and VAR sharing are performed within newly established group 2+3.

5.5.6 Electric state machine

State	Description
Init	Initialization of the controller. The application is not active yet.
BrksOff	MCB is opened (LBO MCB Close/Open is not active and LBI MCB Feedback is not active either).
IslOper	LBO Mains Healthy is not active, MCB is opened (LBO MCB Close/Open) is not active and LBI MCB Feedback is not active either) and LBO Any GCB Closed is active.
MainsOper	LBO Mains Healthy is active, MCB is closed (LBO MCB Close/Open is active and LBI MCB Feedback is active as well) and LBO Any GCB Closed is not active.
ParalOper	LBO Mains Healthy is active, MCB is closed (LBO MCB Close/Open is active and LBI MCB Feedback is active as well) and LBO Any GCB Closed is active too.
Synchro Check	Controller is synchronizing, breaker close command is blocked.
Synchro Perm	Controller is in passive synchronization mode, breaker close command will be issued once synchronization windows is matched.
Synchro Run	Controller is synchronizing, breaker close command will be issued once synchronization window is matched.

5.5.7 High/Low Limits

The High/Low Limits function is supposed to be used to inform internal/external logic about system reached some limit. The function has power and voltage parts, the power part is hard-coded whereas the voltage part is pre-configured via **User protections (page 217)** + **User Setpoints (page 181)** and connected together with power limits in the internal PLC - **Programmable Logic Controller (page 156)**. The power part is also split to Mains and System Limits.

Limits are bounded by conditions which makes these limits work only in specific situations.

> Mains Power Limits

» MCB closed (**MCB FEEDBACK (PAGE 616)** is active

> System limits

» Any Gen-set with Load/Unload active is on the bus (LBO **ANY GEN-SET IN LOAD SHAR (PAGE 627)** is active).

Mains Power Limits

The Mains High/Low limits are enabled by setpoint **Mains P Limit (page 298)**. The high limit is activated if Mains power raise above setpoint **Mains P High Limit On (page 298)** and is deactivated when it drops below **Mains P High Limit Off (page 299)**. The low limit is activated if Mains power drop below setpoint **Mains P Low Limit On (page 299)** and is deactivated when it raise above **Mains P Low Limit Off (page 299)**. In both cases the ALI alarm is shown in the alarm list and LBO **MAINS P HIGH LIMIT (PAGE 641)/MAINS P LOW LIMIT (PAGE 641)** is activated.

System Power Limits

The System High/Low limits are enabled by setpoint **System P Limit (page 300)**. The high limit is activated if System power raise above setpoint **System P High Limit On (page 300)** and is deactivated when it drops below **System P High Limit Off (page 300)**. The low limit is activated if System power drop below setpoint

System P Low Limit On (page 301) and is deactivated when it raise above **System P Low Limit Off (page 301)**. In both cases the ALI alarm is shown in the alarm list and LBO **SYSTEM P HIGH LIMIT (PAGE 648)/SYSTEM P LOW LIMIT (PAGE 648)** is activated.

Note: *In Preconfigured archive, each LBO is wired in the internal PLC trough OR block to the Common High/Low Limit BOUT.*

Bus Voltage Limits

The Bus voltage limits **are available only in the Preconfigured archive** and they are enabled by setpoint **Bus Ph-Ph V Limit**. The high limit is activated if Bus voltage raise above setpoint **Bus Ph-Ph V High Limit** and delay **Bus Ph-Ph V High Limit Del** elapsed. The low limit is activated if Bus voltage drop below setpoint **Bus Ph-Ph V Low Limit** and delay **Bus Ph-Ph V Low Limit Del** elapsed. In both cases the pre-configured User Protection is activated, ALI alarm is shown in the alarm list, and User Protection State connected to the User Protection State **Bus Ph-Ph V High Limit/Bus Ph-Ph V Low Limit** is activated.

Note: *Each User Protection State is wired in the internal PLC trough OR block to the Common High/Low Limit BOUT.*

IMPORTANT: The Voltlage Limits are pre-configured function which works only for wirings where Bus Voltage L3-L1 (page 467) is available and it should be checked before it is used.

Note: *In cace the different wiring is used the source value for both User Protections must be changed in the Configuration - Protections - Analog protections.*

5.5.8 Logical Sequence and Control

Synchronization

There are 3 commands for synchronization called Run, Permissive, and Check. Synchronization Run will regulate frequency and voltage to match the window and close the breaker. Permissive synchronization is passive so regulations are not used to get frequency and voltage to match the window. Check synchronization will only regulate frequency and voltage to match the window but it will not send command to close the breaker. Synchronizations are available only if breaker is opened and there is healthy voltage/frequency. If dead bus is detected the command for breaker closing is sent immediately. If multiple synchronization commands are active while breaker is opened the synchronization is blocked and alarm synchronization blocked appear in the alarm list. Synchronization commands are used only for breaker closing, if the command is deactivated after breaker closure the breaker will remain closed.

➤ **Related LBI:**

- **SYNCHRONIZATION CHECK (PAGE 621)**
- **SYNCHRONIZATION PERMISSIVE (PAGE 621)**
- **SYNCHRONIZATION RUN (PAGE 621)**

Utility/Mains Unload

Utility unload is used to get from parallel to mains operation to island operation. After activation of the LBI all Gen-sets in Load Sharing (Isochronous Control) starts overtaking the load until **Mains Unload MCB Open Window (page 296)** is reached and MCB is opened, or until all Gen-sets in Load Sharing are loaded on their nominal power. If Utility Unload is active Synchronization commands are ignored and alarm Synchronization Blocked is shown in the alarm list.

If there is no Gen-set in Load Sharing in Parallel To Mains Operation, the Utility Unload will open the breaker only if **Mains Unload MCB Open Window (page 296)**. It can be done by change of the local request separately on each Gen-set or by lower load.

In case of Mains Operation the MCB will be opened immediately after Utility Unload is activated.

➤ **Related LBI:**

- **UTILITY UNLOAD (PAGE 622)**

System Unload

System unload is used to get from parallel to mains operation to mains operation. There is not any dedicated LBI for System Unload. In case of load request from setpoint the unloading process is done via activation of LBI Load Lower while System Baseload is active (decreasing of the system power) or Load Raise while Import/Export is active (increasing of Mains import = decreasing of the system power). If power of all Gen-sets in Load Sharing match the setpoint **Generator Unload GCB Open Window (page 295)** and LBI Load Lower (System Baseload) or Load Raise (Import/Export) is active the IntelliMains controller will send command to all Gen-sets in Load Sharing to do the Soft Unload and open their GCBs.

In case of load request from LAI (both LBIs Load Raise and Load Lower are already active) the unloading process is done immediately after power of all Gen-sets in Load Sharing match **Generator Unload GCB Open Window (page 295)**.

Note: The function is not evaluated until system power raise above **Generator Unload GCB Open Window (page 295)** at least once.

Note: Power and GBCs of Local baseload Gen-sets are ignored.

> **Related LBI:**

- >> LOAD LOWER (PAGE 614)
- >> LOAD RAISE (PAGE 614)

Load Control

There are 2 types of load control, the first one is System Baseload which is used when LBI Import/Export is NOT activated. In this control mode the Load Share request for Generators is regulated to get specific power from the System. The second type is Import/Export which is activated by LBI Import/Export. This control mode regulates Load Share request to maintain specific Import/Export of power from/to Mains (Utility).

> **Related LBI:**

- >> IMP/EXP CONTROL (PAGE 613)
- >> LOAD RAISE (PAGE 614)
- >> LOAD LOWER (PAGE 614)

PF/Q Control

PF/Q Control is also divided to System and Import/Export control. The LBI Import/Export is used to switch control mode for both, the power and PF/Q control. But automatic PF/Q Control must be enabled by activating both, LBI Voltage Raise and LBI Voltage Lower. If both LBIs are active the standard setpoints for PF/Q are used (**Subgroup: PF/Q Control (page 302)**). Otherwise the PF/Q control of the System is switched to constant (MAN) Control and Rated Change is supposed to be used to control PF/Q.

IMPORTANT: The excitation of Gen-sets should be controlled all the time, if rated/manual control is not actively used to regulate Gen-sets' excitation the automatic PF/Q control should be enabled.

Example: Automatic PF/Q control can be permanently enabled by connecting both LBIs Voltage Raise and Lower to MCB Feedback. If ability to do voltage rising or lowering while MCB is opened is required, each LBI should be connected to the MCB Feedback and respective input through OR PLC block. This logic is used in the Preconfigured archive.

Example: It is also possible to enable Var Sharing by negating of LBIs Voltage Raise and Lower in Functions in the configuration. This will cause that Var Sharing will be in automatic mode all the time and it will be switched to the constant excitation (MAN control) by activating of both LBIs. This solution will reverse logic of LBIs so if Voltage Raise is gonna be used it is necessary to deactivate Load Lower (activate input which is connected to the LBI Load Lower) and vice versa.

> **Related LBI:**

- >> IMP/EXP CONTROL (PAGE 613)
- >> VOLTAGE RAISE (PAGE 622)
- >> VOLTAGE LOWER (PAGE 622)

Rated Change

By using 2 pairs of LBIs (Load Raise/Lower, Voltage Raise/Lower), the rated change (MAN Control) can be used to change frequency/voltage in island operation while Permissive synchronization is active, or change Load request/VAR excitation control while System Baseload or Import/Export in parallel to Mains operation.

Note: IG controllers which are not in Load Sharing will not listen to IM controller.

> **Related LBI:**

- » IMP/EXP CONTROL (PAGE 613)
- » LOAD RAISE (PAGE 614)
- » LOAD LOWER (PAGE 614)
- » VOLTAGE RAISE (PAGE 622)
- » VOLTAGE LOWER (PAGE 622)

Ramp Pause

The LBI Ramp Pause is used to freeze actual Load request (Required P) so there is constant request for the load regulation loop. The function is available only in parallel to mains operation and all changes in the connected load will be covered by Mains.

Note: The Ramp Pause has higher priority than Process Control and Import/Export.

> **Related LBI:**

- » RAMP PAUSE (PAGE 620)

Process Control

It is activated by LBI Process Control and it is used to switch load request from setpoint to LAI Process Control: P Request. Input for the LAI can be counted by preconfigured internal PLC logic or by any external function.

Note: The Process Control has higher priority than Import/Export.

> **Related LBI:**

- » PROCESS CONTROL (PAGE 618)

> **Related LAI:**

- » PROCESS CONTROL: P REQUEST (PAGE 656)

5.5.9 Mains Decoupling Protections

Vector shift

The vector shift function is the fast protection for mains decoupling. It monitors the Load angle of the System and if it gets changed dramatically, the protection is issued. The Vector shift is evaluated from the **Mains Voltage L1-N** (page 454).

Protection is enabled via setpoint **Vector Shift Protection** (page 357). Limit of protection is adjusted via setpoint **Vector Shift Limit** (page 325). When protection is activated, the breaker is opened. Maximal value of vector shift is represented by value **Max Vector Shift** (page 461).

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).

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

Note: If the MCB application is chosen, then MCB is always opened even there are some gen-set controllers connected on the bus.

ROCOF

The Rate of Change of Frequency function is the fast protection for mains decoupling. 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 (page 358)**, **ROCOF2 Protection (page 359)**, **ROCOF3 Protection (page 360)** and **ROCOF4 Protection (page 361)**.

Sample based ROCOF

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

ROCOF1 Protection (page 358)

- Protection is evaluated from last **ROCOF1 Windows Length (page 326)** samples. If **ROCOF1 (page 461)** is over **ROCOF1 df/dt (page 326)**, breaker is opened. Maximal measured ROCOF, from start of evaluation, is stored in **Max ROCOF1 (page 461)**.

Time based ROCOF

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

ROCOF2 Protection (page 359)

- Protection is evaluated from samples received in last **ROCOF2 Windows Length (page 327)** period. If **ROCOF2 (page 462)** is over **ROCOF2 df/dt (page 327)**, breaker is opened. Maximal measured ROCOF, from start of evaluation, is stored in **Max ROCOF2 (page 462)**.

ROCOF3 Protection (page 360)

- Protection is evaluated from samples received in last **ROCOF3 Windows Length (page 328)** period. If **ROCOF3 (page 462)** is over **ROCOF3 df/dt (page 328)**, breaker is opened. Maximal measured ROCOF, from start of evaluation, is stored in **Max ROCOF3 (page 463)**.

ROCOF4 Protection (page 361)

- Protection is evaluated from samples received in last **ROCOF4 Windows Length (page 329)** period. If **ROCOF4 (page 463)** is over **ROCOF4 df/dt (page 329)**, breaker is opened. Maximal measured ROCOF, from start of evaluation, is stored in **Max ROCOF4 (page 463)**.

5.5.10 Mains Import Measurement

The Mains measurement can be measured by dedicated CT terminals or by analog inputs, and it is divided to **Mains Measurement P (page 308)** and **Mains Measurement Q (page 308)**. The Mains Measurement P has to be enabled for proper work of active power Import/Export. The both measurements has to be enabled for proper work of reactive power Import/Export and power factor control.

Mains Measurement P

- If **Mains Measurement P (page 308)** = Mains CT then **Mains Import P (page 448)** is counted from the current which is measured on **16 MAINS (BUS-L) CURRENT (page 44)**.

- If **Mains Measurement P (page 308)** = Analog Input then **Mains Import P (page 448)** is taken from LAI **MAINS MEASUREMENT P (PAGE 654)**. Mains current can still be measured if **Mains Measurement Q (page 308)** = Mains CT.
- If **Mains Measurement P (page 308)** = None then **Mains Import P (page 448)** is not counted because there is no current measurement. This affects load transferring.

Note: When **Mains Measurement P (page 308)** is set to None or Analog Input (and LAI **MAINS MEASUREMENT P (PAGE 654)** is not configured or has invalid value) alarm **Wrn Load IMP/EXP Fail (page 735)** is activated if Import/Export P is required and alarm **Wrn PF/Q IMP/EXP Fail (page 737)** is activated if Import/Export Q is required.

MainsMeasurement Q

- If **Mains Measurement Q (page 308)** = MainsCT then **Mains Import Q (page 448)** is counted from the current which is measured on **⑩ MAINS (BUS-L) CURRENT (page 44)**.
- If **Mains Measurement Q (page 308)** = Analog Input then **Mains Import Q (page 448)** is taken from the LAI **MAINS MEASUREMENT P (PAGE 654)**. Mains current can be still measured if **Mains Measurement P (page 308)** = Mains CT.
- If **Mains Measurement Q (page 308)** = None then **Mains Import Q (page 448)** is not counted because there is no current measurement. This affects load transferring.

Note: When **Mains Measurement Q (page 308)** is set to None or Analog Input (and LAI **MAINS MEASUREMENT P (PAGE 654)** is not configured or has invalid value) alarm **Wrn PF/Q IMP/EXP Fail (page 737)** is activated if Import/Export Q is required.

5.5.11 Moving Average

The controller is measuring moving averages of selected values. This means that in specific time window is measured value stored and average is counted from these data.

After reaching maximal amount of samples, i.e. value has been measured for whole required time, oldest sample is always replaced with new sample.

1-minute averages

These values hold average of corresponding physical quantity for last 1 minute.

Mains Voltage 1 min Avg

Calculation is carried out continuously whole time the controller is powered on. The calculation is made separately for each phase and depends on setpoint **Connection type (page 265)**.

Ph-Ph connection types uses values **Mains Voltage 1min Avg L1-L2 (page 458)**, **Mains Voltage 1min Avg L2-L3 (page 458)** and **Mains Voltage 1min Avg L3-L1 (page 459)**.

Ph-Pn connection types uses values **Mains Voltage 1min Avg L1-N (page 457)**, **Mains Voltage 1min Avg L2-N (page 458)** and **Mains Voltage 1min Avg L3-N (page 458)**.

IMPORTANT: The values mentioned above are erased when the controller is switched off.

10-minutes averages

These values hold average of corresponding physical quantity for last 10 minutes.

Mains Voltage 10 min Avg

Calculation is carried out continuously whole time the controller is powered on. The calculation is made


separately for each phase and depends on setpoint **Connection type** (page 265).

Ph-Ph connection types uses values **Mains Voltage 10min Avg L1-L2** (page 460), **Mains Voltage 10min Avg L2-L3** (page 460) and **Mains Voltage 10min Avg L3-L1** (page 460).

Ph-N connection types uses values **Mains Voltage 10min Avg L1-N** (page 459), **Mains Voltage 10min Avg L2-N** (page 459) and **Mains Voltage 10min Avg L3-N** (page 459).

IMPORTANT: The values mentioned above are erased when the controller is switched off.

5.5.12 Operating Modes

The operating mode can be selected by pressing Left and Right buttons  on the front panel/display, by changing the **Controller mode** (page 271) 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 PRG MODE** (page 621)
- > **Remote RUN MODE** (page 620)

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.

PRG MODE

In the programming mode the controller will stay in **Not Ready** state, and controller commands cannot be issued (all System and breaker related functions will be blocked).

Note: CU is restarted after configuration or FW is written to it. If the CU is not in the PRG mode, configuration or FW cannot be written to it.

RUN MODE

In the run mode the controller will listen to the commands from the external PLC. The controller behavior is given by activated LBIs and the setpoint settings.

5.5.13 Operation Types & P/Q Control

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Island Operation

This chapter describes the situation where the 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 group of Gen-sets has been connected to the bus, or
- The group was running parallel to mains and the MCB has been opened.

In the Island Operation the IntelliMains 1010 SC does not influence site regulations (load and PF/Q control). The site will deliver power which is demanded by the load while IntelliMains 1010 SC values can be still used to monitor the site.

If the bus bar is empty, the first Gen-set will close its GCB 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 to the bus bar without synchronization. Instead of this, one of the Gen-sets will close the GCB and energize the bus bar and the others will wait and then synchronize to the bus bar.

Parallel To Mains Operation

This chapter describes the situation where the multiple Gen-sets are running parallel to mains. This situation will occur when the common bus bar is connected to the mains (**MCB FEEDBACK (PAGE 616)** is present) and the group of Gen-sets has been connected to the bus. If the bus bar is healthy, all Gen-sets 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 (PAGE 616) 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.

Ramping the power

Power up

Ramp up starts when value **Required P Target (page 484)** is increased above value **Required P (page 484)**. The first phase of the parallel to mains operation is the ramp of the system up to the desired power level. Ramp starts when value **Required P Target (page 484)** rises, value **Required P (page 484)** is ramped from **Total Running P (page 482)**. Setpoint **Load Ramp (page 296)** determines how long it shall take to ramp up from 0 kW to **Running Nominal Power Of All (page 481)**.

Examples	Description
<ul style="list-style-type: none"> ➤ Nominal Mains Import = 100 kW ➤ Load Ramp = 10 s ➤ #System Baseload = 50 kW 	Required P is ramped from 0 kW to 50 kW in 5 s.
<ul style="list-style-type: none"> ➤ Nominal Mains Import = 100 kW 	Total Running P = 50 kW, #System Baseload is

- > Load Ramp = 10 s
- > #System Baseload = 70 kW

changed to 70 kW. Required P is ramped from 50 kW To 70 kW in 2 s.

Power down

Ramp down starts when value **Required P Target (page 484)** drops, value **Required P (page 484)** is ramped from **Total Running P (page 482)** down to the new value of **Required P Target (page 484)** based on **Load Ramp (page 296)**. Setpoint **Load Ramp (page 296)** determines how long it shall take to ramp down from **Nominal Mains Import (page 262)** to 0 kW.

Soft unload

When power of all Gen-sets running in Load Sharing drops below the setpoint **Generator Unload GCB Open Window (page 295)** and **LBI LOAD LOWER (PAGE 614)** (in case of System Baseload) or **LBI LOAD RAISE (PAGE 614)** (in case of Import/Export) is active, the IntelliMains will send command to all Gen-sets in Load Sharing to do the Soft Unload and open their GCBs. The level for GCB opening command can be achieved by rated change (**LBI LOAD LOWER (PAGE 614)** or **LOAD RAISE (PAGE 614)**), or by changing the request from setpoint / LAI.

Note: The function is not evaluated until system power raise above **Generator Unload GCB Open Window (page 295)** at least once.

⬅ back to Parallel To Mains Operation

Load control

If Parallel To Mains Operation is active the load of Gen-set group is controlled to reach the power defined by setpoint **#System Baseload (page 290)** or **Import Load (page 290)**. The regulation loop is adjusted via setpoints **Load Gain (page 293)** and **Load Int (page 293)**.

Current Load control mode is always showed in **System Load Control (page 485)** value.

System Baseload

System baseload ensures that the system keeps certain **Total Running P (page 482)**, which is given by **Required P (page 484)**. **Required P (page 484)** is ramped to **Required P Target (page 484)** using **Load Ramp (page 296)**.

If the **LBI IMP/EXP CONTROL (PAGE 613)** is **NOT** active the **Required P Target (page 484)** is given by:

- > **#System Baseload (page 290)** in case both LBIs **LOAD RAISE (PAGE 614)** and **LOAD LOWER (PAGE 614)** are **NOT** active.
 - » In case only one **LBI LOAD RAISE (PAGE 614)** or **LOAD LOWER (PAGE 614)** was activated the System Baseload request is changed by **Rated Change (page 224)**.
- > **Load Control: System Baseload (page 654)** in case both LBIs **LOAD RAISE (PAGE 614)** and **LOAD LOWER (PAGE 614)** are active.

Note: **Required P Target (page 484)**, (**Mains Import P (page 448)**) can be limited in case of applied or **Import/Export Limitation (page 291)**.

Note: In case **LAI LOAD CONTROL: SYSTEM BASELOAD (PAGE 654)** is not configured or has **Invalid flag (page 441)**, the setpoint source is used instead of **AIN**.

Import/Export

Import/Export ensures that the Gen-sets regulates their power to keep certain **Mains Import P (page 448)**. **Total Running P (page 482)** is given by **Required P (page 484)** which is ramped to **Required P Target (page 484)** using **Load Ramp (page 296)**.

If the LBI IMP/EXP CONTROL (PAGE 613) is active the Required P Target (page 484) is given by:

- Import Load (page 290) in case both LBIs LOAD RAISE (PAGE 614) and LOAD LOWER (PAGE 614) are NOT active.
 - In case only one LBI LOAD RAISE (PAGE 614) or LOAD LOWER (PAGE 614) was activated the Import/Export request is changed by Rated Change (page 224).
- Load Control: Import/Export (page 654) in case both LBIs LOAD RAISE (PAGE 614) and LOAD LOWER (PAGE 614) are active.

Note: Alarm *Wrn Load IMP/EXP Fail (page 735)* is activated if:

- Mains Measurement P (page 308) = None
- Mains Measurement P (page 308) = Analog Input and LAI MAINS MEASUREMENT P (PAGE 654) is either not configured or has Invalid flag (page 441).

Note: In case LAI LOAD CONTROL: IMPORT/EXPORT (PAGE 654) is not configured or has Invalid flag (page 441), the setpoint source is used instead of AIN.

⬅ back to Parallel To Mains Operation

PF/Q control

If MCB FEEDBACK (PAGE 616) is active (Parallel To Mains Operation) and LBIs VOLTAGE RAISE (PAGE 622) + VOLTAGE LOWER (PAGE 622) are active the PF/Q of System is controlled to reach the PF/Q defined by setpoint #System Power Factor (page 304)/#System Base Q (page 304) or Import Power Factor (page 303)/Import Q (page 303).. The regulation loop is adjusted via setpoints PF Gain (page 306) and PF Int (page 306).

Current PF/Q control mode is always showed in System PF/Q Control (page 487) value.

If both LBIs VOLTAGE RAISE (PAGE 622) and VOLTAGE LOWER (PAGE 622) are NOT active the PF/Q regulation is disabled and excitation of the System is constant.

In case only one LBI VOLTAGE RAISE (PAGE 622) or VOLTAGE LOWER (PAGE 622) was activated the PF/Q request is changed by Rated Change (page 224).

IMPORTANT: The excitation of Gen-sets should be controlled all the time, if rated/manual control is not actively used to regulate Gen-sets' excitation the automatic PF/Q control should be enabled.

PF/Q control ensures that the system keeps a certain Total Running Power Factor (page 483) or Total Running Q (page 483) (based on selected mode) in parallel to Mains operation(Breaker state (page 494) = ParalOper) and at least one gen-set is excited.

PF Control

PF Control ensures that the system keeps certain Total Running Q (page 483), which is given by Required PF (page 486). To enable this control, adjust PF/Q Control Mode (page 302) to PF Control and activate both LBIs VOLTAGE RAISE (PAGE 622) and VOLTAGE LOWER (PAGE 622).

System Base PF

If the LBI IMP/EXP CONTROL (PAGE 613) is NOT active the Required PF (page 486) with Required PF Character (page 486) are given by:

- **#System Power Factor** (page 304) in case **PF/Q Request Source** (page 302) = Setpoint or,
- **PF Control: System Base PF** (page 655) in case **PF/Q Request Source** (page 302) = Analog External Value.

Note: Alarm **Wrn PF Control Fail** (page 736) is activated if **LAI PF CONTROL: SYSTEM BASE PF** (PAGE 655) is not configured or has **Invalid flag** (page 441). Power is controlled as if **PF/Q Request Source** (page 302) = Setpoint.

Import/Export PF

If the **LBI IMP/EXP CONTROL** (PAGE 613) is active the **Required PF** (page 486) with **Required PF Character** (page 486) are given by:

- **Import Power Factor** (page 303) in case **PF/Q Request Source** (page 302) = Setpoint or,
- **Q Control: System Base Q** (page 656) in case **PF/Q Request Source** (page 302) = Analog External Value.

Note: Alarm **Wrn PF Control Fail** (page 736) is activated if **LAI PF CONTROL: IMP/EXP PF** (PAGE 656) is not configured or has **Invalid flag** (page 441). Power is controlled as if **PF/Q Request Source** (page 302) = Setpoint.

Note: Alarm **Wrn PF/Q IMP/EXP Fail** (page 737) is activated if:

- **Mains Measurement P** (page 308) = None
- **Mains Measurement P** (page 308) = Analog Input and **LAI MAINS MEASUREMENT P** (PAGE 654) is either not configured or has **Invalid flag** (page 441).
- **Mains Measurement Q** (page 308) = None
- **Mains Measurement Q** (page 308) = Analog Input and **LAI MAINS MEASUREMENT Q** (PAGE 655) is either not configured or has **Invalid flag** (page 441).

🔍 back to PF/Q control

Q Control

Total Running Power Factor (page 483) is adjusted to reach **Required Q** (page 486). To enable this control, adjust **PF/Q Control Mode** (page 302) to **Q Control** and activate both LBIs **VOLTAGE RAISE** (PAGE 622) and **VOLTAGE LOWER** (PAGE 622).

System Base Q

If the **LBI IMP/EXP CONTROL** (PAGE 613) is **NOT** active the **Required PF** (page 486) with **Required PF Character** (page 486) are given by:

- **#System Base Q** (page 304) in case **PF/Q Request Source** (page 302) = Setpoint or,
- **Q Control: System Base Q** (page 656) in case **PF/Q Request Source** (page 302) = Analog External Value.

Note: Alarm **Wrn Q Control Fail** (page 737) is activated if **LAI Q CONTROL: SYSTEM BASE Q** (PAGE 656) is not configured or has **Invalid flag** (page 441). Power is controlled as if **PF/Q Request Source** (page 302) = Setpoint.

Import/Export Q

If the **LBI IMP/EXP CONTROL** (PAGE 613) is active the **Required PF** (page 486) with **Required PF Character** (page 486) are given by:

- > **Import Q** (page 303) in case **PF/Q Request Source** (page 302) = Setpoint or,
- > **Q Control: Imp/Exp Q** (page 656) in case **PF/Q Request Source** (page 302) = Analog External Value.

Note: Alarm **Wrn Q Control Fail** (page 737) is activated if **LAI Q CONTROL: SYSTEM BASE Q** (PAGE 656) is not configured or has **Invalid flag** (page 441). Power is controlled as if **PF/Q Request Source** (page 302) = Setpoint.

Note: Alarm **Wrn PF/Q IMP/EXP Fail** (page 737) is activated if:

- > **Mains Measurement P** (page 308) = None
- > **Mains Measurement P** (page 308) = Analog Input and **LAI MAINS MEASUREMENT P** (PAGE 654) is either not configured or has **Invalid flag** (page 441).
- > **Mains Measurement Q** (page 308) = None
- > **Mains Measurement Q** (page 308) = Analog Input and **LAI MAINS MEASUREMENT Q** (PAGE 655) is either not configured or has **Invalid flag** (page 441).

🔍 back to PF/Q control

5.5.14 Output Control - Frequency/Load

The frequency control output is used to control the frequency (speed) of the Mainss presented on the bus. 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 0 .. 100 % of the **Loadsharing Output** (page 485) which comes out of the controller via communication line. Gen-set controller accepts this value and transform this to his speed control output.

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** (page 294) to 0 and connect one Gen-set in Load Shar to the bus.
2. Change the Gen-set's Speed Bias a little bit to get different frequency than Mains frequency.
3. Start the synchronization by **LBI SYNCHRONIZATION CHECK** (PAGE 621) bus frequency should be frozen.
4. Increase **Frequency Gain** (page 294) and repeat step with Gen-sets's Speed Bias change, after you get unstable frequency control decrease value by 30 % to insure stable performance.
5. Adjust **Frequency Int** (page 294) to get stable (fast and smooth) frequency control and change Gen-sets's Speed Bias back to original vlaue.
6. Set **Angle Gain** (page 295) to 0 and start the synchronization by **LBI SYNCHRONIZATION CHECK** (PAGE 621) once again.
7. Increase **Angle Gain** (page 295) until Slip Angle start to oscilate and decrease value by 30 %.
8. Now your frequency regulation loop setup is done.

Load Control Adjustment

Load control loop is active in parallel to mains mode only (**MCB FEEDBACK** (PAGE 616) is closed). 1 Gen-set is enough fo settings, switch off other Gen-sets while adjusting.

1. Set **#System Baseload (page 290)** setpoint to 30 % of one gen-set.
2. Set **Load Gain (page 293)** to the same value as **Angle Gain (page 295)** and **Load Int (page 293)** to 0.
3. Start the Gen-set and connect it to the mains by **LBI SYNCHRONIZATION RUN (PAGE 621)**.
4. When MCB is closed, gen-set load slowly increases to **#System Baseload (page 290)** value. Check that gen-set power is positive (CT polarity).
5. Increase **Load Int (page 293)** to unstable load control and decrease value by 30 % to insure stable performance. When **Load Int (page 293)** factor is set to zero gen-set load can differ from required **#System Baseload (page 290)**.
6. To adjust and optimize **Load Int (page 293)** change **#System Baseload (page 290)** several times between 30 and 70 % of **Nominal Mains Import (page 262)**.
7. Now your Load regulation loop setup is done.

5.5.15 Output Control - Voltage/PF

The voltage control output is used to control the voltage or the power factor of the system. 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 0...100% of the **Varsharing Output (page 488)** which comes out of the controller via communication line. Gen-set controller accept this value and transform this to its AVR control output.

Voltage/PF control adjustment

Voltage Adjustment

1. Set **Voltage Gain (page 307)**, **Voltage Int (page 307)** to 0 .
2. Start the System without load.
3. Change the Voltage Regulator Bias on the Gen-set little bit to get different voltage than mains voltage.
4. Start the synchronization by **LBI SYNCHRONIZATION CHECK (PAGE 621)** voltage should be frozen.
5. Increase **Voltage Gain (page 307)** to unstable voltage control and decrease value by 30 % to insure stable performance.
6. Adjust **Voltage Int (page 307)** to stable (fast and smooth) voltage control.
7. Now your voltage regulation loop setup is done.

PF Adjustment

Power factor control loop is active in parallel to mains mode only (**MCB FEEDBACK (PAGE 616)** is closed).

1. Set **PF Gain (page 306)** to the same value as parameters **Voltage Gain (page 307)** and **Voltage Int (page 307)** to 0.
2. Set **#System Baseload (page 290)** = 30 % of **Nominal Mains Import (page 262)** and **#System Power Factor (page 304)** = 1.0.
3. Start the Gen-set, connect it to the mains by **LBI SYNCHRONIZATION RUN (PAGE 621)** and activate **LBI VOLTAGE RAISE (PAGE 622)** and **VOLTAGE LOWER (PAGE 622)** to activate PF/Q control.
4. When running in parallel to mains loaded on 30%, increase slowly **PF Gain (page 306)** to unstable point and then decrease the value by 30 % to insure stable performance.
5. Increase **Load Int (page 293)** to unstable load control and decrease value by 30 % to insure stable performance. When **Load Int (page 293)** factor is set to zero Mains load can differ from required

#System Power Factor (page 304).

6. Now your PF/Q regulation loop setup is done.

5.5.16 Process/Technology Control

The Process Control is used in cases where the System load should be controlled based on non-load request which is related to some technology/process such as temperature, pressure, mA sensor, etc. If the LBI **PROCESS CONTROL (PAGE 618)** is activated the power request will be taken from the LAI **PROCESS CONTROL: P REQUEST (PAGE 656)** instead of standard request such as System Baseload or Import/Export. The source value (Power Request) for the LAI can be taken from physical AIN, Modbus, or from the internal PLC. The Process Control has higher priority than standard power requests.

By default the whole function is pre-configured in internal PLC so the LAI **PROCESS CONTROL: P REQUEST (PAGE 656)** is connected to the output of PID regulation loop block which is setup by User Setpoints. The function of the PID block and internal PLC is described in the following chapters: **PID (page 680)/PLC - Programmable Logic Controller (page 156)**.

- The measured input for the PID regulation block is pre-configured on AIN2 (Process Control Input - Sensor: 4-20 mA active, Dimensions: mA, Resolution: 0,01, Range: 16, Offset: 0, 0% = 4 mA, 100 % = 20 mA). The AIN configuration can be changed in the Configuration - I/O Configuration - Analog Inputs.
- The request for the PID block is taken from the user setpoint **Local Process** and it can be always replaced by physical AIN. In any case the Request must have the same Dimensions, Resolution and Range as measured input. If the AIN Request is desired new AIN must be setup in the I/O Configuration and it must be wired to the Req input of the PID block in the PLC Editor.
- The PID Block is enabled by the LBI **PROCESS CONTROL (PAGE 618)** and it's regulation loop is configured by setpoints **Process Gain**, **Process Int**, and **Process Der** in the **Process Control Group**.
- The Init value which is used when the PID block is disabled is set to 10 kW nad Low and High limits are set to 0 kW and **Nominal Mains Import (page 262)**.
- Period of the block is set to 0,1 s.
- The output of the block can be inverted by checking the check box inverted input next to the input Reverse Output.

IMPORTANT: The Process Control function (analog input, PLC PID block, User Setpoints) is automatically pre-configured via script, the configuration should be checked before it is used!

5.5.17 Protections

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InteliMains 1010 SC combines **Fixed protections (page 213)** with **User protections (page 217)** 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 (page 217)** is limited to 200. The maximum number of configured **fast User protections (page 217)** is limited to 50.

Protection types

Level 1 Protections

- ✓ LBO COMMON ALARM LEVEL 1 (PAGE 628)
- ✓ LBO COMMON ALARM ACTIVE LEVEL 1 (PAGE 627)
- ✗ Action: CB open

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 (PAGE 629)	COMMON ALARM ONLY (PAGE 628)	COMMON HISTORY RECORD (PAGE 628)	✗	✗

Level 2 Protections

✓ **LBO COMMON ALARM LEVEL 2 (PAGE 628); except Mains Protection**

✓ **LBO COMMON ALARM ACTIVE LEVEL 2 (PAGE 628) ; except Mains Protection**

Name	Mains Protection*	Mains Protection + FltRes	System Protection
Abbreviation	MP	MPR	SP
Alarm List indication	✗	✓	✓
History record	✓	✓	✓
Fault Reset needed	✗	✓	✓
Action: CB open	✓/✗	✓	✓
LBO Alarm activation	✗	✓	✓
LBO Horn activation	✗	✓	✓
Common LBO	COMMON MAINS PROTECTION (PAGE 629)	COMMON MAINS PROTECTION + FLTRES (PAGE 629)	COMMON SYSTEM STOPPROTECTION (PAGE 629)

* This protection type has selectable behavior (Passive / Active). See the setpoint **MP Protection Behavior (page 335)** for more information.

List of Fixed Protections with selectable behavior (selected behavior is applied to all of these protections):

- Mains >V Protection (page 339)
- Mains >>V Protection (page 341)
- Mains 10min Avg >V Protection (page 342)
- Mains <V Protection (page 343)
- Mains <<V Protection (page 344)
- Mains V Unbalance Protection (page 345)
- Mains >f Protection (page 349)
- Mains >>f Protection (page 350)
- Mains <f Protection (page 351)
- Mains <<f Protection (page 352)

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Protection activation

The table below shows the availability of conditions for analog and binary values

Type	Name of activation	Protection is activated if value is
Analog	Over Limit	over limit
	Over Limit+Fls	over limit or in fault state
	Under Limit	under limit
	Under Limit+Fls	under limit or in fault state
	Fls only	in fault state
Binary	True	logical 1
	TrueOrFls	logical 1 or in fault state*
	False	logical 0
	FalseOrFls	logical 0 or in fault state*

* Fault state can occur if there is loss of communication with configured CAN module.

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Protection blocking

It is possible to configure one Protection Blocking to any **User protections (page 217)**. 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 (page 213)**.

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.

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Fixed protections

Some selected fixed protections has an option to DISABLE the protection.

The setting is done by using the setpoint which is associated to the fixed protection. Each setpoint offers these options.

Setpoint options

Alarms	Fixed Protection States
Enable	Protection is enabled
Disable	Protection is blocked
PROTECTION FORCE DISABLE 1 (PAGE 618) PROTECTION FORCE DISABLE 2 (PAGE 619) PROTECTION FORCE DISABLE 3 (PAGE 619)	Disabling of the protection can be forced by LBI

Bus protections

	Protection	Alarms / Protection name	Fixed Protection States
	Bus >V Protection (page 346)	Hst Bus >V L1-N (page 748) Hst Bus >V L2-N (page 749) Hst Bus >V L3-N (page 749) Hst Bus >V L1-L2 (page 749) Hst Bus >V L2-L3 (page 749) Hst Bus >V L3-L1 (page 750)	FIXED PROTECTIONS STATES 1 (PAGE 658)
	Bus <V Protection (page 347)	Hst Bus <V L1-N (page 750) Hst Bus <V L2-N (page 750) Hst Bus <V L3-N (page 750) Hst Bus <V L1-L2 (page 751) Hst Bus <V L2-L3 (page 751) Hst Bus <V L3-L1 (page 751)	FIXED PROTECTIONS STATES 1 (PAGE 658)
	Bus V Unbalance Protection (page 347)	Hst Bus V Unbalance Ph-N (page 752) Hst Bus V Unbalance Ph-Ph (page 752)	FIXED PROTECTIONS STATES 1 (PAGE 658)
Frequency	Bus >f Protection (page 353)	Hst Bus >f (page 751)	FIXED PROTECTIONS STATES 1 (PAGE 658)

Bus protections

	Protection	Alarms / Protection name	Fixed Protection States
	Bus <f Protection (page 354)	Hst Bus <f (page 752)	FIXED PROTECTIONS STATES 1 (PAGE 658)
Others	Phase Rotation <i>Note: This protection monitors phases rotation and compares it with Phase Rotation (page 270), in case of inconsistency, proper alarm is activated</i>	ALI Bus Ph Rotation Opposite (page 743)	-
	<i>Note: This protection can't be disabled.</i>		
	Inverted Phase <i>Note: This protection monitors phases inversion and in case of inconsistency of all phases, proper alarm is activated</i>	ALI Bus Ph L1 Inverted (page 743) ALI Bus Ph L2 Inverted (page 743)ALI Bus Ph L3 Inverted (page 743)	-
	<i>Note: This protection can not be disabled.</i>		

Table 5.1 Bus protections

Mains protections

	Protection	Alarms / Protection name	Fixed Protection States
Voltage	Mains >>V Protection (page 341)	MP Mains >>V L1-N (page 760) MP Mains >>V L2-N (page 761) MP Mains >>V L3-N (page 761) MP Mains >>V L1-L2 (page 761) MP Mains >>V L2-L3 (page 761) MP Mains >>V L3-L1 (page 762)	FIXED PROTECTIONS STATES 2 (PAGE 659)
	Mains >V Protection (page 339)	MP Mains >V L1-N (page 759) MP Mains >V L2-N (page 759) MP Mains >V L3-N (page 759) MP Mains >V L1-L2 (page 759) MP Mains >V L2-L3 (page 760) MP Mains >V L3-L1 (page 760)	FIXED PROTECTIONS STATES 1 (PAGE 658) FIXED PROTECTIONS STATES 2 (PAGE 659)
	Mains <V Protection (page 343)	MP Mains <V L1-N (page 763) MP Mains <V L2-N (page 764) MP Mains <V L3-N (page 764) MP Mains <V L1-L2 (page 764) MP Mains <V L2-L3 (page 765) MP Mains <V L3-L1 (page 765)	FIXED PROTECTIONS STATES 1 (PAGE 658) FIXED PROTECTIONS STATES 2 (PAGE 659)
	Mains <<V Protection (page 344)	MP Mains <<V L1-N (page 765) MP Mains <<V L2-N (page 766) MP Mains <<V L3-N (page 766) MP Mains <<V L1-L2 (page 766) MP Mains <<V L2-L3 (page 766) MP Mains <<V L3-L1 (page 767)	FIXED PROTECTIONS STATES 2 (PAGE 659)
	Mains V Unbalance Protection (page 345)	MP Mains V Unbalance Ph-N (page 767) MP Mains V Unbalance Ph-Ph (page 767)	FIXED PROTECTIONS STATES 1 (PAGE 658)
	Mains 10min Avg >V Protection (page 342)	-	-
Frequency	Mains >>f Protection (page 350)	MP Mains >>f (page 768)	FIXED PROTECTIONS STATES 2 (PAGE 659)
	Mains >f Protection (page 349)	MP Mains >f (page 768)	FIXED PROTECTIONS STATES 2 (PAGE 659)
	Mains <f Protection (page 351)	MP Mains <f (page 768)	FIXED PROTECTIONS STATES 2 (PAGE 659)

Mains protections

	Protection	Alarms / Protection name	Fixed Protection States
			659)
	Mains <<f Protection (page 352)	MP Mains <<f (page 769)	FIXED PROTECTIONS STATES 2 (PAGE 659)
Current	Short Circuit Protection (page 337)	MPR Short Circuit (page 770)	FIXED PROTECTIONS STATES 2 (PAGE 659)
	IDMT Overcurrent Protection (page 337)	MPR IDMT Mains >A (page 770)	FIXED PROTECTIONS STATES 2 (PAGE 659)
	Current Unbalance Protection (page 339)	MPR Current Unbalance (page 770)	FIXED PROTECTIONS STATES 1 (PAGE 658)
Power	IDMT Overload Protection (page 335)	IDMT Overload (page 770)	FIXED PROTECTIONS STATES 2 (PAGE 659)
Others	Vector Shift Protection (page 357)	Hst Vector Shift (page 757)	FIXED PROTECTIONS STATES 2 (PAGE 659)
	ROCOF1 Protection (page 358)	Hst ROCOF 1 (page 756)	-
	ROCOF2 Protection (page 359)	Hst ROCOF2 (page 756)	-
	ROCOF3 Protection (page 360)	Hst ROCOF2 (page 756)	-
	ROCOF4 Protection (page 361)	Hst ROCOF4 (page 756)	-

Table 5.2 Mains protections

User protections

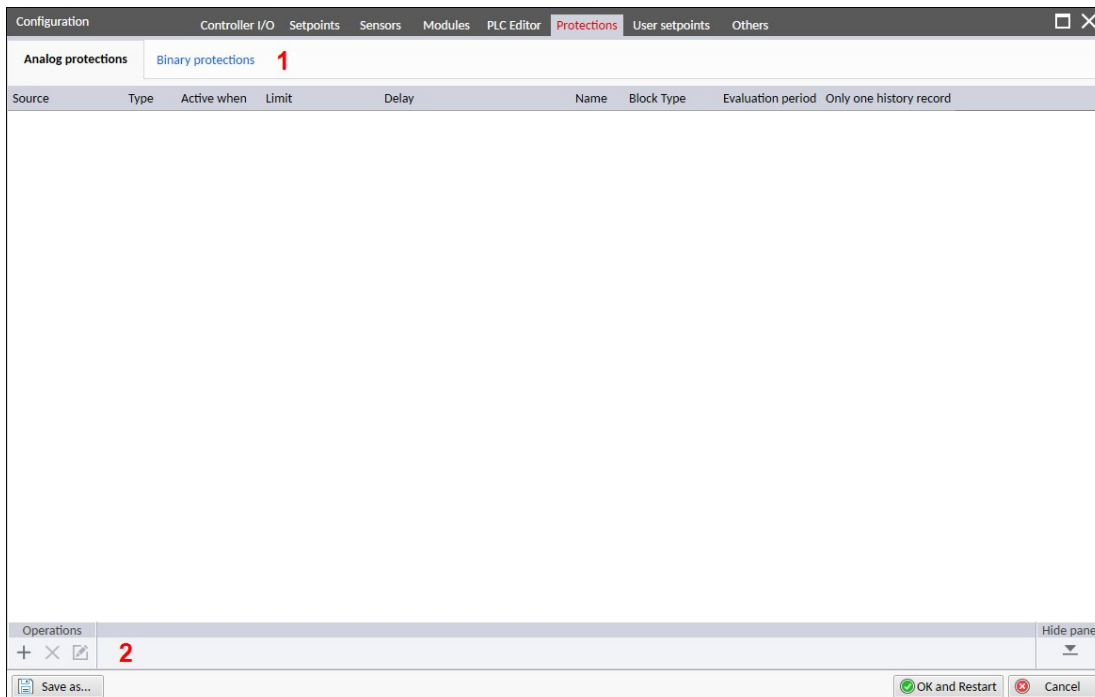
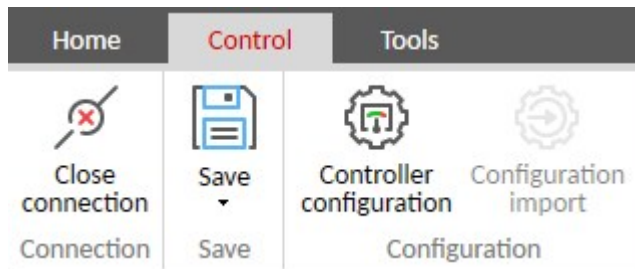
Source upon which the protection is configured can be selected. It can be any analog value or binary state.




Source

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

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>Add protection by clicking on the  icon</p> <p>Delete selected protection by clicking on the  icon.</p> <p>Edit 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 the number '1'.
- Type / Level:** A dropdown menu showing 'Warning' with a yellow triangle icon and the number '2'.
- Custom Name:** A text input field containing 'Wrn' and the number '3'.
- Active When:** A dropdown menu showing 'Over Limit' and the number '4'.
- Block Type:** A dropdown menu showing 'All the time' and the number '5'.
- History Record:** A dropdown menu showing 'Always' and the number '6'.
- Evaluation Period:** A dropdown menu showing 'Standard (0.1 s)' and the number '7'.
- Protection State:** A checkbox that is currently unchecked, with the number '8'.
- Limit:** A section header for the limit configuration.
- Limit Source:** A text input field containing the number '9'.
- Delay:** A section header for the delay configuration.
- Delay Source:** A text input field containing the number '10'.

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

1	Selecting the input source see User protections on page 217
2	Selecting the protection type see Protection types on page 211
3	Text input for Alarm / History message
4	Selecting the protection activation see Protection activation on page 213
5	Selecting the block type see Protection blocking on page 213
6	Selecting if the occurrence of a protection is recorded every time or only once after a Fault Reset.
7	Selecting the evaluation period

8	If Protection State is checked the protection is then shown in the Values in the group User Protection States .
9	<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"> > Existing setpoint > New user setpoint > Existing user setpoint <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 0.1 and dimension [s]</p> <ul style="list-style-type: none"> > Existing setpoint > New user setpoint > Existing user setpoint <p>Prefix is added to the name based on protection type / leve</p>

Adding binary protection

The screenshot shows the 'Binary Protection' dialog box. It contains the following fields and controls:

- Source Value:** A text input field containing '1'.
- Type / Level:** A dropdown menu showing 'Warning' with a yellow triangle icon.
- Custom Name:** A text input field containing 'Wrn'.
- Active When:** A dropdown menu showing 'True'.
- Block Type:** A dropdown menu showing 'All the time'.
- History Record:** A dropdown menu showing 'Always'.
- Protection State:** A checkbox that is currently unchecked.
- Delay:** A section containing a 'Source' text input field with '8' and several icons (dots, square, circle, question mark).

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

1	Selecting the input source see User protections on page 217
2	Selecting the protection type see Protection types on page 211
3	Text input for Alarm / History message
4	Selecting the protection activation see Protection activation on page 213
5	Selecting the block type see Protection blocking on page 213

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

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Protection states

Protection states is a new feature introduced in IntelliMains 1010 SC, which helps with better management of alarms. Until now, you could only use LBO **ALARM** (PAGE 625) which did not specify what is going on. Protection states work in similar way, like any other LBO. The difference is, that protection state gets active only when there is specific alarm present in the alarm list. Thanks to this, you can create PLC logic, which will react to specific alarms only.

Fixed protection states

Important **Fixed protections** (page 213) have a protection state. The protection state is (usually) named exactly as the alarm. Fixed protection states are in a group of 32.

> Protection states groups:

- >> **FIXED PROTECTIONS STATES 1** (PAGE 658)
- >> **FIXED PROTECTIONS STATES 2** (PAGE 659)
- >> **FIXED PROTECTIONS STATES 3** (PAGE 660)
- >> **FIXED PROTECTIONS STATES 4** (PAGE 661)

User protections states

During the **Configuration of protections in IntelliConfig** (page 218), you can decide whether you want to add user protection state for the protection. The name is exactly same as the alarm's message.

When you're adding user protection state, it will try to fill in gaps (if there are any present) in an actual list of **User Protection States** (page 662), if there is no gap, it will be automatically added to the end. User protection states are in a group of 32 with maximally 10 groups i.e. 320 user protection states are available.

Note: Group of User protection states is showed only when there is at least 1 protection state in it.

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5.5.18 Rated Change

The rated change (manual control) is used to raise or lower power request or directly move with Loadsharing Output and Varsharing Output. The power request rate is always related to the setpoint **#System Baseload** (page 290) or **Import Load** (page 290) which works as a base value for rating.

Frequency/Load Rate

The rate for active power request is applied always when the MCB is closed (Parallel To Mains Operation) and there is at least one Gen-set in Load Sharing. If these conditions are met the System Baseload or Import/Export is available and system rating is allowed. If the MCB is opened and Permissive synchronization is active the rate is applied directly to the **Loadsharing Output** (page 485) (frequency rate).

- LBIs used to control the rate
 - **LOAD RAISE** (PAGE 614)
 - **LOAD LOWER** (PAGE 614)
- Conditions for load control rate
 - **LBI MCB FEEDBACK** (PAGE 616) = log 1 AND
 - **LBI UTILITY UNLOAD** (PAGE 622) = log 0 AND
 - **LBI PROCESS CONTROL** (PAGE 618) = log 0 AND
 - Any GCB is closed
- The base value is defined by the setpoint **#System Baseload** (page 290) or **Import Load** (page 290)
- The rate is defined by setpoints
 - **Raise Load Rate** (page 291) or **Lower Load Rate** (page 292) [% of Nominal Mains Import (page 262) per second]
 - **Frequency Regulation Rate** (page 292) [%/s - Load Sharing Output] (only if MCB is opened)
- The rated change is reset always when the **LBI IMP/EXP CONTROL** (PAGE 613) is switched OR new value is written to the related base setpoint OR MCB is opened
- **Minimum Required P Target** (page 484) for System Baseload rate = **Minimal Power PTM** (page 334)
- **Maximum Required P Target** (page 484) for System Baseload rate = Available Nominal Power on the bus
- **Minimum Required P Target** (page 484) for Imp/Exp rate = - **Nominal Mains Import** (page 262)
- **Maximum Required P Target** (page 484) for Imp/Exp rate = + **Nominal Mains Import** (page 262)
- **Minimum Loadsharing Output** (page 485) = 0 %
- **Maximum Loadsharing Output** (page 485) = 150 %

IMPORTANT: If there is not enough Gen-sets in Load Sharing to cover full load rate request the hysteresis may occur.

Voltage/VAR Rate

The voltage and PF/Q rate always control directly the **Varsharing Output** (page 488). The rate for voltage change is applied always when the MCB is opened, whereas the rate for PF/Q rate is applied when MCB is closed (Parallel To Mains Operation).

- LBIs used to control the rate
 - **VOLTAGE RAISE (PAGE 622)**
 - **VOLTAGE LOWER (PAGE 622)**
- Conditions for PF/Q VRO rate
 - **LBI MCB FEEDBACK (PAGE 616)** = log 1 AND
 - **LBI UTILITY UNLOAD (PAGE 622)** = log 0 AND
 - **LBI PROCESS CONTROL (PAGE 618)** = log 0 AND
 - Any GCB is Closed
- There is no base value, the rate is added directly to the actual Var Sharing Output
- The rate is defined by setpoints
 - **Voltage Regulation Rate (page 305) or PF/Q Regulation Rate (page 305) [V/s - VRO]**
- The rated change is not reset at all, VRO always follow actual request.
- Minimum **Varsharing Output (page 488)** = - 150 %
- Maximum **Varsharing Output (page 488)** = + 150 %

Note: The frequency/voltage rate is not available for Gen-set in single island operation. IntelliMains controller must be used to change frequency/voltage of the bus while all Permissive synchronization is active. All Gen-sets connected to the bus should be in Load/Var Sharing while Hz/V rated change in island operation is used.

Note: The rated change is ignored on Gen-sets with active droop functionality.

5.5.19 Regulation Loops

Regulation loops overview

Regulation loops overview

Loop type	Related setpoints	Related Operation
Frequency	Frequency Gain (page 294) Frequency Int (page 294)	Synchronization Island
Voltage	Voltage Gain (page 307) Voltage Int (page 307)	Synchronization Island
Angle regulation	Angle Gain (page 295)	Phase Match Synchronization
Load	Load Gain (page 293) Load Int (page 293)	Parallel To Mains
PF control	PF Gain (page 306) PF Int (page 306)	Parallel To Mains

Frequency, Load sharing, Load regulation loops have one common output = **Loadsharing Output (page 485)** which is sent to controllers through CAN. The value of this output is always composed from the contribution of each of the regulation loops.

Voltage, PF, VAR sharing have one common output = **Varsharing Output (page 488)** which is sent to controllers through CAN. The value of this output is always composed from the contribution of each of the regulation loop.

Note: All regulation loops are PID, but only PI components are visible as setpoints.

Loop type	Description
Frequency	The frequency loop is active in the first phase of synchronization when the bus frequency is regulated to match the mains frequency and in island operation.
Voltage	The voltage loop is active in the first phase of synchronization when the bus voltage is regulated to match the mains voltage and in island operation.
Angle regulation	The differential angle control loop is active during the second phase of synchronization to match the mains/bus angle when phase match synchronization type is used.
Load	The load regulation loop is active when the system is running in parallel with mains and during load transfers from mains to bus or vice versa.
PF control	The PF control loop is active when the system is running in parallel with mains and during load transfers from mains to bus or vice versa.

Adjustment of regulation loops

The regulation loops have two adjustable factors: P-factor and I-factor (except angle regulation loop, which has P-factor only). The P-factor (gain) influences the stability and overshoot of the regulation loop and the I-factor (int) influences the steady-state error as well as the settling time. See the picture below for typical responses of a PI regulation loop.

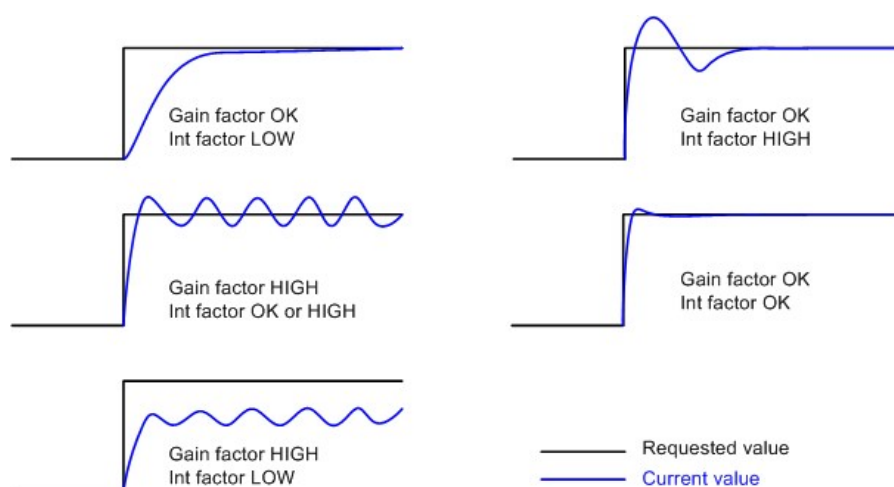


Image 5.107 Typical responses of PI regulator

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.

5.5.20 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** (page 270).

 **back to General Functions**

6 Communication

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6.1 PC

6.1.1 Direct communication	228
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6.1.1 Direct communication

Computer can be connected to IntelliMains1010 SC via USB, RS485 or ethernet interface.

Connection via USB

USB A to B cable can be used for communication via USB ports. The IntelliMains1010 SC 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.

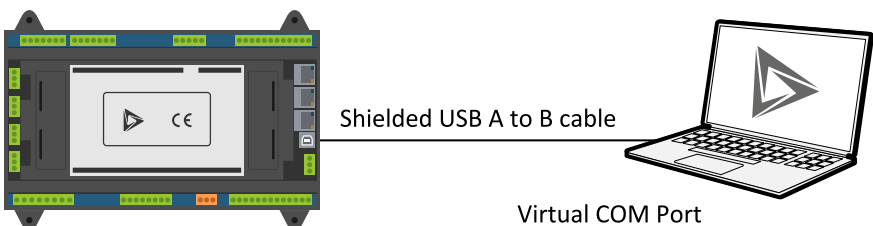


Image 6.1 Shielded USB type A cable is used

Connection via RS485

On board RS485 connector can be used for communication via RS485 connection. This interface uses **RS485 Modbus Mode (page 363)** port of the controller. It is also possible to use RS485-USB convertor.

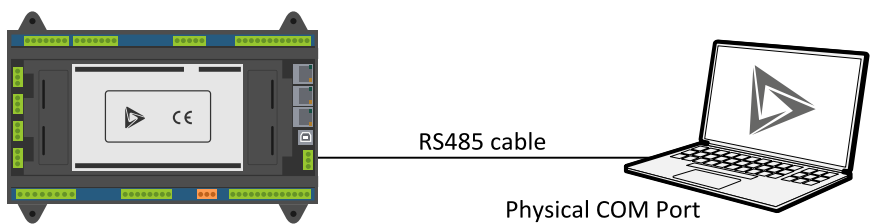


Image 6.2 Built-in RS485 is used

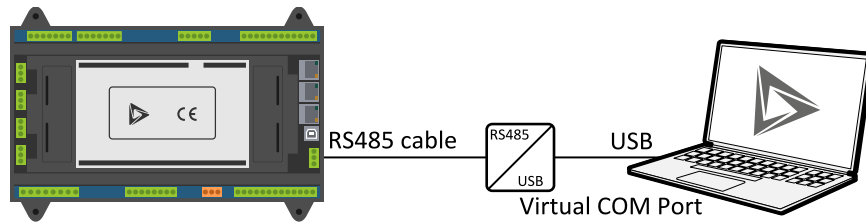


Image 6.3 RS485 and USB is used

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 **Trusted (page 175)** interface which is in default configured to port **Ethernet 1 (page 18)**. This communication is more reliable than the USB because it is more robust against interference.

Note: It is necessary to use manual IP address on both PC and controller if there is no device which will provide DHCP.

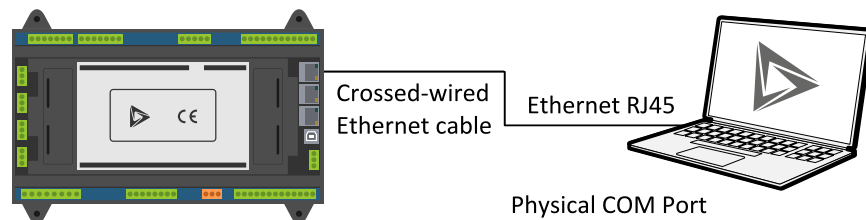


Image 6.4 Ethernet cable is used

⬅ back to Communication

6.1.2 Remote communication

The IntelMains1010 SC can be connected also remotely via built-in ethernet ports. For remote connection the **Untrusted (page 175)** interface which is in default configured to port **Ethernet 2 (page 19)** should be used.

Ethernet LAN connection

Direct IP LAN connection is intended to be used to connect more than one controller at the same time while controllers are connected to the local are network (LAN). For LAN connections, it is recommended to use **Trusted (page 175)** 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.

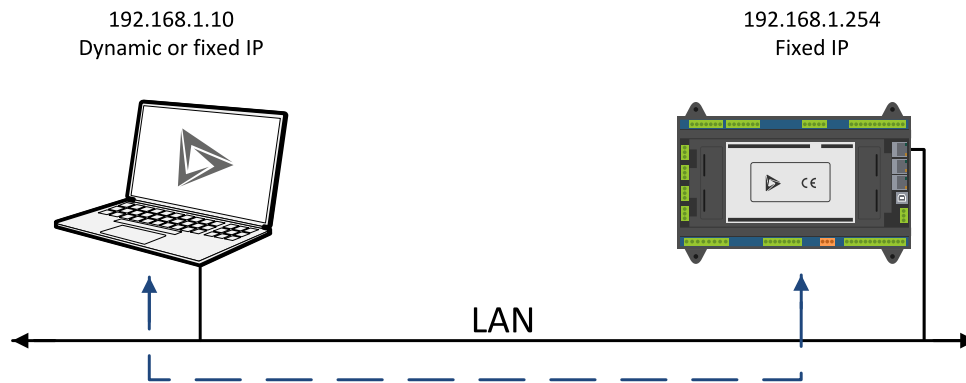


Image 6.5 Ethernet LAN connection

Setting-up static IP address

This settings is related to **Group: ETH Interface 1 - Trusted (page 372)**, **Group: ETH Interface 2 - Untrusted (page 377)** and **Group: ETH Interface 3 - Modbus (page 395)**.

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.

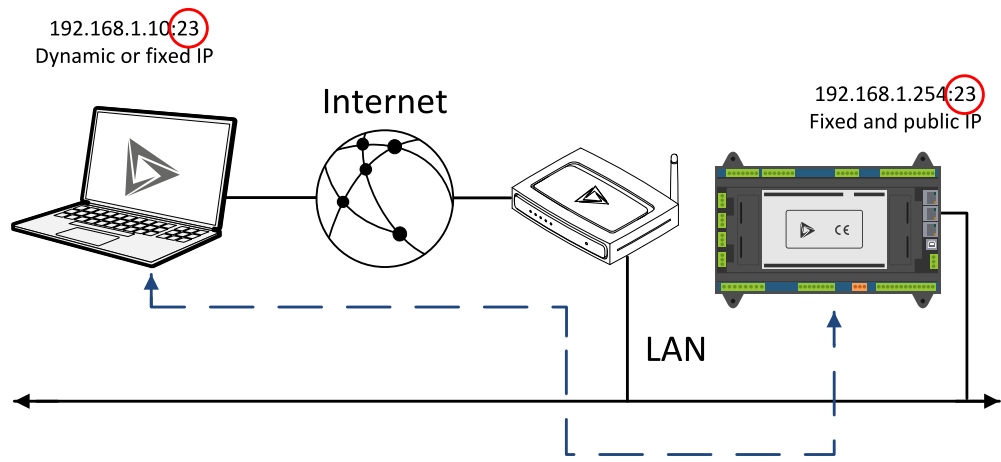


Image 6.6 Ethernet WAN connection

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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6.2 Connection to 3rd party systems

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6.2.2 Modbus-RTU, Modbus/TCP	233

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6.2.1 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 and SNMP v2c

The SNMP Agent function is to be enabled by the setpoint **SNMP Agent** (page 389). The setpoints **SNMP RD Community String** (page 390) and **SNMP WR Community String** (page 390) 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: ETH Interface 2 - Untrusted (page 377)** by the setpoints **SNMP Traps IP Address 1 (page 390)** and **SNMP Traps IP Address 2 (page 391)**. 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 (page 389)**.

- Each notification (kind of event) is identified by an unique identifier (Trap ID in SNMPv1 or Notification OID in SNMPv2). 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.

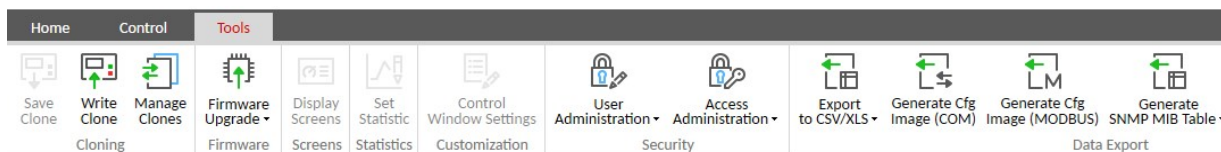
Operational events

This events are used for SNMP traps. See the list below:

- Start commands
 - Start button
 - AMF start
 - Remote start
- Stop commands
 - Stop button
 - AMF stop
 - Remote stop
- Breaker records
 - Load on Mains
 - Load on mains
- Others
 - Test on load
 - Mains fail
 - Mains returned

6.2.2 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 **RS 485 (page 44)** . The serial speed for Modbus-RTU communication is adjusted by the setpoint **RS485 Modbus Speed (page 363)** and the serial mode is adjusted by the setpoint **RS485 Modbus Mode (page 363)**. Only 1 client can be connected at once through this type of connection.
- Modbus/TCP (Modbus server) can be used with the **Ethernet 1 (page 18) / Ethernet 2 (page 19) / Ethernet 3 (page 19)**. 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 (page 394)**.

Note: Setpoint **Modbus Client Inactivity Timeout (page 398)** is common for both **Ethernet 1 (page 18)**, **Ethernet 2 (page 19)** and **Ethernet 3 (page 19)** interfaces.

DO NOT READ ALARM LIST FROM MORE THAN 1 CLIENT! LOSS OF INFORMATION MAY OCCUR.

Modbus, Modbus/TCP protocol can be used simultaneously with direct Ethernet connection and the SNMP agent.

Note: Recommended timeout for Modbus client is 300 ms.

IMPORTANT: Do not use setpoints for real-time control from super-ordinate systems. Frequent repeated writing of setpoints would cause the history file getting overwritten and losing important records.

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

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

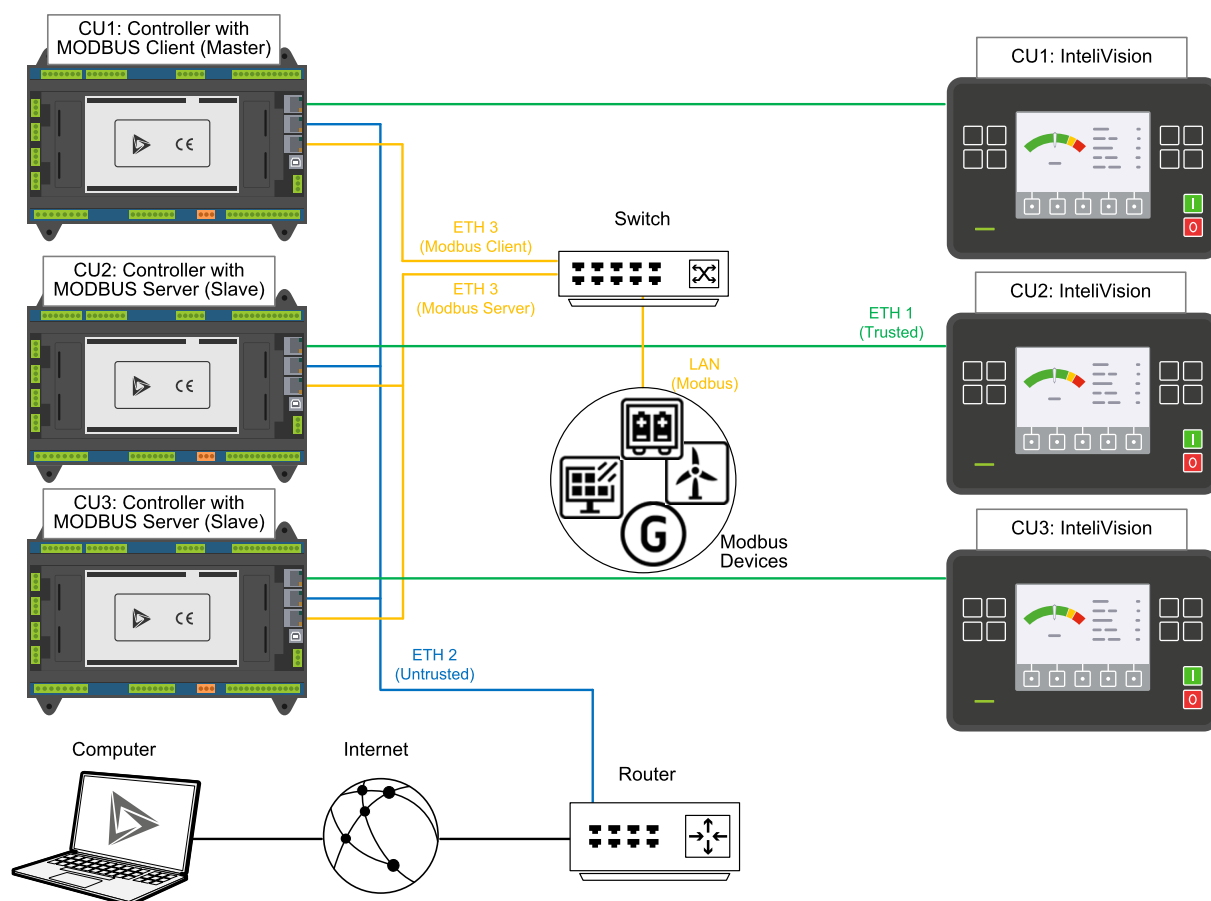


Image 6.7 Advanced Ethernet Topology With One Modbus Client

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

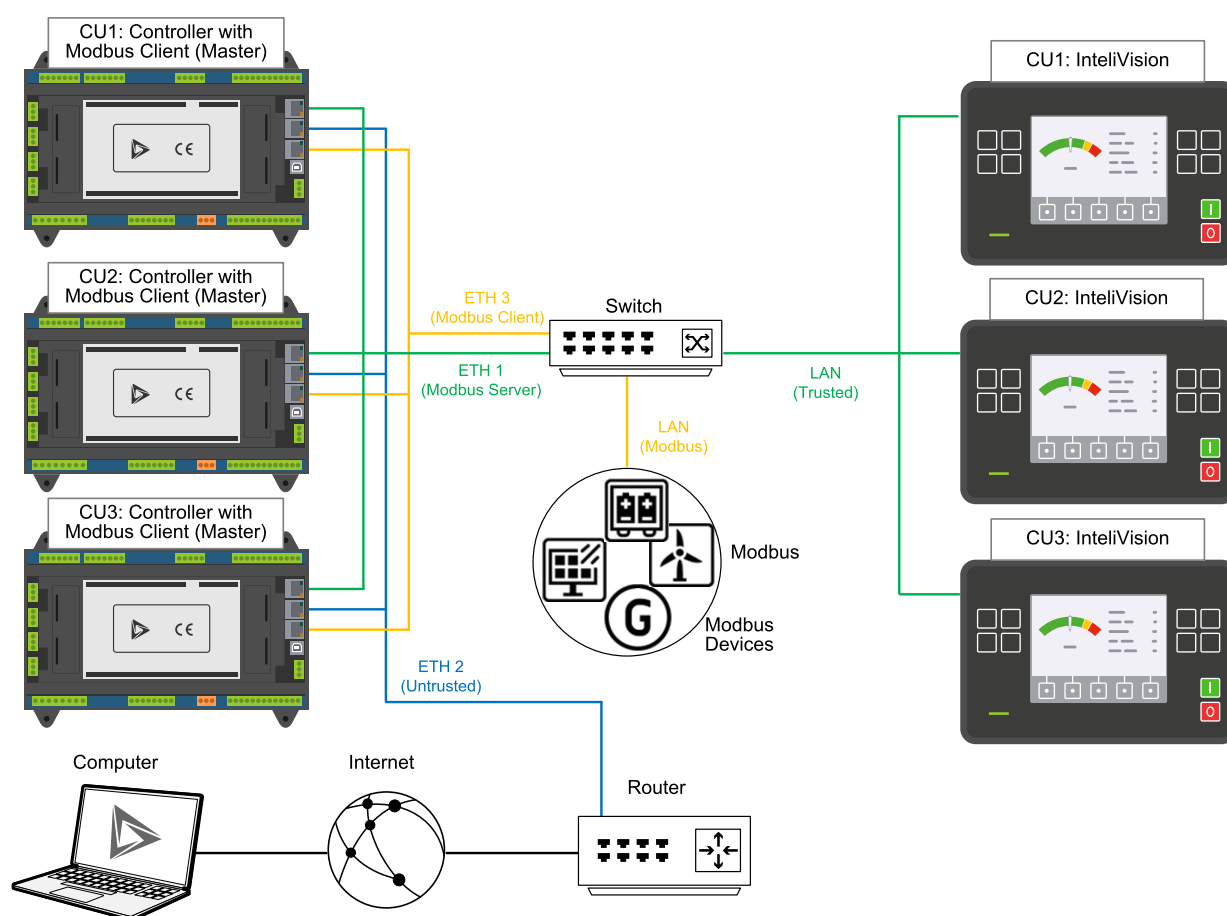


Image 6.8 Advanced Ethernet Topology With Multiple Modbus Clients

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* (page 22).

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 (page 237)**.

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 (page 237)**.

Note: Setpoint must be configured with access level 0 to allow writing it via MODBUS.

Mapping data types to registers

As there are multiple data types in the controller but only one data type in MODBUS (the register, which is 2 byte long), a mapping table is necessary to compose and decompose the MODBUS messages correctly.

Data type	Meaning	Number of registers	Data 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 MSB2 = value, byte 1 LSB2 = value, byte 0 (LSB)
Unsigned32	4-byte unsigned integer	2	MSB1 = value, byte 3 (MSB)

Data type	Meaning	Number of registers	Data mapping
			LSB1 = value, byte 2 MSB2 = value, byte 1 LSB2 = value, byte 0 (LSB)
Binary8	8-bit binary value	1	MSB = 0 LSB = value, bits 0-7
Binary16	16-bit binary value	1	MSB = value, bits 8-15 LSB = value, bits 0-7
Binary32	32-bit binary value	2	MSB1 = value, bits 24-31 LSB1 = value, bits 16-23 MSB2 = value, bits 8-15 LSB2 = value, bits 0-7
Char	1-byte ASCII character	1	MSB = 0 LSB = ASCII value of the character
StrList	Index into a list of strings	1	MSB = 0 LSB = index into the list
ShortStr	Zero-terminated string of max 15 ASCII characters.	8	MSB1 = ASCII value of the 1. character LSB1 = ASCII value of the 2. character MSB2 = ASCII value of the 3. character LSB2 = ASCII value of the 4. character ...
LongStr	Zero-terminated string of max 31 ASCII characters.	16	MSB1 = ASCII value of the 1. character LSB1 = ASCII value of the 2. character MSB2 = ASCII value of the 3. character LSB2 = ASCII value of the 4. character ...
Date	Date (dd-mm-yy)	2	MSB1 = BCD (dd) LSB1 = BCD (mm) MSB2 = BCD (yy) LSB2 = 0
Time	Time (hh-mm-ss)	2	MSB1 = BCD (hh) LSB1 = BCD (mm) MSB2 = BCD (ss) LSB2 = 0
Alarm	An item of the Alarmlist	27	MSB1 = reserved for future use LSB1 = reserved for future use MSB2 = Alarm level *) LSB2 = Alarm status **) MSB3 = alarm string ***)

Data type	Meaning	Number of registers	Data mapping
			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
4010	1	-	-	Not implemented
4211	1	write	Unsigned16	Password
4212 - 4213	2	read	Unsigned32	Communication status

Register addresses	Number of registers	Access	Data type	Meaning
4214	1	read	Unsigned8	Number of items in the Alarmlist
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
5000	1	read/write	Int16	RemoteControl2B 1 (page 514)
5001	1	read/write	Int16	RemoteControl2B 2 (page 515)
5002	1	read/write	Int16	RemoteControl2B 3 (page 515)
5003	1	read/write	Int16	RemoteControl2B 4 (page 515)
5004	1	read/write	Int16	RemoteControl2B 5 (page 515)
5005	1	read/write	Int16	RemoteControl2B 6 (page 516)
5006	1	read/write	Int16	RemoteControl2B 7 (page 516)
5007	1	read/write	Int16	RemoteControl2B 8 (page 516)
5100 - 5101	2	read/write	Int32	RemoteControl4B 1 (page 516)
5102 - 5103	2	read/write	Int32	RemoteControl4B 2 (page 517)
5104 - 5105	2	read/write	Int32	RemoteControl4B 3 (page 517)
5106 - 5107	2	read/write	Int32	RemoteControl4B 4 (page 517)
5200	1	read/write	Binary16	RemoteControlBin (page 517)

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
Mode cmd 0x03	PRG Mode	0x0000 0000
	RUN 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 Butto 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 Butto 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 Butto 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 Butto 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

* 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
01036	8213	BatteryVoltage	V	Integer	2	1	0	400	Controller I/O

Request: (Numbers in Hex)							
01	03	04	1D	00	01	15	3C
Controller address	Modbus function	Register address 041D _{hex} 1053_{dec}		Number of registers		CRC	

Response: (Numbers in Hex)						
01	03	02	00	F0	B8	00
Controller address	Modbus function	Length of data 02 _{hex} 2 bytes read	Data 00F0 _{hex} 240_{dec}		CRC	

We read value 240 from register 01036. From table of modbus registers we get dimension of read value and "Dec". Dec=1 means shift one decimal place to the right. So battery voltage is **24.0 V**.

> Reading Nominal power

» Export table of values from InteliConfig

Table: Values									
Allowed MODBUS functions: 03, 04									
Register (s)	Com.Obj.	Name	Dimension	Type	Len	Dec	Min	Max	Group
01228	9018	Nominal Mains Import	kW	Integer	2	0	0	32767	Basic Settings

Request: (Numbers in Hex)							
01	03	04	CC	00	01	45	05
Controller address	Modbus function	Register address 04CC _{hex} 1228 _{dec}		Number of registers		CRC	

Response: (Numbers in Hex)							
01	03	02	00	C8	B9	D2	
Controller address	Modbus function	Length of data 02 _{hex} 2 bytes read	Data 00C8 _{hex} 200 _{dec}		CRC		

Read nominal power is 200 kW.

➤ **Reading all binary inputs as modbus register**

Table: Values									
Allowed MODBUS functions: 03, 04									
Register (s)	Com.Obj.	Name	Dimension	Type	Len	Dec	Min	Max	Group
01068	8235	Binary Inputs		Binary#2	2	0	-	-	Controller I/O

Request: (Numbers in Hex)							
01	03	04	2C	00	01	44	F3
Controller address	Modbus function	Register address 042C _{hex} 1068 _{dec}		Number of registers		CRC	

Response: (Numbers in Hex)						
01	03	02	00	12	38	49
Controller address	Modbus function	Length of data 02 _{hex} 2 bytes read	Data 0012 _{hex} 00010010 _{bin}		CRC	

Binary inputs is 00010010. It means Binary input 2 and binary input 5 are active.

Note: You can use Modbus function 4 instead of 3, rest of data remain same (CRC differs).

> Reading specific binary inputs

Table: Binaries						
Allowed MODBUS functions: 01, 02						
Addresses Modbus Addr. Prot. Addr.	Source = Value = State	C.O.# State #	Name of Value Name of State	Bit #	Bit Name Activated by protection (s):	Group
00000	Value	8235	Binary Inputs	0	MCB Feedback	Controller I/O
00001	Value	8235	Binary Inputs	1	Remote Start/Stop	Controller I/O
00002	Value	8235	Binary Inputs	2	Remote TEST	Controller I/O

We will read state of MCB Feedback binary input.

Request: (Numbers in Hex)							
01	01	00	01	00	01	AC	0A
Controller address	Modbus function	Register address 0001 _{hex} 0001 _{dec}		Number of registers		CRC	

Response: (Numbers in Hex)					
01	01	01	01	90	48
Controller address	Modbus function	Length of data	Data	CRC	
		01 _{hex} 1 byte read	01 _{hex} active		

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).

> Nominal Power – writing

Table: Setpoints									
Allowed MODBUS functions: 03, 04, 06, 16									
Register (s)	Com.Obj.	Name	Dimension	Type	Len	Dec	Min	Max	Group
03008	8276	Nominal Power	kW	Unsigned	2	0	1	5000	Basic Settings

Request: (Numbers in Hex)							
01	06	0B	C0	00	64	8A	39
Controller address	Modbus function	Register address 0BC0 _{hex} = 3008 _{dec}		Data 0064 _{hex} = 100 _{dec}		CRC	

Response: (Numbers in Hex)							
01	06	0B	C0	00	00	8B	D2
Controller address	Modbus function	Register address 0BC0 _{hex} = 3008 _{dec}		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.lammertbies.nl/comm/info/crc-calculation.html> Use CRC-16 (Modbus)

Write LSB first.

For writing nominal power 100 kW the CRC is calculated from this data: 01060BC00064_{hex}

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7 Technical data

Power supply

Power supply range	8-36 V DC
Power consumption	16 W
RTC battery	Replaceable, type CR1632 3V
Fusing power	8 A
Consumption	2.5 A Controller + 10 x 0.5 A BOUs
Fusing E-STOP	1.2 A
Max. Heat Dissipation	16 W

Operating conditions

Operating temperature	-40 °C to +70 °C
Storage temperature	-40 °C to +80 °C
Operating humidity (norm 60068-2-30)	25/55°C, 48hours, 95 % non-condensing (EN 60068-2-30)
Protection degree	IP20
Vibration	5-25 Hz, ± 1.6 mm 25-100 Hz, $a = 4$ g
Shocks	$a = 500$ m/s ²
Surrounding air temperature rating 70 °C.	
Suitable for pollution degree 2.	

AC Current measurement

Measurement inputs	3ph Mains (Bus Left) current 1ph Bus (Bus Right) current (Auxiliary current)
Measurement range	1 A / 5 A
Maximum continuous current	2 A / 10 A
Allowed overload	18 A for 15 sec.
Accuracy	± 3 mA / ± 15 mA for 0.0 to 0.4 A / 0.0 to 2.0 A 0.75 % of value for 0.4 to 1.0 A / 2.0 to 5.0 A
Frequency range	40-70 Hz (accuracy 0.002 %)
Input impedance	0.68 M Ω ph-ph , 0.34 M Ω ph-n

AC Voltage measurement

Measurement inputs	3ph-n Mains (Bus Left) voltage 3ph-n Bus (Bus Right) voltage
Measurement range	115 V ph-N / 200 V ph-ph suitable also for VTs output 231 V ph-N / 400 V ph-ph UL, cUL: 346 V ph-N / 600 V ph-ph
Linear measurement and protection range (maximal voltage)	433 V ph-N / 750 V ph-ph
Accuracy	0.25 %
Frequency range	40-70 Hz (accuracy 0.002 %)
Input impedance	0.72 M Ω ph-ph , 0.36 M Ω ph-n
Measurement category CAT III, overvoltage category III	

E-Stop

Physically disconnects BO 1 & BO 2 from power supply.

Binary inputs

Number	12, non-isolated
Close/Open indication	0-2 V DC close contact 6-36 V DC open contact
Configurable	Pull-up / Pull-down
Pulse input	Bin 9 and 10 max. 50 Hz

Binary outputs

Number	12, non-isolated
Max. current	0.5 A
Switching to	Positive supply terminal

Analog inputs

Number	4, switchable (R/U/I)
Range	R = 0-10000 Ω ; U = 0-10 V; I = 0-20 mA
Accuracy	R: 2 % from value for 0-250 Ω R: 4% from value for 250-2500 Ω R: 6 % from value for 5000-10000 Ω U: 1% from value ± 100 mV I: 1% from value ± 200 μ A

Analog output 1

Protection	Reinforced isolation
Type	Switchable: U ± 10 V, I ± 20 mA, PWM: 0 V/5 V
Accuracy	U: 1 % from value ± 100 mV I: 1 % from value ± 200 μ A

Analog output 2

Protection	Basic isolation
Type	Switchable: U ± 10 V, I ± 20 mA, PWM: 0 V/5 V
Accuracy	U: 1 % from value ± 100 mV I: 1 % from value ± 200 μ A

Communications

USB Device	Basic isolation, USB type B
RS 485	Basic isolation
ETH1 ETH2 ETH3	10/100 Mbit
CAN 1A CAN 2A CAN 1B CAN 2B	Basic isolation, 1000/250/50 kbps , nominal impedance 120 Ω
Protocols	Modbus RTU/TCP SNMP V1/V2c/V3

Weight

Controller	750 g
Package	920 g

Controller handles 300 million records into the History, which represents roughly 1 record per second during 9,5 years. Shall be the History recording faster, the controller lifetime will become smaller.

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8.1.2 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.

Default Name	Name	Description
Maintenance Timers		
Maintenance Timers		
Maintenance Timer 1		
Maintenance Timer 1	Maintenance Timer 1	Subgroup Name
Maintenance Timer 1 Protection	Maintenance Timer 1 Protection	Setpoint - Protection
Maintenance Timer 1 RunHours	Maintenance Timer 1 RunHours	Setpoint - RunHours
Maintenance Timer 1 Interval	Maintenance Timer 1 Interval	Setpoint - Interval
Maintenance Timer 1 RunHours	Maintenance Timer 1 RunHours	Value - RunHours
Maintenance Timer 1 Interval	Maintenance Timer 1 Interval	Value - RunHours
AL Maintenance 1	AL Maintenance 1	LBO
Wrn Maintenance Timer 1 RunHours	Wrn Maintenance Timer 1 RunHours	FPS - Runhours - Wrn
BOC Maintenance Timer 1 RunHours	BOC Maintenance Timer 1 RunHours	FPS - Runhours - BOC
Wrn Maintenance Timer 1 Interval	Wrn Maintenance Timer 1 Interval	FPS - Runhours - Wrn
BOC Maintenance Timer 1 Interval	BOC Maintenance Timer 1 Interval	FPS - Runhours - BOC
Maintenance Timer 1 RunHours	Maintenance Timer 1 RunHours	Alarm - RunHours
Maintenance Timer 1 Interval	Maintenance Timer 1 Interval	Alarm - Interval
Maintenance Timer 1 Reset	Maintenance Timer 1 Reset	History - Reset
Maintenance Timer 1 Reset	Maintenance Timer 1 Reset	Reset Command
Maintenance Timer 2		
Maintenance Timer 3		
Maintenance Timer 4		
Conditioned Running Hours		
Pulse Counters		
Fast Pulse Counters		

8.1.3 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 (page 256)**.

List of group of setpoints

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List of setpoints

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Group: Basic settings

Subgroup: Name

Controller Name

Setpoint group	Basic settings	Related FW	1.1.0
Range [units]	0 .. 15 characters [-]		
Default value	InteliMains1010 SC	Force value	NO
Step	[-]		
Comm object	8637	Related applications	MCB
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 IntelliConfig or from controller's configuration menu.			

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Subgroup: Power settings

Nominal Mains Import

Setpoint group	Basic settings	Related FW	1.1.0
Range [units]	1 .. 32 000 [kW] (depends on the selected Power Formats And Units (page 168))		
Default value	200 kW (depends on the selected Power Formats And Units (page 168))	Force value	YES
Step	1 kW (depends on the selected Power Formats And Units (page 168))		
Comm object	8276	Related applications	MCB
Config level	Standard		
Setpoint visibility	Always		
Description			
Nominal power imported from the Mains.			
Mains protections/functions such as IDMT Overload Protection (page 335) and 2POverload Start Evaluation Level (page 309), etc are related to this setpoint.			

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Subgroup: Current settings

Nominal Current

Setpoint group	Basic settings	Related FW	1.1.0
Range [units]	1 .. 10000 [A]		
Default value	350A	Force value	YES
Step	1 A		
Comm object	8275	Related applications	MCB
Config level	Standard		
Setpoint visibility	Always		
Description			
Current limit for current protections and maximal continuous current.			

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Mains CT Ratio Prim

Setpoint group	Basic settings	Related FW	1.1.0
Range [units]	1 .. 15000 [A]		
Default value	500 A	Force value	NO
Step	1 A		
Comm object	8274	Related applications	MCB
Config level	Standard		
Setpoint visibility	Always		
Description			
This setpoint defines the primary range of the current transformer used for the Mains current measurement.			
Note: The setpoint is applied on all three phases of the Mains current.			
Note: The CT is usually described by this definition: CT Ratio Prim / CT Ratio Sec : Example: 100/5, 500/5, 1000/1			

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Mains CT Ratio Sec

Setpoint group	Basic settings	Related FW	1.1.0
Range [units]	/5A or /1A [-]		
Default value	/5A	Force value	NO
Step	[-]		
Comm object	10556	Related applications	MCB
Config level	Standard		
Setpoint visibility	Always		
Description			
This setpoint defines the secondary range of the current transformer used for the Mains current measurement.			
Note: <i>This setpoint is applied on all three phases of the Mains current.</i>			
Note: <i>The CT is usually described by this definition: CT Ratio Prim / CT Ratio Sec: Example: 100/5, 500/5, 1000/1</i>			

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Aux Current Ratio Prim

Setpoint group	Basic settings	Related FW	1.1.0
Range [units]	1 .. 15000 [A]		
Default value	75 A	Force value	YES
Step	1 A		
Comm object	8566	Related applications	MCB
Config level	Standard		
Setpoint visibility	Always		
Description			
This setpoint is used for settings of primary CT ratio of Auxiliary Current measurement.			
IMPORTANT: L1 Aux current must be measured otherwise the power will be calculated wrongly.			
Note: The CT is usually described by this definition: Aux Current Ratio Prim / Aux Current Ratio Sec : Example: 100/5, 500/5, 1000/1			

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Aux Current Ratio Sec

Setpoint group	Basic settings	Related FW	1.1.0
Range [units]	/1A or /5A [-]		
Default value	/5A	Force value	YES
Step	[-]		
Comm object	10557	Related applications	MCB
Config level	Standard		
Setpoint visibility	Always		
Description			
This setpoint is used for settings of secondary CT ratio of Auxiliary Current measurement.			
IMPORTANT: L1 Aux current must be measured otherwise the power will be calculated wrongly.			
<i>Note: The CT is usually described by this definition: Aux Current Ratio Prim / Aux Current Ratio Sec: Example: 100/5, 500/5, 1000/1</i>			

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Subgroup: Voltage settings

Connection type

Setpoint group	Basic settings	Related FW	1.1.0
Range [units]	3ph4Wire / High Leg D / 3ph3Wire / SplitPhase / MonoPhase [-]		
Default value	3Ph4Wire [-]	Force value	NO
Step	[-]		
Comm object	11628	Related applications	MCB
Config level	Standard		
Setpoint visibility	Always		
Description			
This setpoint defines connection type of the installation.			
3Ph4Wire	Grounded Star (Grounded Wye) connection – 3PY Three phase voltage measurement L1,L2,L3 with 120° phase shift 3x CT (Current Transformer)		
High Leg D	High Leg Delta connection Three phase voltage measurement L1,L2,L3 3x CT (Current Transformer)		
3Ph3Wire	Ungrounded Delta connection Open Delta Ungrounded Wye Corner-Grounded Delta Split Phase Delta		

	Three phase voltage measurement L1,L2,L3 with 120° phase shift No neutral is available 3x CT (Current Transformer)
SplitPhase	Double Delta connection Split Phase Two phase voltage measurement L1,L2 with 180° phase shift 2x CT (Current Transformer)
Mono Phase	Single phase voltage measurement L1-N 1x CT (Current Transformer)

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Bus AC Bus Nominal Voltage Ph-N

Setpoint group	Basic settings	Related FW	1.1.0
Range [units]	10 .. 34641 [V]		
Default value	277 V	Force value	YES
Step	1 V		
Comm object	8277	Related applications	MCB
Config level	Standard		
Setpoint visibility	Only ifConnection type (page 265) != High Leg D or Connection type (page 265) != MonoPhase		
Description			
Nominal Bus voltage (phase to neutral).			

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Bus Nominal Voltage Ph-Ph

Setpoint group	Basic settings	Related FW	1.1.0
Range [units]	10 .. 60000 [V]		
Default value	480 V	Force value	YES
Step	1 V		
Comm object	11657	Related applications	MCB
Config level	Standard		
Setpoint visibility	Always		
Description			
Nominal Bus voltage (phase to phase).			

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MainsAC Shore Nominal Voltage Ph-N

Setpoint group	Basic settings	Related FW	1.1.0
Range [units]	10 .. 34641 [V]		
Default value	277 V	Force value	YES
Step	1 V		
Comm object	9888	Related applications	MCB
Config level	Standard		
Setpoint visibility	Only ifConnection type (page 265) != High Leg D or Connection type (page 265) != MonoPhase		
Description			
Nominal Mains voltage (phase to neutral).			

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Mains Nominal Voltage Ph-Ph

Setpoint group	Basic settings	Related FW	1.1.0
Range [units]	10 .. 60000 [V]		
Default value	480 V	Force value	YES
Step	1 V		
Comm object	9907	Related applications	MCB
Config level	Standard		
Setpoint visibility	Always		
Description			
Nominal Mains voltage (phase to phase).			

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Mains VT Ratio

Setpoint group	Basic settings	Related FW	1.1.0
Range [units]	0.01 .. 6000.00 [V/V]		
Default value	1.00 V/V	Force value	NO
Step	0.01 V/V		
Comm object	20281	Related applications	MCB
Config level	Advanced		
Setpoint visibility	Always		
Description			
This setpoint adjusts the converting ratio of the voltage meas transformer used on ① MAINS (BUS-L) VOLTAGE			
Note: This setpoint is applied on all three phases of Mains voltage.			

Example:

- > No VT is in use - voltage conversion is 1/1
Mains VT Ratio = 1.00
- > VT 22kV/100V - voltage conversion is 22000/100
Mains VT Ratio = 220.00
- > VT 3.3kV/110V - voltage conversion is 3300/110
Mains VT Ratio = 30.00

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Mains Voltage Input Range Select

Setpoint group	Basic settings	Related FW	1.1.0
Range [units]	200V / 400V / 600V [-]		
Default value	600 V	Force value	YES
Step	[-]		
Comm object	10662	Related applications	MCB
Config level	Standard		
Setpoint visibility	Always		
Description			
This setpoint adjusts the range of Ph-Ph AC Voltage measurement settings (page 17) on the ① MAINS (BUS-L) VOLTAGE .			
<i>Note: It is possible to accurately measure Ph-Ph voltage which is maximally 25 % above the selected range. So the maximal accurately measured voltage for the controller is 433 V Ph-N / 750 V Ph-Ph with the selected range 600 V.</i>			
<i>Note: If MonoPhase wiring is used the ranges are approximately corresponding to 116 V, 231 V, and 346 V Ph-N.</i>			
IMPORTANT: The range has to be set to fit the expected range of the AC voltage.			

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Bus VT Ratio

Setpoint group	Basic settings	Related FW	1.1.0
Range [units]	0.01 .. 6000.00 [V/V]		
Default value	1.00 V/V	Force value	NO
Step	0.01 V/V		
Comm object	20282	Related applications	MCB
Config level	Advanced		
Setpoint visibility	Always		
Description			
This setpoint adjusts the converting ratio of the voltage meas transformer used on ② BUS (BUS-R) VOLTAGE			

Note: This setpoint is applied on all three phases of Bus voltage.

Example:

- No VT is in use - voltage conversion is 1/1
Bus VT Ratio = 1.00
- VT 22kV/100V - voltage conversion is 22000/100
Bus VT Ratio = 220.00
- VT 3.3kV/110V - voltage conversion is 3300/110
Bus VT Ratio = 30.00

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Bus Voltage Input Range

Setpoint group	Basic settings	Related FW	1.1.0
Range [units]	200V / 400V / 600V [-]		
Default value	600 V	Force value	YES
Step	[-]		
Comm object	10663	Related applications	MCB
Config level	Advanced		
Setpoint visibility	Always		
Description			
This setpoint adjusts the range of Ph-Ph AC Voltage measurement settings (page 17) on the ② BUS (BUS-R) VOLTAGE .			
<i>Note: It is possible to accurately measure Ph-Ph voltage which is maximally 25 % above the selected range. So, the maximal accurately measured voltage for the controller is 433 V Ph-N / 750 V Ph-Ph with the selected range 600 V.</i>			
<i>Note: If MonoPhase wiring is used the ranges are approximately corresponding to 116 V, 231 V, and 346 V Ph-N.</i>			
IMPORTANT: The range has to be set to fit the expected range of the AC voltage.			

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Bus Dead Level

Setpoint group	Basic settings	Related FW	1.1.0
Range [units]	0.0 .. 13.0 [%] of Bus AC Bus Nominal Voltage Ph-N (page 266) and Bus Nominal Voltage Ph-Ph (page 266)		
Default value	6.5 % of Bus AC Bus Nominal Voltage Ph-N (page 266) and Bus Nominal Voltage Ph-Ph (page 266)	Force value	NO
Step	0.1 % of Bus AC Bus Nominal Voltage Ph-N (page 266) and Bus Nominal Voltage Ph-Ph (page 266)		

Comm object	14473	Related applications	MCB
Config level	Advanced		
Setpoint visibility	Always		
Description			
This setpoint defines the percentage voltage level below which is Bus considered as dead.			

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Subgroup: Phase Rotation

Phase Rotation

Setpoint group	Basic settings	Related FW	1.1.0
Range [units]	Clockwise / Counterclockwise [-]		
Default value	Clockwise	Force value	YES
Step	[-]		
Comm object	15122	Related applications	MCB
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	1.1.0
Range [units]	33.00 .. 520.00 [Hz]		
Default value	60,00 Hz	Force value	YES
Step	0.01 Hz		
Comm object	8278	Related applications	MCB
Config level	Standard		
Setpoint visibility	Always		
Description			
Nominal frequency of system (usually 50 or 60 Hz).			

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Subgroup: Controller settings

Controller mode

Setpoint group	Basic settings	Related FW	1.1.0
Range [units]	PRG / RUN [-]		
Default value	OFF	Force value	NO
Step	[-]		
Comm object	8315	Related applications	MCB
Config level	Advanced		
Setpoint visibility	Always		
Description			
This setpoint can be used for changing the controller's mode remotely, e.g. via Modbus.			
InteliConfig: Use the mode selector on the main screen for changing the mode from the front panel.			

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Power On Mode

Setpoint group	Basic settings	Related FW	1.1.0				
Range [units]	Previous / PRG [-]						
Default value	Previous	Force value	NO				
Step	[-]						
Comm object	13000	Related applications	MCB				
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>PRG</td><td>Controller is switched into PRG mode.</td></tr></table>				Previous	Controller is switched into the last mode before power off.	PRG	Controller is switched into PRG mode.
Previous	Controller is switched into the last mode before power off.						
PRG	Controller is switched into PRG mode.						
Note: Remote modes - In case that some LBI remote mode is activated during power on of controller than this LBI has higher priority than this setpoint - controller mode is forced into mode selected via LBI. After deactivation of LBI, controller is switched into value selected via setpoint Power On Mode							

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Horn Timeout

Setpoint group	Basic settings	Related FW	1.1.0						
Range [units]	Disabled = 0; 1 .. 600; Horn Reset [s]								
Default value	10 s	Force value	NO						
Step	1 s								
Comm object	8264	Related applications	MCB						
Config level	Advanced								
Setpoint visibility	Always								
Description									
This setpoint affects horn's behavior.									
<table><tr><td>Disabled</td><td>Horn sound is disabled e.g. LBO HORN (PAGE 638) is never activated</td></tr><tr><td>1 .. 600 [s]</td><td>Timeout for LBO HORN (PAGE 638). Output opens after this time elapses</td></tr><tr><td>Horn Reset</td><td>LBO HORN (PAGE 638) is active until button Horn Reset is pressed.</td></tr></table>				Disabled	Horn sound is disabled e.g. LBO HORN (PAGE 638) is never activated	1 .. 600 [s]	Timeout for LBO HORN (PAGE 638). Output opens after this time elapses	Horn Reset	LBO HORN (PAGE 638) is active until button Horn Reset is pressed.
Disabled	Horn sound is disabled e.g. LBO HORN (PAGE 638) is never activated								
1 .. 600 [s]	Timeout for LBO HORN (PAGE 638). Output opens after this time elapses								
Horn Reset	LBO HORN (PAGE 638) is active until button Horn Reset is pressed.								
Note: Horn timeout starts again from the beginning if any new alarm appears before previous Horn timeout has elapsed.									

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Fail Safe Binary State

Setpoint group	Basic settings	Related FW	1.1.0
Range [units]	Log0 / Log1 / Last Valid State [-]		
Default value	Last Valid State	Force value	YES
Step	[-]		
Comm object	21215	Related applications	MCB
Config level	Standard		
Setpoint visibility	Always		
Description			
This setpoint adjusts behavior of all binary inputs while the received value is invalid (communication lost). Changes of the setpoint will not be applied on peripherals which are already in fail safe binary state.			
Log0		The value is logical zero.	
Log1		The value is logical one.	
Last Valid State		The value is replaced by last valid state.	

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SW Key

Setpoint group	Basic settings	Related FW	1.1.0
Range [units]	31 characters [-]		
Default value	AUTO	Force value	NO
Step	[-]		
Comm object	24258	Related applications	MCB
Config level	Advanced		
Setpoint visibility	Always		
Description			
This setpoint is designed for SW Key which unlocks premium features.			

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User Logging Record

Setpoint group	Basic settings	Related FW	1.1.0
Range [units]	Enabled / Disabled		
Default value	Enabled	Force value	NO
Step	[-]		
Comm object	23885	Related applications	MCB
Config level	Advanced		
Setpoint visibility	Always		
Description			
This setpoint enables recording of user login in/out to the controller history.			
<div><div></div><div>Example: The fallowing records will be shown in the history if enabled: User with user index (0) loegged in via ETH.</div></div>			

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Subgroup: Controller Redundancy

Hot Swap Redundancy

Setpoint group	Basic settings	Related FW	1.1.0
Range [units]	Disabled / Master / Backup [-]		
Default value	Disabled	Force value	YES
Step	-		
Comm object	16716	Related applications	MCB
Config level	Standard		
Setpoint visibility	Always		
Description			
This setpoint adjusts behavior of Hot Swap Redundancy (page 141) function.			
Disabled	Hot Swap Redundancy function is disabled.		
Master	Hot Swap Redundancy function is enabled and the controller acts as the Master device.		
Backup	Hot Swap Redundancy function is enabled and the controller acts as the Backup device.		

Note: Hot Swap Redundancy function can be enabled only if you have correct SW Key (page 273).

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Subgroup: Battery Protections

Battery Undervoltage

Setpoint group	Basic settingsBasic settings	Related FW	1.1.0
Range [units]	8.0 V .. Battery Overvoltage (page 275) [V]		
Default value	18.0 V	Force value	NO
Step	0.1 V		
Comm object	8387	Related applications	MCB
Config level	Standard		
Setpoint visibility	Always		
Description			
Warning threshold for low battery voltage.			

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Battery Overvoltage

Setpoint group	Basic settingsBasic settings	Related FW	1.1.0
Range [units]	Battery Undervoltage (page 274) .. 40.0 [V]		
Default value	36.0 V	Force value	NO
Step	0.1 V		
Comm object	9587	Related applications	MCB
Config level	Standard		
Setpoint visibility	Always		
Description			
Warning threshold for high battery voltage.			

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Battery Under And Overvoltage Delay


Setpoint group	Basic settingsBasic settings	Related FW	1.1.0
Range [units]	0 .. 600 [s]		
Default value	5 s	Force value	NO
Step	1 s		
Comm object	8383	Related applications	MCB
Config level	Standard		
Setpoint visibility	Always		
Description			
Delay for which battery voltage can be out of range given by setpoints Battery Undervoltage (page 274) and Battery Overvoltage (page 275) . After this delay elapses, appropriate alarm (AHI Battery Undervoltage (page 748) or AHI Battery Overvoltage (page 748)) is activated.			

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Subgroup: Group Settings

Control Group

Setpoint group	Basic settings	Related FW	1.1.0
Range [units]	1 .. 32 [-]		
Default value	1 [-]	Force value	YES
Step	1 [-]		
Comm object	10589	Related applications	MCB
Config level	Standard		
Setpoint visibility	Always		
Description			
This setpoint adjusts control group in which the particular controller belongs to.			
If there are no logical groups on the site, adjust this setpoint to 1. See more information in chapter Control Groups (page 193) .			

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Group Link L

Setpoint group	Basic settings	Related FW	1.1.0
Range [units]	1 .. 32 [-]		
Default value	1 [-]	Force value	YES
Step	1 [-]		
Comm object	10590	Related applications	MCB
Config level	Standard		
Setpoint visibility	Only if LBI GROUP LINK (PAGE 612) is configured		
Description			
If the input GROUP LINK (PAGE 612) of this particular controller is used to provide the "group link" information for two Control groups (to get more information refer to the chapter Control Groups (page 193)). This setpoint is used to select which group is located at the left side of the group link breaker. (bus tie breaker). If this particular controller is not used for the group link function, adjust this setpoint to 1.			

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Group Link R

Setpoint group	Basic settings	Related FW	1.1.0
Range [units]	1 .. 32 [-]		
Default value	2 [-]	Force value	YES
Step	1 [-]		
Comm object	10591	Related applications	MCB
Config level	Standard		
Setpoint visibility	Only if LBI GROUP LINK (PAGE 612) is configured		
Description			
If the input GROUP LINK (PAGE 612) of this particular controller is used to provide the "group link" information for two Control groups (to get more information refer to the chapter Control Groups (page 193)). 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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Subgroup: Time & Date

Time

Setpoint group	Basic settings	Related FW	1.1.0
Range [units]	HH:MM:SS [-]		
Default value	0:0:0	Force value	NO
Step	[-]		
Comm object	24554	Related applications	MCB
Config level	Standard		
Setpoint visibility	Always		
Description			
Real time clock adjustment.			

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Date

Setpoint group	Basic settings	Related FW	1.1.0
Range [units]	YYYY-MM-DD [-]		
Default value	2017-01-01	Force value	NO
Step	[-]		
Comm object	24553	Related applications	MCB
Config level	Standard		
Setpoint visibility	Always		
Description			
Actual date adjustment.			

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Time Stamp Act

Setpoint group	Scheduler	Related FW	1.1.0
Range [units]	Disabled / Condition / Always [-]		
Default value	Enabled	Force value	NO
Step	[-]		
Comm object	10532	Related applications	MCB
Config level	Standard		
Setpoint visibility	Always		
Description			
This setpoint adjusts the behavior of periodic history records.			
Disabled	Periodic history records are disabled.		
Condition	Periodic history records are enabled. Records are written to the history according to the setpoint Time Stamp Period if LBI Time Stamp Act is activated.		
Always	Periodic history records are enabled. Records are written to the history according to setpoint Time Stamp Period.		

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Time Stamp Period

Setpoint group	Basic settings	Related FW	1.1.0
Range [units]	Off / 1 .. 240 [min]		
Default value	60 min	Force value	YES
Step	1 min		
Comm object	8979	Related applications	MCB
Config level	Standard		
Setpoint visibility	Always		
Description			
Time interval for periodic history records.			

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Time Zone

Setpoint group	Basic settings	Related FW	1.1.0
Range [units]	GMT-12:00 .. GMT+13:00 [hours]		
Default value	GMT+1:00	Force value	NO
Step	[-]		
Comm object	24366	Related applications	MCB
Config level	Standard		
Setpoint visibility	Always		
Description			
This setpoint is used to select the time zone where the controller is located. See your computer time zone setting (click on the time indicator located in the rightmost position of the Windows task bar) if you are not sure about your time zone.			
Note: <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	Basic settings	Related FW	1.1.0
Range [units]	Disabled / Auto / Manual		
Default value	Auto	Force value	NO
Step	[-]		
Comm object	20250	Related applications	MCB
Config level	Standard		
Setpoint visibility	Always		
Description			
This setpoints is used to enable or disable daylight saving time.			
<div><div>></div><div>AUTO - activation / deactivation of the DST, and changing of the RTC Time value accordingly is performed automatically by the controller. The user always sees valid local time without any action from his side.</div></div>			
<div><div>></div><div>MANUAL - activation, and deactivation of the DST is performed manually by the user via the setpoint Time mode. Changing of the RTC Time value accordingly is then performed automatically by the controller. So the user does not need to readjust the RTC time, he only needs to select the proper Time Mode (page 280).</div></div>			
<div><div>></div><div>DISABLED - 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	Basic settings	Related FW	1.1.0
Range [units]	STD / DST		
Default value	DST	Force value	NO
Step	[-]		
Comm object	20249	Related applications	MCB
Config level	Standard		
Setpoint visibility	Only if DST Switching Mode = Manual		
Description			
In manual DST Switching Mode (page 279) 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	Basic settings	Related FW	1.1.0
Range [units]	Australia / Chile / Europe / Mexico / New Zealand / Paraguay / US/Canada		
Default value	US/Canada	Force value	NO
Step	[-]		
Comm object	20251	Related applications	MCB
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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Group: Synchronization

Subgroup: Synchronization

Synchronization Type

Setpoint group	Synchronization	Related FW	1.1.0
Range [units]	PhaseMatch / SlipSynchr [-]		
Default value	PhaseMatch	Force value	YES
Step	[-]		
Comm object	14802	Related applications	MCB
Config level	Standard		
Setpoint visibility	Always		
Description			
This setpoint adjusts the type of Synchronization (page 188) .			
➤ PhaseMatch			
This type of synchronization is based on voltage and phase shift match. Limits are adjusted via setpoints Voltage Window (page 283) and Phase Window (page 284) . When voltage and phase shift match the breaker close command is sent after Dwell Time (page 284) is elapsed.			
➤ SlipSynchr			
This type of synchronization regulates the voltage to match Voltage Window (page 283) and Bus Frequency (page 466) to match the Mains Frequency (page 453) + Slip Frequency (page 285) . When this frequency is reached, Dwell Time (page 284) 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 MCB Latency (page 286).			
Note: Synchronization is not allowed if there is any already synchronized Mains Controller in the control group.			

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Voltage Matching

Setpoint group	Synchronization	Related FW	1.1.0
Range [units]	Enabled/Disabled [-]		
Default value	Enabled	Force value	YES
Step	[-]		
Comm object	8645	Related applications	MCB
Config level	Standard		
Setpoint visibility	Always		
Description			
<p>This setpoint defines whether voltage regulation will be enabled during synchronization.</p> <p>➤ Enabled: Voltage matching during the Run or Check synchronization types is allowed.</p> <p>➤ Disabled: Voltage matching during synchronization is not allowed. Voltage regulation is frozen during active synchronization.</p> <p><i>Note: Disabled option is suitable for adjusting the voltage using a potentiometer directly on AVR.</i></p>			

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Auto Re-synchronize

Setpoint group	Synchronization	Related FW	1.1.0
Range [units]	Enabled/Disabled [-]		
Default value	Disabled	Force value	YES
Step	[-]		
Comm object	19661	Related applications	MCB
Config level	Standard		
Setpoint visibility	Always		
Description			
This setpoint defines what will happen if the breaker is opened and the command for synchronization / breaker closure is still active.			
<div><div>></div><div>Enabled: If synchronism is lost / breaker is opened and LBI SYNCHRONIZATION RUN (PAGE 621) or SYNCHRONIZATION PERMISSIVE (PAGE 621) is still active the controller will activate synchronization again.</div></div>			
<div><div>></div><div>Disabled: If synchronism is lost / breaker is opened and LBI for synchronization is still active the controller will not activate synchronization again until the currently activated LBI is deactivated and any synchro LBI is activated again.</div></div>			

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Synchronization Timeout

Setpoint group	Synchronization	Related FW	1.1.0
Range [units]	1 .. 1800 [s] / No Timeout		
Default value	60 s	Force value	YES
Step	1 s		
Comm object	8657	Related applications	MCB
Config level	Standard		
Setpoint visibility	Always		
Description			
This setpoint adjusts the maximum duration of Synchronization (page 188) .			
<i>Note: If this setpoint is adjusted to No Timeout then automatic restart of synchronization occurs every 180s. This method helps to synchronize successfully even in difficult conditions.</i>			

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Voltage Window

Setpoint group	Synchronization	Related FW	1.1.0
Range [units]	0,0 .. 100,0 [%]		
Default value	10,0 %	Force value	YES
Step	0,1 %		
Comm object	8650	Related applications	MCB
Config level	Standard		
Setpoint visibility	Always		
Description			
This setpoint adjusts the maximal voltage difference between respective phases of Mains and Bus for Synchronization (page 188). (Bus Voltage L1-N (page 466), Mains Voltage L1-N (page 454), Bus Voltage L2-N (page 466),Mains Voltage L2-N (page 454), ...)			

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Setpoint group	Synchronization	Related FW	1.1.0
Range [units]	-120 .. 120 [°]		
Default value	0 °	Force value	YES
Step	1 °		
Comm object	9578	Related applications	MCB
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	1.1.0
Range [units]	0 .. 90 [°]		
Default value	10 °	Force value	YES
Step	1 °		
Comm object	8652	Related applications	MCB
Config level	Standard		
Setpoint visibility	Only if Synchronization Type (page 281) = PhaseMatch		
Description			
This setpoint adjusts the maximal Slip Angle (page 457) for Synchronization (page 188) . In order to disable breaker close command, adjust this setpoint to 0. Synchronization procedure will be active for Synchronization Timeout (page 283) or until breaker is closed from an external device.			

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Dwell Time

Setpoint group	Synchronization	Related FW	1.1.0
Range [units]	0,0 .. 25,0 [s]		
Default value	0,3 s	Force value	YES
Step	0,1 s		
Comm object	8653	Related applications	MCB
Config level	Standard		
Setpoint visibility	Always		
Description			
The period of time that the phase angle difference must be within Phase Window (page 284) and voltage difference within Voltage Window (page 283) before the breaker is closed.			

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Slip Frequency

Setpoint group	Synchronization	Related FW	1.1.0
Range [units]	-0,50 .. 0,50 [Hz]		
Default value	-0,25 Hz	Force value	YES
Step	0,01 Hz		
Comm object	14798	Related applications	MCB
Config level	Standard		
Setpoint visibility	Only if Synchronization Type (page 281) = SlipSynchr		
Description			
This setpoint adjusts the required Bus Frequency (page 466) during synchronization while Synchronization Type (page 281) = SlipSynchr.			
<i>Note: Required Bus Frequency (page 466) = Mains Frequency (page 453) + Slip Frequency.</i>			

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Slip Frequency Window

Setpoint group	Synchronization	Related FW	1.1.0
Range [units]	0,01 .. 0,50 [Hz]		
Default value	0,15 Hz	Force value	YES
Step	0,01 Hz		
Comm object	14799	Related applications	MCB
Config level	Standard		
Setpoint visibility	Only if Synchronization Type (page 281) = SlipSynchr		
Description			
Window of slip frequency for slip synchronization (Synchronization Type (page 281) = SlipSynchr).			

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MCB Latency

Setpoint group	Synchronization	Related FW	1.1.0
Range [units]	20 .. 1 000 [ms]		
Default value	80 ms	Force value	YES
Step	1 ms		
Comm object	14801	Related applications	MCB
Config level	Standard		
Setpoint visibility	Only if Synchronization Type (page 281) = SlipSynchr		
Description			
Latency of MCB.			
IMPORTANT: This setpoint is enable, when Synchronization Type (page 281) has Split Synchro value			

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Subgroup: Breaker Control Mode

MCB Contactor Logic

Setpoint group	Synchronization	Related FW	1.1.0
Range [units]	Close-On / Close-Off [-]		
Default value	Close-Off	Force value	YES
Step	[-]		
Comm object	8444	Related applications	MCB
Config level	Advanced		
Setpoint visibility	Always		

Description

This setpoint adjusts the behavior of LBO **MCB CLOSE/OPEN** (PAGE 641) and LBI **MCB FEEDBACK** (PAGE 616).

Close On	When LBO MCB CLOSE/OPEN (PAGE 641) is closed – LBI MCB FEEDBACK (PAGE 616) should be closed.
Close Off	When LBO MCB CLOSE/OPEN (PAGE 641) is closed – LBI MCB FEEDBACK (PAGE 616) should be opened.

Binary output
MCB Close /Open

Close

Open

Mains ok

Mains failure

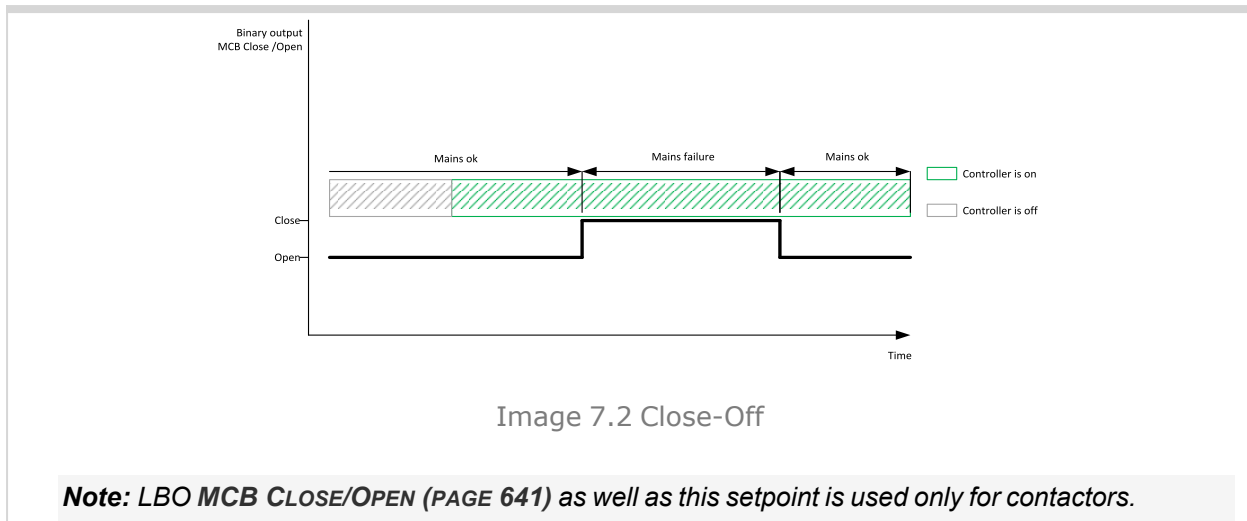
Mains ok

Controller is on

Controller is off

Time

Image 7.1 Close-On



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MCB Opens On

Setpoint group	Synchronization	Related FW	1.1.0
Range [units]	Mains Fail / Gen Run [-]		
Default value	Mains Fail	Force value	YES
Step	[-]		
Comm object	9850	Related applications	MCB
Config level	Advanced		
Setpoint visibility	Always		
Description			
This setpoint adjusts behavior of MCB opening during Controller mode (page 271) = RUN .			
Mains Fail	MCB open command is sent immediately after Mains fail conditions are evaluated.		
Gen Run	MCB will be opened after Gen-set is running.		
	Note: This option should be used for MCB using 230 V control without of the undervoltage coil.		

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MCB Control Mode

Setpoint group	Synchronization	Related FW	1.1.0
Range [units]	Internal / External [-]		
Default value	Internal	Force value	YES
Step	[-]		
Comm object	9873	Related applications	MCB
Config level	Advanced		
Setpoint visibility	Always		
Description			

This setpoint adjusts control mode of MCB.

Internal	<p>The MCB breaker is controlled by controller.</p> <p>The controller accepts the opening of MCB from the external device (Mains relay). When the MCB is opened externally then:</p> <ul style="list-style-type: none"> ➤ The event "MCB opened Externally" is recorded in history log <p>Incorrect reaction of the MCB FEEDBACK (PAGE 616) to internal MCB Close/Open command causes Hst MCB Fail (page 753)</p>
External	<p>Controller does not control the MCB at all. The MCB is controlled externally, when the MCB FEEDBACK (PAGE 616) gets changed, then the event "MCB Opened" or "MCB Closed" is recorded to the history log.</p> <p>Controller always accepts the MCB FEEDBACK (PAGE 616) without of issuing any alarm.</p> <p>The controller informs the superordinate system about the status of the breaker automaton using the signal</p> <ul style="list-style-type: none"> ➤ LBO SYNCHRONIZATION (PAGE 648)

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Attempts To Close Breaker

Setpoint group	Synchronization	Related FW	1.1.0
Range [units]	1 .. 5 [-]		
Default value	2	Force value	NO
Step	1 [-]		
Comm object	19885	Related applications	MCB
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.			
<div>Example: If the breaker feedback is not received at the end of the attempt, an alarm is not issued, unless it was the last attempt to close the breaker.</div>			

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Delay Between Closing Attempts

Setpoint group	Synchronization	Related FW	1.1.0
Range [units]	20 .. 60 [s]		
Default value	20 [s]	Force value	NO
Step	1 [s]		
Comm object	19883	Related applications	MCB
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 breaker's 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	Synchronization	Related FW	1.1.0
Range [units]	1 .. 60 [s]		
Default value	2	Force value	YES
Step	1 [-]		
Comm object	19884	Related applications	MCB
Config level	Advanced		
Setpoint visibility	Always		
Description			
This setpoint adjusts the length of breaker closing attempt.			
<div><div></div><div>Example: When set to 10s, the LBO MCB ON COIL (PAGE 643) is set for 10 s.</div></div>			

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Mains Coupling

Setpoint group	Synchronization	Related FW	1.1.0				
Range [units]	Enabled / Disabled [-]						
Default value	Disabled	Force value	YES				
Step	[-]						
Comm object	11037	Related applications	MCB				
Config level	Standard						
Setpoint visibility	Always						
Description							
This setpoint defines how the controller cooperates with other mains controllers in the system where common busbar is supplied from multiple mains incomers.							
<table><tr><td>Disabled</td><td>It is forbidden to close the MCB if there is mains voltage on the bus.</td></tr><tr><td>Enabled</td><td>It is allowed to close the MCB if there is mains voltage on the bus.</td></tr></table>				Disabled	It is forbidden to close the MCB if there is mains voltage on the bus.	Enabled	It is allowed to close the MCB if there is mains voltage on the bus.
Disabled	It is forbidden to close the MCB if there is mains voltage on the bus.						
Enabled	It is allowed to close the MCB if there is mains voltage on the bus.						

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Group: Frequency/Load Control

Subgroup: Load Control

Import Load

Setpoint group	Frequency/Load Control	Related FW	1.1.0
Range [units]	-32 000 .. 32 000 [kW] (depends on the selected Power Formats And Units (page 168)))		
Default value	0 kW (depends on the selected Power Formats And Units (page 168)))	Force value	NO
Step	1 kW (depends on the selected Power Formats And Units (page 168)))		
Comm object	8641	Related applications	MCB
Config level	Standard		
Setpoint visibility	Always		
Description			
Defines actual imported (exported) active power in parallel to mains operations in Import/Export mode or the minimal imported (maximal exported) active power from the Mains in Baseload with I/E Limit mode. See chapter Load control (page 204) for more information.			
Note: <i>If the value of the setpoint is >0 the power is imported from the Mains, if the setpoint value is <0, then the power is exported to the mains.</i>			

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#System Baseload

Setpoint group	Frequency/Load Control	Related FW	1.1.0
Range [units]	0 .. 32 000 [kW] (depends on the selected Power Formats And Units (page 168))		
Default value	25 kW (depends on the selected Power Formats And Units (page 168))	Force value	NO
Step	1 kW (depends on the selected Power Formats And Units (page 168))		
Comm object	8775	Related applications	MCB
Config level	Standard		
Setpoint visibility	Always		
Description			
Required total active power of the controller group in parallel to mains operation in Baseload mode. See chapter Load control (page 204) for more information.			
Note: The # setpoints are shared with all controllers on site.			
Note: The # setpoints are shared with all controllers on site via intercontroller CAN line.			

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Import/Export Limitation

Setpoint group	Frequency/Load Control	Related FW	1.1.0
Range [units]	Enabled / Disabled [-]		
Default value	Disabled	Force value	NO
Step	[-]		
Comm object	9592	Related applications	MCB
Config level	Standard		
Setpoint visibility	Always		
Description			
Enable or disable limitation for Import/Export. If the limitation is enabled, then the request for the power of the System is limited to prevent the Import go below the limit which is give by the setpoint Import Load (page 290).			
Example: If the Import Load is set to -5 kW the maximum power exported to the Mains is 5 kW. If the Import Load is set to 5 kW the minimum power imported from the Mains is 5 kW.			

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Subgroup: Rated Change

Raise Load Rate

Setpoint group	Frequency/Load Control	Related FW	1.1.0
Range [units]	0,01 ... 100 [%/s]		
Default value	1,00	Force value	YES
Step	[% of Nominal Mains Import (page 262)/s]		
Comm object	19637	Related applications	MCB
Config level	Standard		
Setpoint visibility	Always		
Description			
<p>This setpoint sets relative rate of Required P Target (page 484) per second if LBI LOAD RAISE (PAGE 614) is active and System Baseload or Import/Export load control is used.</p> <p>If the LBI LOAD RAISE (PAGE 614) is activated the load request will be increasing with the rate defined by this setpoint.</p>			
Note: This setpoint is related to the Nominal Mains Import (page 262) .			

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Lower Load Rate

Setpoint group	Frequency/Load Control	Related FW	1.1.0
Range [units]	0,01 ... 100 [%/s]		
Default value	1,00	Force value	YES
Step	[% of Nominal Mains Import (page 262)/s]		
Comm object	19638	Related applications	MCB
Config level	Standard		
Setpoint visibility	Always		
Description			
<p>This setpoint sets relative rate of Required P Target (page 484) per second if LBI LOAD LOWER (PAGE 614) is active and System Baseload or Import/Export load control is used.</p> <p>If the LBI LOAD LOWER (PAGE 614) is activated the load request will be increasing with the rate defined by this setpoint.</p>			
Note: This setpoint is related to the Nominal Mains Import (page 262) .			

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Frequency Regulation Rate


Setpoint group	Frequency/Load Control	Related FW	1.1.0
Range [units]	0,001 ... 100 [%/s]		
Default value	0,100	Force value	YES
Step	[%/s]		
Comm object	19634	Related applications	MCB
Config level	Standard		
Setpoint visibility	Always		
Description			
This setpoint sets rate of Loadsharing Output (page 485) per second if LBI LOAD LOWER (PAGE 614) or LOAD RAISE (PAGE 614) is active and Multiple Island Operation is active.			
<i>Note: This setpoint is related directly to the Loadsharing Output (page 485).</i>			

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Subgroup: Regulation Loops

Load Gain

Setpoint group	Frequency/Load Control	Related FW	1.1.0
Range [units]	0,00 .. 200,00 [-]		
Default value	10,00 [-]	Force value	YES
Step	0,01 [-]		
Comm object	8659	Related applications	MCB
Config level	Standard		
Setpoint visibility	Always		
Description			
This setpoint adjusts the gain factor (P-factor) of the load control PI loop.			
Note: See the chapter <i>Regulation Loops (page 225)</i> for more information.			

 back to List of setpoints

Load Int

Setpoint group	Frequency/Load Control	Related FW	1.1.0
Range [units]	0,10 .. 60,00 [s]		
Default value	2,00 [s]	Force value	YES
Step	0,01 [s]		
Comm object	8713	Related applications	MCB
Config level	Standard		
Setpoint visibility	Always		
Description			
This setpoint adjusts the integration factor (I-factor) of the load control PI loop.			
Note: See the chapter <i>Regulation Loops (page 225)</i> for more information.			

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Frequency Gain

Setpoint group	Frequency/Load Control	Related FW	1.1.0
Range [units]	0,00 .. 200,00 [-]		
Default value	10,00 [-]	Force value	YES
Step	0,01 [-]		
Comm object	8715	Related applications	MCB
Config level	Standard		
Setpoint visibility	Always		
Description			
This setpoint adjusts the gain factor (P-factor) of the frequency control PI loop.			
Note: See the chapter Regulation Loops (page 225) for more information.			

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Frequency Int

Setpoint group	Frequency/Load Control	Related FW	1.1.0
Range [units]	0,10 .. 60,00 [s]		
Default value	2,00 [s]	Force value	YES
Step	0,01 [s]		
Comm object	8716	Related applications	MCB
Config level	Standard		
Setpoint visibility	Always		
Description			
This setpoint adjusts the integration factor (I-factor) of the frequency control PI loop.			
Note: See the chapter Regulation Loops (page 225) for more information.			

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Angle Gain

Setpoint group	Frequency/Load Control	Related FW	1.1.0
Range [units]	0,00 .. 200,00 [-]		
Default value	10,00 [-]	Force value	YES
Step	0,01 [-]		
Comm object	8718	Related applications	MCB
Config level	Standard		
Setpoint visibility	Always		
Description			
This setpoint is used for adjusting of the gain factor (P-factor) of the phase angle P-control loop.			
Note: During synchronization, first the frequency loop is started to match the System frequency with the mains or bus and after that the phase angle loop is started to match the phase angle.			
Note: See the chapter <i>Regulation Loops</i> (page 225) for more information.			

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Subgroup: Load Transfer

Generator Unload GCB Open Window

Setpoint group	Frequency/Load Control	Related FW	1.1.0
Range [units]	0 .. 100 [%] of Running Nominal P In Load Shar (page 481)		
Default value	10 % of Running Nominal P In Load Shar (page 481)	Force value	YES
Step	1 % of Running Nominal P In Load Shar (page 481)		
Comm object	8547	Related applications	
Config level	Standard		
Setpoint visibility	Always		
Description			
<p>This setpoint adjusts the required value of the Total Running P In Load Shar (page 482) for GCB Opening function which will send command to all Gen-sets in Load Shar to do the Soft Unload and open GCB.</p> <p>The opening command is issued only if opening level is reached and LBI Load Lower (during System Baseload) or Load Raise (during Import/Export) is active.</p> <p>Note: This setpoint should be above Minimal Power PTM (page 334) level so the system is able to reach the window.</p>			

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Mains Unload MCB Open Window

Setpoint group	Frequency/Load Control	Related FW	1.1.0
Range [units]	0 .. 100 [%] of Nominal Mains Import (page 262)		
Default value	% of Nominal Mains Import (page 262)	Force value	YES
Step	1 % of Nominal Mains Import (page 262)		
Comm object	14694	Related applications	MCB
Config level	Standard		
Setpoint visibility	Always		
Description			
This setpoint adjusts the value which defines the level where the Mains is considered as unloaded. When this window is reached and it is required to open MCB, the MCB will be opened and remaining load in the window will be transfer to Mainss.			
IMPORTANT: If the window is set too high the Mains can be considered as unloaded and MCB will be opened while there is not enough reserve power on Mainss. This can cause overload of Mainss and blackout.			
IMPORTANT: This window and the setpoint Minimal Power PTM (page 334) must be set in the way where MCB opening will not be blocked by Minimal Power PTM level while all available Mainss are running in Load Shar.			
Note: This setpoint is window. It means that when you adjust this setpoint to 10%, there is window from -10% to +10%. The reason is Import/Export function.			

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Load Ramp

Setpoint group	Frequency/Load Control	Related FW	1.1.0
Range [units]	0 .. 600 [s]		
Default value	200 s	Force value	YES
Step	1 s		
Comm object	8658	Related applications	MCB
Config level	Standard		
Setpoint visibility	Always		
Description			
This setpoint adjusts the ramping time of Required P (page 484) to Required P Target (page 484) while loading/unloading.			
The ramping time is set for ΔP which is given by the value Running Nominal Power Of All (page 481) .			
Example: Running Nominal Power Of All (page 481) = 20 kW, Load Ramp = 10 seconds. The ramp is changing with speed 20 kW per 10 seconds (2 kW/s) to the zero value.			

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Subgroup: Power Switch

System Power Switch 1 On

Setpoint group	Frequency/Load Control	Related FW	1.1.0
Range [units]	0,0 .. 100,0 %		
Default value	0,0 %	Force value	YES
Step	0,1 % of Running Nominal Power Of All (page 481)		
Comm object	11658	Related applications	MCB
Config level	Advanced		
Setpoint visibility	All the time		
Description			
Threshold level for switching the LBO POWER SWITCH 1 (PAGE 646) on.			

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System Power Switch 1 Off

Setpoint group	Frequency/Load Control	Related FW	1.1.0
Range [units]	0,0 .. 100,0 %		
Default value	10,0 %	Force value	YES
Step	0,1 % of Running Nominal Power Of All (page 481)		
Comm object	11659	Related applications	MCB
Config level	Advanced		
Setpoint visibility	All the time		
Description			
Threshold level for switching the LBO POWER SWITCH 1 (PAGE 646) off.			

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System Power Switch 2 On

Setpoint group	Frequency/Load Control	Related FW	1.1.0
Range [units]	0,0 .. 100,0 %		
Default value	100,0 %	Force value	YES
Step	0,1 % of Running Nominal Power Of All (page 481)		
Comm object	19532	Related applications	MCB
Config level	Advanced		
Setpoint visibility	All the time		
Description			
Threshold level for switching the LBO POWER SWITCH 2 (PAGE 647) on.			

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System Power Switch 2 Off

Setpoint group	Frequency/Load Control	Related FW	1.1.0
Range [units]	0,0 .. 100,0 %		
Default value	90,0 %	Force value	YES
Step	0,1 % of Running Nominal Power Of All (page 481)		
Comm object	19533	Related applications	MCB
Config level	Advanced		
Setpoint visibility	All the time		
Description			
Threshold level for switching the LBO POWER SWITCH 2 (PAGE 647) off.			

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Subgroup: High/Low Limits

Mains P Limit

Setpoint group	Frequency/Load Control	Related FW	1.1.0
Range [units]	Enable / Disable [-]		
Default value	Disable	Force value	YES
Step	[-]		
Comm object	19535	Related applications	MCB
Config level	Standard		
Setpoint visibility	Always		
Description			
This setpoint is used to enable/disable Mains High/Low Limits..			

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Mains P High Limit On

Setpoint group	Frequency/Load Control	Related FW	1.1.0
Range [units]	High Limit Off .. 100,0 [% of Nominal Mains Import (page 262)]		
Default value	100,0 %	Force value	YES
Step	0,1 [%]		
Comm object	19536	Related applications	MCB
Config level	Standard		
Setpoint visibility	Always		
Description			
This setpoint specifies the trigger level for Mains power high limit.			

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Mains P High Limit Off

Setpoint group	Frequency/Load Control	Related FW	1.1.0
Range [units]	Low Limit Off .. High Limit On [% of Nominal Mains Import (page 262)]		
Default value	95,0 %	Force value	YES
Step	0,1 [%]		
Comm object	19537	Related applications	MCB
Config level	Standard		
Setpoint visibility	Always		
Description			
This setpoint specifies the off-level for Mains power high limit.			

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Mains P Low Limit On

Setpoint group	Frequency/Load Control	Related FW	1.1.0
Range [units]	0,0 .. Low Limit Off [% of Nominal Mains Import (page 262)]		
Default value	0,0 %	Force value	YES
Step	0,1 [%]		
Comm object	19538	Related applications	MCB
Config level	Standard		
Setpoint visibility	Always		
Description			
This setpoint specifies the trigger level for Mains power low limit.			

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Mains P Low Limit Off

Setpoint group	Frequency/Load Control	Related FW	1.1.0
Range [units]	Low Limit On .. High Limit Off [% of Nominal Mains Import (page 262)]		
Default value	5,0 %	Force value	YES
Step	0,1 [%]		
Comm object	19539	Related applications	MCB
Config level	Standard		
Setpoint visibility	Always		
Description			
This setpoint specifies the off-level for Mains power low limit.			

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System P Limit

Setpoint group	Frequency/Load Control	Related FW	1.1.0
Range [units]	Enable / Disable [-]		
Default value	Disable	Force value	YES
Step	[-]		
Comm object	19540	Related applications	MCB
Config level	Standard		
Setpoint visibility	Always		
Description			
This setpoint is used to enable/disable System High/Low Limits..			

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System P High Limit On

Setpoint group	Frequency/Load Control	Related FW	1.1.0
Range [units]	High Limit Off .. 100,0 [% of Loadsharing Output (page 485)]		
Default value	100,0 %	Force value	YES
Step	0,1 [%]		
Comm object	19541	Related applications	MCB
Config level	Standard		
Setpoint visibility	Always		
Description			
This setpoint specifies the trigger level for System power high limit.			

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System P High Limit Off

Setpoint group	Frequency/Load Control	Related FW	1.1.0
Range [units]	Low Limit Off .. High Limit On [% of Loadsharing Output (page 485)]		
Default value	95,0 %	Force value	YES
Step	0,1 [%]		
Comm object	19542	Related applications	MCB
Config level	Standard		
Setpoint visibility	Always		
Description			
This setpoint specifies the off-level for System power high limit.			

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System P Low Limit On

Setpoint group	Frequency/Load Control	Related FW	1.1.0
Range [units]	0,0 .. Low Limit Off [% of Loadsharing Output (page 485)]		
Default value	0,0 %	Force value	YES
Step	0,1 [%]		
Comm object	19543	Related applications	MCB
Config level	Standard		
Setpoint visibility	Always		
Description			
This setpoint specifies the trigger level for System power low limit.			

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System P Low Limit Off

Setpoint group	Frequency/Load Control	Related FW	1.1.0
Range [units]	Low Limit On .. High Limit Off [% of Loadsharing Output (page 485)]		
Default value	5,0 %	Force value	YES
Step	0,1 [%]		
Comm object	19544	Related applications	MCB
Config level	Standard		
Setpoint visibility	Always		
Description			
This setpoint specifies the off-level for System power low limit.			

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Group: VAR Control

Subgroup: PF/Q Control

PF/Q Control Mode

Setpoint group	VAR Control	Related FW	1.1.0				
Range [units]	PF Control / Q Control [-]						
Default value	PF Control	Force value	NO				
Step	[-]						
Comm object	10120	Related applications	MCB				
Config level	Standard						
Setpoint visibility	Always						
Description							
This setpoint adjust the type of PF/Q control.							
<table><tr><td>PF Control</td><td>The Total Running Power Factor (page 483) is controlled according to preset required value. See PF Control (page 205) for more information.</td></tr><tr><td>Q Control</td><td>The Total Running Q (page 483) is controlled according to preset required value. See PF Control (page 205) for more information.</td></tr></table>				PF Control	The Total Running Power Factor (page 483) is controlled according to preset required value. See PF Control (page 205) for more information.	Q Control	The Total Running Q (page 483) is controlled according to preset required value. See PF Control (page 205) for more information.
PF Control	The Total Running Power Factor (page 483) is controlled according to preset required value. See PF Control (page 205) for more information.						
Q Control	The Total Running Q (page 483) is controlled according to preset required value. See PF Control (page 205) for more information.						
Actual selected control mode is available in System PF/Q Control (page 487) .							

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PF/Q Request Source

Setpoint group	VAR Control	Related FW	1.1.0
Range [units]	Setpoint / Analog External Value [-]		
Default value	Setpoint	Force value	YES
Step	[-]		
Comm object	16130	Related applications	MCB
Config level	Standard		
Setpoint visibility	Always		
Description			
This setpoint adjust the source type requested of PF/Q control. See PF Control (page 205) for more information.			

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Import Power Factor

Setpoint group	VAR Control	Related FW	1.1.0
Range [units]	0,001 .. 1,999 [-]		
Default value	1 [-]	Force value	NO
Step	0,001 [-]		
Comm object	8642	Related applications	MCB
Config level	Standard		
Setpoint visibility	Always		
Description			
Defines required power factor in parallel to mains operation in PF Control IMP/EXP mode.			
See chapter PF Control (page 205) for more information.			
Note: <i>If the setpoint value is >1 the Mains Load Character is C, if the setpoint value is <0 the Mains Load Character is L.</i>			

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Import Q

Setpoint group	VAR Control	Related FW	1.1.0
Range [units]	-32000 .. 32000 [kVAr] (depends on the selected Power Formats And Units (page 168))		
Default value	0 kVAr	Force value	NO
Step	1 kVAr (depends on the selected Power Formats And Units (page 168))		
Comm object	14143	Related applications	MCB
Config level	Standard		
Setpoint visibility	Always		
Description			
Defines actual imported (exported) reactive power in parallel to mains operations in Q Control IMP/EXP Mode.			
See chapter Q Control (page 206) for more information.			
Note: <i>If the value of the setpoint is >0 the power is imported from the mains, if the setpoint value is <0, then the power is exported to the mains.</i>			

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#System Power Factor

Setpoint group	VAR Control	Related FW	1.1.0
Range [units]	0,60 .. 1,20 [-]		
Default value	1,00 [-]	Force value	NO
Step	0,01 [-]		
Comm object	8776	Related applications	MCB
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.			
See chapter PF Control (page 205) for more information.			
Note: If the setpoint value is >1 the Total Running Load Character is C, if the setpoint value is <0 the Total Running Load Character is L.			
Note: The # setpoints are shared with all controllers on site via intercontroller CAN line.			

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#System Base Q


Setpoint group	VAR Control	Related FW	1.1.0
Range [units]	-32 000 .. 32 000 [kVAr] (depends on the selected Power Formats And Units (page 168))		
Default value	0 kVAr (depends on the selected Power Formats And Units (page 168))	Force value	NO
Step	1 kVAr (depends on the selected Power Formats And Units (page 168))		
Comm object	16407	Related applications	MCB
Config level	Standard		
Setpoint visibility	Always		
Description			
Required total reactive power of the controller group in parallel to mains operation in Q Control BASE mode.			
See chapter Q Control (page 206) for more information.			
Note: The # setpoints are shared with all controllers on site via intercontroller CAN line.			

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Subgroup: Rated Change

Voltage Regulation Rate

Setpoint group	VAR Control	Related FW	1.1.0
Range [units]	0,001 ... 100 [%/s]		
Default value	0,100	Force value	YES
Step	[%/s]		
Comm object	19635	Related applications	MCB
Config level	Standard		
Setpoint visibility	Always		
Description			
This setpoint sets rate of Varsharing Output (page 488) per second if LBI VOLTAGE LOWER (PAGE 622) or VOLTAGE RAISE (PAGE 622) is active and Multiple Island Operation is active.			
<i>Note: This setpoint is related directly to the Varsharing Output (page 488).</i>			

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PF/Q Regulation Rate

Setpoint group	VAR Control	Related FW	1.1.0
Range [units]	0,001 ... 100 [%/s]		
Default value	0,100	Force value	YES
Step	[%/s]		
Comm object	19636	Related applications	MCB
Config level	Standard		
Setpoint visibility	Always		
Description			
This setpoint sets rate of Varsharing Output (page 488) per second if LBI VOLTAGE LOWER (PAGE 622) or VOLTAGE RAISE (PAGE 622) is active and Parallel To Mains Operation is active.			
<i>Note: This setpoint is related directly to the Varsharing Output (page 488).</i>			

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Subgroup: Regulation Loops

PF Gain

Setpoint group	VAR Control	Related FW	1.1.0
Range [units]	0.00 .. 200.00 [-]		
Default value	10.00 [-]	Force value	YES
Step	0.01 [-]		
Comm object	8503	Related applications	MCB
Config level	Standard		
Setpoint visibility	Always		
Description			
This setpoint adjusts the gain factor (P-factor) of the PF control PI loop.			
Note: See the chapter Regulation Loops (page 225) for more information.			

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PF Int

Setpoint group	VAR Control	Related FW	1.1.0
Range [units]	0.10 .. 60.00 [s]		
Default value	2.00 [s]	Force value	YES
Step	0.01 [s]		
Comm object	8721	Related applications	MCB
Config level	Standard		
Setpoint visibility	Always		
Description			
This setpoint adjusts the integration factor (I-factor) of the PF control PI loop.			
Note: See the chapter <i>Regulation Loops (page 225)</i> for more information.			

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Voltage Gain

Setpoint group	VAR Control	Related FW	1.1.0
Range [units]	0.00 .. 200.00 [-]		
Default value	10.00 [-]	Force value	YES
Step	0.01 [-]		
Comm object	8501	Related applications	MCB
Config level	Standard		
Setpoint visibility	Always		
Description			
This setpoint adjusts the gain factor (P-factor) of the voltage control PI loop.			
Note: See the chapter Regulation Loops (page 225) for more information.			

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Voltage Int

Setpoint group	VAR Control	Related FW	1.1.0
Range [units]	0.10 .. 60.00 [s]		
Default value	2.00 [s]	Force value	YES
Step	0.01 [s]		
Comm object	8720	Related applications	MCB
Config level	Standard		
Setpoint visibility	Always		
Description			
This setpoint adjusts the integration factor (I-factor) of the voltage control PI loop.			
Note: See the chapter Regulation Loops (page 225) for more information.			

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Group: Mains Settings

Subgroup: Mains Import Measurement

Mains Measurement P

Setpoint group	Mains Settings	Related FW	1.1.0
Range [units]	None / Mains CT / Analog Input [-]		
Default value	None	Force value	NO
Step	[-]		
Comm object	10599	Related applications	MCB
Config level	Advanced		
Setpoint visibility	Always		
Description			
Defines source value of the Mains Import P (page 448) .			
None	The value Mains Import P (page 448) is not measured.		
Mains CT	The value Mains Import P (page 448) is measured via Mains CTs which are located on phase L1, L2 and L3.		
Analog Input	The value Mains Import P (page 448) is measured via analog input, accordingly LAI: MAINS MEASUREMENT P (PAGE 654) .		

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Mains Measurement Q

Setpoint group	Mains Settings	Related FW	1.1.0
Range [units]	None / Mains CT / Analog Input [-]		
Default value	None	Force value	NO
Step	[-]		
Comm object	10598	Related applications	MCB
Config level	Advanced		
Setpoint visibility	Always		
Description			
Defines source value of the Mains Import Q (page 448) .			
None	The value Mains Import Q (page 448) is not measured.		
Mains CT	The value Mains Import Q (page 448) is measured via Mains CTs which are located on phase L1, L2 and L3.		
Analog Input	The value Mains Import Q (page 448) is measured via analog input, accordingly LAI: MAINS MEASUREMENT Q (PAGE 655) .		

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Subgroup: Overload Protection

2POverload Start Evaluation Level

Setpoint group	Mains Settings	Related FW	1.1.0
Range [units]	100 .. 200 [%] of Nominal Mains Import (page 262)		
Default value	120 % of Nominal Mains Import (page 262)	Force value	YES
Step	1 % of Nominal Mains Import (page 262)		
Comm object	8280	Related applications	MCB
Config level	Standard		
Setpoint visibility	Always		

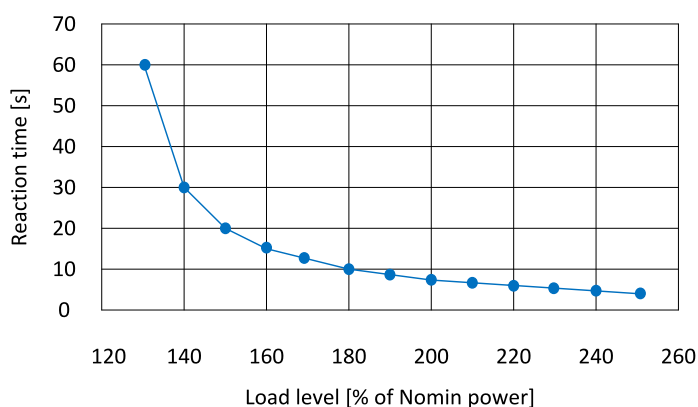
Description

This setpoint adjusts the relative power level, where the thermal overload protection starts to be evaluated. See setpoint **IDMT Overload Protection (page 335)** for complete explanation of the protection.

Load level	Reaction time [s]
100	no reaction
110	no reaction
120	600
130	60
140	30
150	20
160	15
170	12
180	10
190	8.6
200	7.5
210	6.7
220	6
230	5.5
240	5
250	4.6

2POvrldStEvDel 5 s
OverldStrtEval 120 %

$$\text{Reaction time [s]} = \frac{2POvrldStEvDel * \text{OverldStrtEval}}{\text{MainsActivePower [\%]} - \text{OverldStrtEval}}$$



The reaction time of the thermal overload protection is not fixed and is specified by the parameter **2POverload Start Evaluation Delay (page 310)**.

Note: Maximum reaction time is 3600 s after this time the protection is tripped.

🔍 back to List of setpoints

2POverload Start Evaluation Delay

Setpoint group	Mains Settings	Related FW	1.1.0
Range [units]	0.1 .. 600.0 [s]		
Default value	5.0 s	Force value	YES
Step	0.1 s		
Comm object	8281	Related applications	MCB
Config level	Standard		
Setpoint visibility	Always		

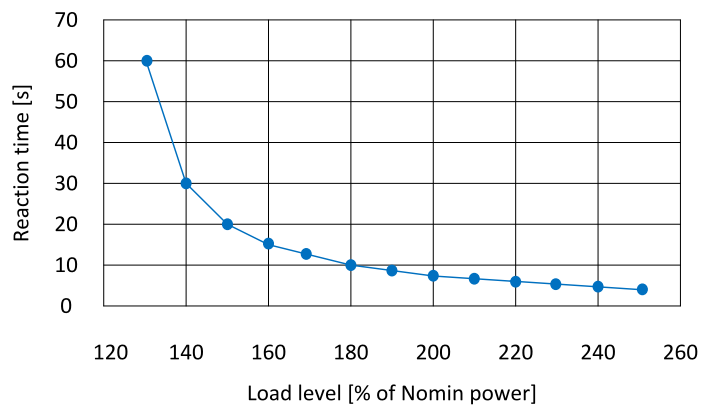
Description

This setpoint adjusts the default delay for the thermal overload protection. See setpoint **IDMT Overload Protection** (page 335) for complete explanation of the protection.

Load level	Reaction time [s]
100	no reaction
110	no reaction
120	3600 (max. value)
130	60
140	30
150	20
160	15
170	12
180	10
190	8.6
200	7.5
210	6.7
220	6
230	5.5
240	5
250	4.6

2POvrldStEvDel 5 s
OverldStrtEval 120 %

$$\text{Reaction time [s]} = \frac{2\text{POvrldStEvDel} * \text{OverldStrtEval}}{\text{MainsActivePower [\%]} - \text{OverldStrtEval}}$$



The reaction time of the thermal overload protection is not fixed; it depends on how much is the load above the limit of **2POverload Start Evaluation Level** (page 309). The higher is the load the shorter the reaction time will be.

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Subgroup: Current Protection

Short Circuit

Setpoint group	Mains Settings	Related FW	1.1.0
Range [units]	100 .. 500 [%] of Nominal Current (page 263)		
Default value	150 % of Nominal Current (page 263)	Force value	NO
Step	1 % of Nominal Current (page 263)		
Comm object	8282	Related applications	MCB
Config level	Standard		
Setpoint visibility	Always		
Description			
This setpoint specifies the relative current threshold level for Short Circuit Protection (page 337) .			

🔍 back to List of setpoints

Short Circuit Delay

Setpoint group	Mains Settings	Related FW	1.1.0
Range [units]	0.00 .. 10.00 [s]		
Default value	0 s	Force value	NO
Step	0.01 s		
Comm object	9991	Related applications	MCB
Config level	Advanced		
Setpoint visibility	Always		
Description			
This setpoint specifies the delay for Short Circuit Protection (page 337) .			

🔍 back to List of setpoints

IDMT Mains >A Delay

Setpoint group	Mains Settings	Related FW	1.1.0
Range [units]	1.0 .. 600.0 [s]		
Default value	4.0 s	Force value	NO
Step	0.1 s		
Comm object	8283	Related applications	MCB
Config level	Standard		
Setpoint visibility	Always		
Description			
This setpoint adjusts the delay for IDMT Overcurrent Protection (page 337) .			
IDMT curve shape selection. IDMT Overcurrent Delay is a reaction time of IDMT protection for 200% overcurrent $I_{Mains} = 2 \cdot \text{Nominal Current}$ (page 263)			
IDMT is “very inverse” over current protection. Reaction time is not constant but depends on over current			

level according to the following formula:

$$\text{Reaction Time} = \frac{\text{Overcurrent IDMT Delay} * \text{Nominal Current}}{I_{\text{gen}} * \text{Nominal Current}}$$

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

I_{Bus} is maximal value of all measured phases of Mains 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

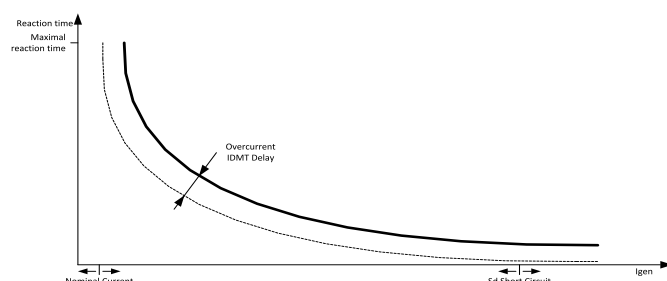


Image 7.3 IDMT Overcurrent Delay

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Current Unbalance

Setpoint group	Mains Settings	Related FW	1.1.0
Range [units]	1 .. 200 [%] of Nominal Mains Import (page 262)		
Default value	50 % of Nominal Mains Import (page 262)	Force value	NO
Step	1 % of Nominal Mains Import (page 262)		
Comm object	8284	Related applications	MCB
Config level	Advanced		
Setpoint visibility	Only if Connection type (page 265) != MonoPhase		
Description			
This setpoint specifies the relative current threshold level for Current Unbalance Protection (page 339).			

🔍 back to List of setpoints

Current Unbalance Delay

Setpoint group	Mains Settings	Related FW	1.1.0
Range [units]	0.0 .. 600.0 [s]		
Default value	5.0 s	Force value	NO
Step	0.1 s		
Comm object	8285	Related applications	MCB
Config level	Advanced		
Setpoint visibility	Only if Connection type (page 265) != MonoPhase		
Description			
This setpoint specifies the delay for Current Unbalance Protection (page 339) .			

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Subgroup: Mains Voltage Protections

Mains >V

Setpoint group	Mains Settings	Related FW	1.1.0
Range [units]	100.0 .. Mains >>V (page 315) of MainsAC Shore Nominal Voltage Ph-N (page 267) and Mains Nominal Voltage Ph-Ph (page 267) [%]		
Default value	110.0 % of MainsAC Shore Nominal Voltage Ph-N (page 267) and Mains Nominal Voltage Ph-Ph (page 267)	Force value	YES
Step	0.1 % of MainsAC Shore Nominal Voltage Ph-N (page 267) and Mains Nominal Voltage Ph-Ph (page 267)		
Comm object	8305	Related applications	MCB
Config level	Standard		
Setpoint visibility	Always		
Description			
This setpoint specifies the relative voltage threshold level for Mains >V Protection (page 339).			
Note: Mains Voltage L1-N (page 454), Mains Voltage L2-N (page 454), Mains Voltage L3-N (page 454), Mains Voltage L1-L2 (page 454), Mains Voltage L2-L3 (page 454) and Mains Voltage L3-L1 (page 455) are used for this protection.			

🔍 back to List of setpoints

Mains >V Delay

Setpoint group	Mains Settings	Related FW	1.1.0
Range [units]	0.00 .. 600.00 [s]		
Default value	5.00 s	Force value	YES
Step	0.01 s		
Comm object	8306	Related applications	MCB
Config level	Standard		
Setpoint visibility	Always		
Description			
This setpoint specifies the delay for Mains >V Protection (page 339) .			

⬅ back to List of setpoints

Mains >V Hys

Setpoint group	Mains Settings	Related FW	1.1.0
Range [units]	0.0 .. 30.0 [%] of MainsAC Shore Nominal Voltage Ph-N (page 267) and Mains Nominal Voltage Ph-Ph (page 267)		
Default value	0.0 [%] of MainsAC Shore Nominal Voltage Ph-N (page 267) and Mains Nominal Voltage Ph-Ph (page 267)	Force value	NO
Step	0.1 % of MainsAC Shore Nominal Voltage Ph-N (page 267) and Mains Nominal Voltage Ph-Ph (page 267)		
Comm object	14132	Related applications	MCB
Config level	Standard		
Setpoint visibility	Always		
Description			
This setpoint adjusts the hysteresis for return from Mains >V Protection (page 339) .			

⬅ back to List of setpoints

Mains >>V

Setpoint group	Mains Settings	Related FW	1.1.0
Range [units]	Mains >V (page 313) .. 130.0 [%] of MainsAC Shore Nominal Voltage Ph-N (page 267) and Mains Nominal Voltage Ph-Ph (page 267)		
Default value	120.0 % of MainsAC Shore Nominal Voltage Ph-N (page 267) and Mains Nominal Voltage Ph-Ph (page 267)	Force value	YES
Step	0.1 % of MainsAC Shore Nominal Voltage Ph-N (page 267) and Mains Nominal Voltage Ph-Ph (page 267)		
Comm object	11345	Related applications	MCB
Config level	Standard		
Setpoint visibility	Always		
Description			
This setpoint specifies the relative voltage threshold level for Mains >>V Protection (page 341).			
<i>Note: Mains Voltage L1-N (page 454), Mains Voltage L2-N (page 454), Mains Voltage L3-N (page 454), Mains Voltage L1-L2 (page 454), Mains Voltage L2-L3 (page 454) and Mains Voltage L3-L1 (page 455) are used for this protection.</i>			

◀ back to List of setpoints

Mains >>V Delay

Setpoint group	Mains Settings	Related FW	1.1.0
Range [units]	0.00 .. 600.00 [s]		
Default value	0.10 s	Force value	YES
Step	0.01 s		
Comm object	11347	Related applications	MCB
Config level	Standard		
Setpoint visibility	Always		
Description			
This setpoint specifies the delay for Mains >>V Protection (page 341) .			

◀ back to List of setpoints

Mains >>V Hys

Setpoint group	Mains Settings	Related FW	1.1.0
Range [units]	0.0 .. 30.0 [%] of MainsAC Shore Nominal Voltage Ph-N (page 267) and Mains Nominal Voltage Ph-Ph (page 267)		
Default value	0.0 % of MainsAC Shore Nominal Voltage Ph-N (page 267) and Mains Nominal Voltage Ph-Ph (page 267)	Force value	YES
Step	0.1 % of MainsAC Shore Nominal Voltage Ph-N (page 267) and Mains Nominal Voltage Ph-Ph (page 267)		
Comm object	14133	Related applications	MCB
Config level	Standard		
Setpoint visibility	Always		
Description			
This setpoint adjusts the hysteresis for return from Mains >>V Protection (page 341).			

◀ back to List of setpoints

Mains 10min Avg >V

Setpoint group	Mains Settings	Related FW	1.1.0
Range [units]	100.0 .. 150.0 [%] of Mains Nominal Voltage Ph-Ph (page 267)		
Default value	110.0 % of Mains Nominal Voltage Ph-Ph (page 267)	Force value	YES
Step	0.1 % of Mains Nominal Voltage Ph-Ph (page 267)		
Comm object	13795	Related applications	MCB
Config level	Advanced		
Setpoint visibility	Always		
Description			
This setpoint specifies the relative voltage threshold level for Mains 10min Avg >V Protection (page 342).			

◀ back to List of setpoints

Mains 10min Avg >V Delay

Setpoint group	Mains Settings	Related FW	1.1.0
Range [units]	0.00 .. 600.00 [s]		
Default value	0 s	Force value	YES
Step	0.01 s		
Comm object	16898	Related applications	MCB
Config level	Advanced		
Setpoint visibility	Always		
Description			
This setpoints adjust delay for Mains 10min Avg >V Protection (page 342) .			

🔍 back to List of setpoints

Mains <V

Setpoint group	Mains Settings	Related FW	1.1.0
Range [units]	Mains <<V (page 319) .. 99.0 [%] of MainsAC Shore Nominal Voltage Ph-N (page 267) and Mains Nominal Voltage Ph-Ph (page 267)		
Default value	60 % of MainsAC Shore Nominal Voltage Ph-N (page 267) and Mains Nominal Voltage Ph-Ph (page 267)	Force value	YES
Step	1 % of MainsAC Shore Nominal Voltage Ph-N (page 267) and Mains Nominal Voltage Ph-Ph (page 267)		
Comm object	8307	Related applications	MCB
Config level	Standard		
Setpoint visibility	Always		
Description			
This setpoint specifies the relative voltage threshold level for Mains <V Protection (page 343).			
Note: Mains Voltage L1-N (page 454), Mains Voltage L2-N (page 454), Mains Voltage L3-N (page 454), Mains Voltage L1-L2 (page 454), Mains Voltage L2-L3 (page 454) and Mains Voltage L3-L1 (page 455) are used for this protection.			

🔍 back to List of setpoints

Mains <V Delay

Setpoint group	Mains Settings	Related FW	1.1.0
Range [units]	0.00 .. 600.00 [s]		
Default value	1.50 s	Force value	YES
Step	0.01 s		
Comm object	8308	Related applications	MCB
Config level	Standard		
Setpoint visibility	Always		
Description			
This setpoint specifies the delay for Mains <V Protection (page 343) .			

⬅ back to List of setpoints

Mains <V Hys

Setpoint group	Mains Settings	Related FW	1.1.0
Range [units]	0.0 .. 50.0 [%] of MainsAC Shore Nominal Voltage Ph-N (page 267) and Mains Nominal Voltage Ph-Ph (page 267)		
Default value	0.0 % of MainsAC Shore Nominal Voltage Ph-N (page 267) and Mains Nominal Voltage Ph-Ph (page 267)	Force value	YES
Step	0.1 % of MainsAC Shore Nominal Voltage Ph-N (page 267) and Mains Nominal Voltage Ph-Ph (page 267)		
Comm object	14130	Related applications	MCB
Config level	Standard		
Setpoint visibility	Always		
Description			
This setpoint adjusts the hysteresis for return from Mains <V Protection (page 343) .			

⬅ back to List of setpoints

Mains <<V

Setpoint group	Mains Settings	Related FW	1.1.0
Range [units]	10.0 .. Mains <V (page 317) [%] of MainsAC Shore Nominal Voltage Ph-N (page 267) and Mains Nominal Voltage Ph-Ph (page 267)		
Default value	30.0 % of MainsAC Shore Nominal Voltage Ph-N (page 267) and Mains Nominal Voltage Ph-Ph (page 267)	Force value	YES
Step	0.1 % of MainsAC Shore Nominal Voltage Ph-N (page 267) and Mains Nominal Voltage Ph-Ph (page 267)		
Comm object	11346	Related applications	MCB
Config level	Standard		
Setpoint visibility	Always		
Description			
This setpoint specifies the relative voltage threshold level for Mains <<V Protection (page 344).			
<i>Note: Mains Voltage L1-N (page 454), Mains Voltage L2-N (page 454), Mains Voltage L3-N (page 454), Mains Voltage L1-L2 (page 454), Mains Voltage L2-L3 (page 454) and Mains Voltage L3-L1 (page 455) are used for this protection.</i>			

◀ back to List of setpoints

Mains <<V Delay

Setpoint group	Mains Settings	Related FW	1.1.0
Range [units]	0.00 .. 600.00 [s]		
Default value	0.10 s	Force value	YES
Step	0.01 s		
Comm object	11348	Related applications	MCB
Config level	Standard		
Setpoint visibility	Always		
Description			
This setpoint specifies the delay for Mains <<V Protection (page 344) .			

◀ back to List of setpoints


Mains <<V Hys

Setpoint group	Mains Settings	Related FW	1.1.0
Range [units]	0.0 .. 50.0 [%] of MainsAC Shore Nominal Voltage Ph-N (page 267) and Mains Nominal Voltage Ph-Ph (page 267)		
Default value	0.0 % of MainsAC Shore Nominal Voltage Ph-N (page 267) and Mains Nominal Voltage Ph-Ph (page 267)	Force value	YES
Step	0.1 % of MainsAC Shore Nominal Voltage Ph-N (page 267) and Mains Nominal Voltage Ph-Ph (page 267)		
Comm object	14131	Related applications	MCB
Config level	Standard		
Setpoint visibility	Always		
Description			
This setpoint adjusts the hysteresis for return from Mains <<V Protection (page 344).			

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Mains V Unbalance

Setpoint group	Mains Settings	Related FW	1.1.0
Range [units]	1 .. 200 [%] of MainsAC Shore Nominal Voltage Ph-N (page 267) and Mains Nominal Voltage Ph-Ph (page 267)		
Default value	10 % of MainsAC Shore Nominal Voltage Ph-N (page 267) and Mains Nominal Voltage Ph-Ph (page 267)	Force value	YES
Step	1 % of MainsAC Shore Nominal Voltage Ph-N (page 267) and Mains Nominal Voltage Ph-Ph (page 267)		
Comm object	8446	Related applications	MCB
Config level	Advanced		
Setpoint visibility	Always		
Description			
This setpoint specifies the relative voltage threshold level for Mains V Unbalance Protection (page 345).			

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Mains V Unbalance Delay

Setpoint group	Mains Settings	Related FW	1.1.0
Range [units]	0.00 .. 600.00 [s]		
Default value	2.00 s	Force value	YES
Step	0.01 s		
Comm object	8447	Related applications	MCB
Config level	Advanced		
Setpoint visibility	Always		
Description			
This setpoint specifies the delay for Mains V Unbalance Protection (page 345) .			

⬅ back to List of setpoints

Subgroup: Mains Frequency Protection

Mains >f

Setpoint group	Mains Settings	Related FW	1.1.0
Range [units]	0.00 ..Mains >>f (page 322) [Hz]		
Default value	1.50 Hz	Force value	YES
Step	0.01 Hz		
Comm object	8310	Related applications	MCB
Config level	Standard		
Setpoint visibility	Always		
Description			
This setpoint adjusts maximal accepted frequency for Mains >f Protection (page 349) .			

⬅ back to List of setpoints

Mains >f Delay

Setpoint group	Mains Settings	Related FW	1.1.0
Range [units]	0.00 .. 1000.00 [s]		
Default value	5.00 s	Force value	YES
Step	0.01 s		
Comm object	16632	Related applications	MCB
Config level	Standard		
Setpoint visibility	Always		
Description			
This setpoint specifies the delay for Mains >f Protection (page 349) .			

⬅ back to List of setpoints

Mains >f Hys

Setpoint group	Mains Settings	Related FW	1.1.0
Range [units]	0.00 .. 2.50 [Hz]		
Default value	0.00 Hz	Force value	YES
Step	0.01 Hz		
Comm object	14134	Related applications	MCB
Config level	Standard		
Setpoint visibility	Always		
Description			
This setpoint adjusts the hysteresis for return from Mains >f Protection (page 349) .			

⬅ back to List of setpoints

Mains >>f

Setpoint group	Mains Settings	Related FW	1.1.0
Range [units]	Mains >f (page 321) .. 10.00 [Hz]		
Default value	2.50 Hz	Force value	YES
Step	0.01 Hz		
Comm object	11349	Related applications	MCB
Config level	Standard		
Setpoint visibility	Always		
Description			
This setpoint adjusts maximal accepted frequency for Mains >>f Protection (page 350).			

⬅ back to List of setpoints

Mains >>f Delay

Setpoint group	Mains Settings	Related FW	1.1.0
Range [units]	0.00 .. 1000.00 [s]		
Default value	0.00 s	Force value	YES
Step	0.01 s		
Comm object	16628	Related applications	MCB
Config level	Standard		
Setpoint visibility	Always		
Description			
This setpoint specifies the delay for Mains >>f Protection (page 350) .			

⬅ back to List of setpoints

Mains >>f Hys

Setpoint group	Mains Settings	Related FW	1.1.0
Range [units]	0.00 .. 2.50 [Hz]		
Default value	0.00 Hz	Force value	YES
Step	0.01 Hz		
Comm object	16076	Related applications	MCB
Config level	Standard		
Setpoint visibility	Always		
Description			
This setpoint adjusts the hysteresis for return from Mains >>f Protection (page 350) .			

⬅ back to List of setpoints

Mains <f

Setpoint group	Mains Settings	Related FW	1.1.0
Range [units]	Mains <f (page 324) .. 0.00 [Hz]		
Default value	-1.50 Hz	Force value	YES
Step	0.01 Hz		
Comm object	14587	Related applications	MCB
Config level	Standard		
Setpoint visibility	Always		
Description			
This setpoint adjusts minimal accepted frequency for Mains <f Protection (page 351) .			

⬅ back to List of setpoints

Mains <f Delay

Setpoint group	Mains Settings	Related FW	1.1.0
Range [units]	0.00 .. 1000.00 [s]		
Default value	5.00 s	Force value	YES
Step	0.01 s		
Comm object	16633	Related applications	MCB
Config level	Standard		
Setpoint visibility	Always		
Description			
This setpoint specifies the delay for Mains <f Protection (page 351) .			

⬅ back to List of setpoints

Mains <f Hys

Setpoint group	Mains Settings	Related FW	1.1.0
Range [units]	0.00 .. 2.50 [Hz]		
Default value	0.00 Hz	Force value	YES
Step	0.01 Hz		
Comm object	14135	Related applications	MCB
Config level	Standard		
Setpoint visibility	Always		
Description			
This setpoint adjusts the hysteresis for return from Mains <f Protection (page 351) .			

⬅ back to List of setpoints

Mains <<f

Setpoint group	Mains Settings	Related FW	1.1.0
Range [units]	-10.00 .. Mains <f (page 323) [Hz]		
Default value	-2.50 Hz	Force value	YES
Step	0.01 Hz		
Comm object	16483	Related applications	MCB
Config level	Standard		
Setpoint visibility	Always		
Description			
This setpoint adjusts maximal accepted frequency for Mains <<f Protection (page 352).			

⬅ back to List of setpoints

Mains <<f Delay

Setpoint group	Mains Settings	Related FW	1.1.0
Range [units]	0.00 .. 1000.00 [s]		
Default value	0.00 s	Force value	YES
Step	0.01 s		
Comm object	16630	Related applications	MCB
Config level	Standard		
Setpoint visibility	Always		
Description			
This setpoint specifies the delay for Mains <<f Protection (page 352) .			

⬅ back to List of setpoints

Mains <<f Hys

Setpoint group	Mains Settings	Related FW	1.1.0
Range [units]	0.00 .. 2.50 [Hz]		
Default value	0.00 Hz	Force value	YES
Step	0.01 Hz		
Comm object	16555	Related applications	MCB
Config level	Standard		
Setpoint visibility	Always		
Description			
This setpoint adjusts the hysteresis for return from Mains <<f Protection (page 352) .			

🔍 back to List of setpoints

Subgroup: Loss of Mains Protections

Vector Shift Limit

Setpoint group	Mains Settings	Related FW	1.1.0
Range [units]	1 .. 45 [°]		
Default value	10 °	Force value	YES
Step	1 °		
Comm object	9843	Related applications	MCB
Config level	Standard		
Setpoint visibility	Only if Vector Shift Protection (page 357) != Disabled		
Description			
This setpoint adjusts the threshold level for the Vector Shift Protection (page 357) .			
<i>Note: To adjust this setpoint properly, check the value Max Vector Shift (page 461). The value is available in IntelliConfig, contains the maximal measured vector shift value since the Bus has been synchronized to the mains and after opening of 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>			

🔍 back to List of setpoints

ROCOF1 Windows Length

Setpoint group	Mains Settings	Related FW	1.1.0
Range [units]	3 .. 30 [-]		
Default value	5	Force value	YES
Step	1 [-]		
Comm object	9990	Related applications	MCB
Config level	Standard		
Setpoint visibility	Only if ROCOF1 Protection (page 358) != Disabled		
Description			
<p>This setpoint adjusts the time averaging level for the ROCOF1 Protection (page 358).</p> <p>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.</p>			

⬅ back to List of setpoints

ROCOF1 df/dt

Setpoint group	Mains Settings	Related FW	1.1.0
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	MCB
Config level	Standard		
Setpoint visibility	Only if ROCOF1 Protection (page 358) != Disabled		
Description			
This setpoint adjusts the trip level for ROCOF1 Protection (page 358) .			

⬅ back to List of setpoints

ROCOF2 Windows Length

Setpoint group	Mains Settings	Related FW	1.1.0
Range [units]	0.1 .. 2.5 [s]		
Default value	0.5 s	Force value	YES
Step	0.1 s		
Comm object	16137	Related applications	MCB
Config level	Standard		
Setpoint visibility	Only if ROCOF2 Protection (page 359) != Disabled		
Description			
This setpoint adjusts the time averaging level for the ROCOF2 Protection (page 359) . 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.			

⬅ back to List of setpoints

ROCOF2 df/dt

Setpoint group	Mains Settings	Related FW	1.1.0
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	MCB
Config level	Standard		
Setpoint visibility	Only if ROCOF2 Protection (page 359) != Disabled		
Description			
This setpoint adjusts the trip level for ROCOF2 Protection (page 359) .			

⬅ back to List of setpoints

ROCOF3 Windows Length

Setpoint group	Mains Settings	Related FW	1.1.0
Range [units]	0.1 .. 2.5 [s]		
Default value	1.0 s	Force value	YES
Step	0.1 s		
Comm object	16138	Related applications	MCB
Config level	Standard		
Setpoint visibility	Only if ROCOF3 Protection (page 360) != Disabled		
Description			
This setpoint adjusts the time averaging level for the ROCOF3 Protection (page 360) . 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.			

 [back to List of setpoints](#)

ROCOF3 df/dt

Setpoint group	Mains Settings	Related FW	1.1.0
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	MCB
Config level	Standard		
Setpoint visibility	Only if ROCOF3 Protection (page 360) != Disabled		
Description			
This setpoint adjusts the trip level for ROCOF3 Protection (page 360) .			

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ROCOF4 Windows Length

Setpoint group	Mains Settings	Related FW	1.1.0
Range [units]	0.1 .. 2.5 [s]		
Default value	2.0 s	Force value	YES
Step	0.1 s		
Comm object	16139	Related applications	MCB
Config level	Standard		
Setpoint visibility	Only if ROCOF4 Protection (page 361) != Disabled		
Description			
<p>This setpoint adjusts the time averaging level for the ROCOF4 Protection (page 361).</p> <p>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.</p>			

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ROCOF4 df/dt

Setpoint group	Mains Settings	Related FW	1.1.0
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	MCB
Config level	Standard		
Setpoint visibility	Only if ROCOF4 Protection (page 361) != Disabled		
Description			
This setpoint adjusts the trip level for ROCOF4 Protection (page 361) .			

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Group: Bus Settings

Subgroup: Voltage Protection

Bus >V

Setpoint group	Bus Settings	Related FW	1.1.0
Range [units]	100 .. 200 of Bus AC Bus Nominal Voltage Ph-N (page 266) and Bus Nominal Voltage Ph-Ph (page 266) [%]		
Default value	120 % of Bus AC Bus Nominal Voltage Ph-N (page 266) and Bus Nominal Voltage Ph-Ph (page 266)	Force value	YES
Step	1 % of Bus AC Bus Nominal Voltage Ph-N (page 266) and Bus Nominal Voltage Ph-Ph (page 266)		
Comm object	8291	Related applications	MCB
Config level	Standard		
Setpoint visibility	Always		
Description			
This setpoint specifies the relative voltage threshold level for Bus >V Protection (page 346) .			
<i>Note: Bus Voltage L1-N (page 466), Bus Voltage L2-N (page 466), Bus Voltage L3-N (page 466), Bus Voltage L1-L2 (page 466), Bus Voltage L2-L3 (page 467) and Bus Voltage L3-L1 (page 467) are used for this protection.</i>			

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Bus >V Delay

Setpoint group	Bus Settings	Related FW	1.1.0
Range [units]	0.01 .. 600 [s]		
Default value	5.00 s	Force value	YES
Step	0.01 s		
Comm object	8292	Related applications	MCB
Config level	Standard		
Setpoint visibility	Always		
Description			
This setpoint specifies the delay for Bus >V Protection (page 346) .			

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Bus <V

Setpoint group	Bus Settings	Related FW	1.1.0
Range [units]	20 .. 99 [%] of Bus AC Bus Nominal Voltage Ph-N (page 266) and Bus Nominal Voltage Ph-Ph (page 266)		
Default value	90 % of Bus AC Bus Nominal Voltage Ph-N (page 266) and Bus Nominal Voltage Ph-Ph (page 266)	Force value	YES
Step	1 % of Bus AC Bus Nominal Voltage Ph-N (page 266) and Bus Nominal Voltage Ph-Ph (page 266)		
Comm object	8293	Related applications	MCB
Config level	Standard		
Setpoint visibility	Always		
Description			
This setpoint specifies the relative voltage threshold level for Bus <V Protection (page 347).			
<i>Note: Bus Voltage L1-N (page 466), Bus Voltage L2-N (page 466), Bus Voltage L3-N (page 466), Bus Voltage L1-L2 (page 466), Bus Voltage L2-L3 (page 467) and Bus Voltage L3-L1 (page 467) are used for this protection.</i>			

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Bus <V Delay

Setpoint group	Bus Settings	Related FW	1.1.0
Range [units]	0.01 .. 600.00 [s]		
Default value	5.00 s	Force value	YES
Step	0.01 s		
Comm object	16417	Related applications	MCB
Config level	Standard		
Setpoint visibility	Always		
Description			
This setpoint specifies the delay for Bus <V Protection (page 347) .			

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Bus V Unbalance

Setpoint group	Bus Settings	Related FW	1.1.0
Range [units]	1 .. 200 [%]		
Default value	10 %	Force value	YES
Step	1 %		
Comm object	8288	Related applications	MCB
Config level	Advanced		
Setpoint visibility	Only if Connection type (page 265) != MonoPhase		
Description			
This setpoint specifies the relative voltage threshold level for Bus V Unbalance Protection (page 347) .			

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Bus V Unbalance Delay

Setpoint group	Bus Settings	Related FW	1.1.0
Range [units]	0.01 .. 600.00 [s]		
Default value	3.00 s	Force value	YES
Step	0.01 s		
Comm object	8289	Related applications	MCB
Config level	Standard		
Setpoint visibility	Only if Connection type (page 265) != MonoPhase		
Description			
This setpoint specifies the delay for Bus V Unbalance Protection (page 347) .			

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Subgroup: Frequency Protection

Bus >f

Setpoint group	Bus Settings	Related FW	1.1.0
Range [units]	0.00 .. 5.00 [Hz]		
Default value	1.50 Hz	Force value	YES
Step	0.01 Hz		
Comm object	8296	Related applications	MCB
Config level	Standard		
Setpoint visibility	Always		
Description			
This setpoint adjusts maximal accepted frequency for Bus >f Protection (page 353) .			
Note: $f_{max} = \textit{Nominal Frequency (page 270)} + \textit{Bus >f}$			

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Bus >f Delay

Setpoint group	Bus Settings	Related FW	1.1.0
Range [units]	0.01 .. 600.0 [s]		
Default value	5.00 s	Force value	YES
Step	0.01 s		
Comm object	8297	Related applications	MCB
Config level	Standard		
Setpoint visibility	Always		
Description			
This setpoint specifies the delay for Bus >f Protection (page 353) .			

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Bus <f

Setpoint group	Bus Settings	Related FW	1.1.0
Range [units]	0.00 .. 5.00 [Hz]		
Default value	1.50 Hz	Force value	YES
Step	0.01 Hz		
Comm object	14588	Related applications	MCB
Config level	Standard		
Setpoint visibility	Always		
Description			
This setpoint adjusts maximal accepted frequency for Bus <f Protection (page 354) .			
Note: f_{min} = Nominal Frequency (page 270) - Bus <f			

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Bus <f Delay

Setpoint group	Bus Settings	Related FW	1.1.0
Range [units]	0.01 .. 600.0 [s]		
Default value	5.00 s	Force value	YES
Step	0.01 s		
Comm object	16423	Related applications	MCB
Config level	Standard		
Setpoint visibility	Always		
Description			
This setpoint specifies the delay for Bus <f Protection (page 354) .			

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Subgroup: Underload Protection

Minimal Power PTM

Setpoint group	Bus Settings	Related FW	1.1.0
Range [units]	0 .. 100 [%] of Running Nominal P In Load Shar (page 481)		
Default value	5 % of Running Nominal P In Load Shar (page 481)	Force value	NO
Step	1 % of Running Nominal P In Load Shar (page 481)		
Comm object	9241	Related applications	MCB
Config level	Standard		
Setpoint visibility	Always		
Description			
<p>This setpoint defines minimal acceptable required power of the System. If Required P Target (page 484) is below the Minimal Power PTM, then the Required P Target (page 484) is overridden by this setpoint. Furthermore if Minimal Power PTM Protection (page 355) is enabled and the requested power of the System stays below Minimal Power PTM longer then Minimal Power PTM Protection Del (page 334), the alarm SP Request Under MinPowerPTM (page 771) is activated.</p> <div>IMPORTANT: If the setpoint is set too high it can happen that MCB opening will be blocked because it will not be possible to reach the Mains Unload MCB Open Window (page 296).</div> <p>Note: Setpoint Minimal Power PTM is related to Running Nominal P In Load Shar (page 481).</p>			

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Minimal Power PTM Protection Del

Setpoint group	Bus Settings	Related FW	1.1.0
Range [units]	0 .. 600 [s]		
Default value	10 s	Force value	NO
Step	1 s		
Comm object	17013	Related applications	MCB
Config level	Standard		
Setpoint visibility	Always		
Description			
This setpoint specifies the delay for Minimal Power PTM Protection (page 355) .			

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Group: Protections

Subgroup: MP Protection Behavior

MP Protection Behavior

Setpoint group	Protections	Related FW	1.1.0
Range [units]	Passive / Active [-]		
Default value	Passive	Force value	YES
Step	[-]		
Comm object	19545	Related applications	MCB
Config level	Advanced		
Setpoint visibility	Always		
Description			
This setpoint defines the behavior of Mains Protection. This protection type is used only for over / under voltage and frequency protections.			
<div><div>></div><div>Passive: Protection will only block synchronization and breaker closing if triggered.</div></div> <div><div>></div><div>Active: Protection will block synchronization and breaker closing, and it will also open the breaker if triggered.</div></div>			

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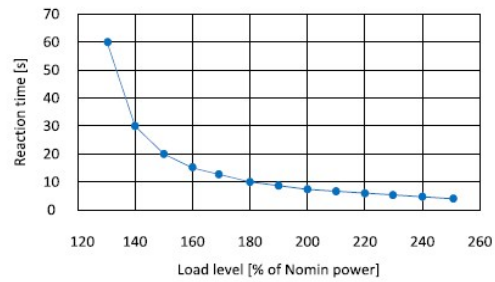
Subgroup: Overload Protection

IDMT Overload Protection

Setpoint group	Protections	Related FW	1.1.0
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	13231	Related applications	MCB
Config level	Advanced		
Setpoint visibility	Always		
Description			
This setpoint enables or disables IDMT Overload protection.			
Behavior of protection is adjusted via setpoints 2POverload Start Evaluation Level (page 309) and 2POverload Start Evaluation Delay (page 310) . This protection activates alarm IDMT Overload (page 770) .			
The reaction time is calculated by this formula:			
$\text{Reaction time} = \frac{\text{2POverload Start Evaluation Level} \times \text{2Poverload Start Evaluation Delay}}{\frac{\text{Mains } P}{\text{Nominal Power}} \times 100 \times \text{2Poverload Start Evaluation Level}}$			

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 / Disabled: Protection is enabled / disabled.
- > Protection Force Disable 1 / 2 / 3: Protection is enabled or disabled by the state of LBI
**PROTECTION FORCE DISABLE 1 (PAGE 618) / PROTECTION FORCE DISABLE 2 (PAGE 619) /
PROTECTION FORCE DISABLE 3 (PAGE 619).**

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Subgroup: Current Protection

Short Circuit Protection

Setpoint group	Protections	Related FW	1.1.0
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	15665	Related applications	MCB
Config level	Advanced		
Setpoint visibility	Always		
Description			
This setpoint enables or disables Short Circuit protection.			
Behavior of protection is adjusted via setpoints Short Circuit Protection (page 337) and Short Circuit Delay (page 311) . When value of Mains Current L1 (page 456) , Mains Current L2 (page 456) and Mains Current L3 (page 456) related to Nominal Current (page 263) cross over Short Circuit (page 311) for time longer than Short Circuit Delay (page 311) alarm MPR Short Circuit (page 770) is activated.			
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 1 (PAGE 618) / PROTECTION FORCE DISABLE 2 (PAGE 619) / PROTECTION FORCE DISABLE 3 (PAGE 619) .			

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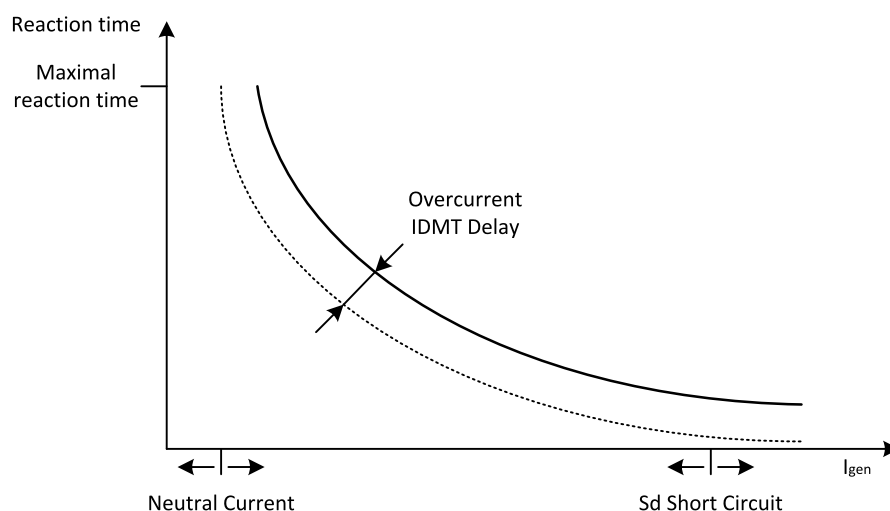
IDMT Overcurrent Protection

Setpoint group	Protections	Related FW	1.1.0
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	15666	Related applications	MCB
Config level	Advanced		
Setpoint visibility	Always		
Description			
This setpoint enables or disables IDMT Overcurrent Protection.			
Behavior of protection is adjusted via setpoints IDMT Mains >A Delay (page 311) . This protection activates alarm MPR IDMT Mains >A (page 770) .			
The reaction time is calculated by this formula:			
$\text{Reaction time} = \frac{IDMT \text{ Mains } >A \text{ Delay} \times \text{Nominal Current}}{I_{\text{mains}} - \text{Nominal Current}}$			

I_{Mains} = Maximum (Mains Current L1 (page 456), Mains Current L2 (page 456) and Mains Current L3 (page 456))

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		
		$\leq 100\%$	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



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 1 (PAGE 618) / PROTECTION FORCE DISABLE 2 (PAGE 619) /
 PROTECTION FORCE DISABLE 3 (PAGE 619).**

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Current Unbalance Protection

Setpoint group	Protections	Related FW	1.1.0
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	15667	Related applications	MCB
Config level	Advanced		
Setpoint visibility	Always		

Description

This setpoint enables or disables Current Unbalance Protection.

Protection is enabled. Behavior of protection is adjusted via setpoints **Current Unbalance (page 312)** and **Current Unbalance Delay (page 313)**. When relative difference between Mains currents is over setpoint **Current Unbalance (page 312)** for time longer than **Current Unbalance Delay (page 313)** alarm **MPR Current Unbalance (page 770)** is activated.

IMPORTANT: Behavior of this protection is influenced by setpoint Connection type (page 265)

Connection type (page 265)	Compared values (maximum difference)
3Ph4Wire	(Mains Current L1 (page 456), Mains Current L2 (page 456), Mains Current L3 (page 456))
High Leg D	
3Ph3Wire	
SplitPhase	
MonoPhase	No protection is evaluated.

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 1 (PAGE 618) / PROTECTION FORCE DISABLE 2 (PAGE 619) / PROTECTION FORCE DISABLE 3 (PAGE 619).

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Subgroup: Voltage Protection

Mains >V Protection

Setpoint group	Protections	Related FW	1.1.0
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	20806	Related applications	MCB														
Config level	Advanced																
Setpoint visibility	Always																
Description																	
This setpoint enables or disables Mains >V Protection.																	
Behavior of protection is adjusted via setpoints Mains >V (page 313) , Mains >V Delay (page 314) and Mains >V Hys (page 314) . When Mains voltage exceeds limit set by Mains >V (page 313) for period longer than Mains >V Delay (page 314) relevant history records is written to the history and MCB is opened if:																	
<div><div>></div> Controller mode (page 271) = OFF and MCB Opens On (page 287) = Mains Fail</div> <div><div>></div> Controller mode (page 271) = MAN and Breaker state (page 494) = ParalOper</div> <div><div>></div> Controller mode (page 271) = AUTO</div>																	
Return from Mains >V can have hysteresis set by Mains >V Hys (page 314) .																	
<table><tr><th>Value</th><th>History Record</th></tr><tr><td>Mains Voltage L1-N (page 454)</td><td>MP MAINS >V L1-N (PAGE 759)</td></tr><tr><td>Mains Voltage L2-N (page 454)</td><td>MP MAINS >V L2-N (PAGE 759)</td></tr><tr><td>Mains Voltage L3-N (page 454)</td><td>MP MAINS >V L3-N (PAGE 759)</td></tr><tr><td>Mains Voltage L1-L2 (page 454)</td><td>MP MAINS >V L1-L2 (PAGE 759)</td></tr><tr><td>Mains Voltage L2-L3 (page 454)</td><td>MP MAINS >V L2-L3 (PAGE 760)</td></tr><tr><td>Mains Voltage L3-L1 (page 455)</td><td>MP MAINS >V L3-L1 (PAGE 760)</td></tr></table>				Value	History Record	Mains Voltage L1-N (page 454)	MP MAINS >V L1-N (PAGE 759)	Mains Voltage L2-N (page 454)	MP MAINS >V L2-N (PAGE 759)	Mains Voltage L3-N (page 454)	MP MAINS >V L3-N (PAGE 759)	Mains Voltage L1-L2 (page 454)	MP MAINS >V L1-L2 (PAGE 759)	Mains Voltage L2-L3 (page 454)	MP MAINS >V L2-L3 (PAGE 760)	Mains Voltage L3-L1 (page 455)	MP MAINS >V L3-L1 (PAGE 760)
Value	History Record																
Mains Voltage L1-N (page 454)	MP MAINS >V L1-N (PAGE 759)																
Mains Voltage L2-N (page 454)	MP MAINS >V L2-N (PAGE 759)																
Mains Voltage L3-N (page 454)	MP MAINS >V L3-N (PAGE 759)																
Mains Voltage L1-L2 (page 454)	MP MAINS >V L1-L2 (PAGE 759)																
Mains Voltage L2-L3 (page 454)	MP MAINS >V L2-L3 (PAGE 760)																
Mains Voltage L3-L1 (page 455)	MP MAINS >V L3-L1 (PAGE 760)																
Setpoint options:																	
<div><div>></div> Enabled / Disabled: Protection is enabled / disabled.</div> <div><div>></div> Protection Force Disable 1 / 2 / 3: Protection is enabled or disabled by the state of LBI PROTECTION FORCE DISABLE 1 (PAGE 618) / PROTECTION FORCE DISABLE 2 (PAGE 619) / PROTECTION FORCE DISABLE 3 (PAGE 619).</div>																	

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Mains >>V Protection

Setpoint group	Protections	Related FW	1.1.0
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	20805	Related applications	MCB
Config level	Advanced		
Setpoint visibility	Always		

Description

This setpoint enables or disables Mains >>V Protection.

Behavior of protection is adjusted via setpoints **Mains >>V (page 315)**, **Mains >>V Delay (page 315)** and **Mains >>V Hys (page 316)**. When Mains voltage exceeds limit set by **Mains >>V (page 315)** for period longer than **Mains >>V Delay (page 315)** relevant history records is written to the history and MCB is opened if:

- **Controller mode (page 271) = OFF**
and **MCB Opens On (page 287) = Mains Fail**
- **Controller mode (page 271) = MAN**
and **Breaker state (page 494) = ParalOper**
- **Controller mode (page 271) = AUTO**

Return from Mains >>V can have hysteresis set by **Mains >>V Hys (page 316)**.

Value	History Record
Mains Voltage L1-N (page 454)	MP MAINS >>V L1-N (PAGE 760)
Mains Voltage L2-N (page 454)	MP MAINS >>V L2-N (PAGE 761)
Mains Voltage L3-N (page 454)	MP MAINS >>V L3-N (PAGE 761)
Mains Voltage L1-L2 (page 454)	MP MAINS >>V L1-L2 (PAGE 761)
Mains Voltage L2-L3 (page 454)	MP MAINS >>V L2-L3 (PAGE 761)
Mains Voltage L3-L1 (page 455)	MP MAINS >>V L3-L1 (PAGE 762)

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 1 (PAGE 618) / PROTECTION FORCE DISABLE 2 (PAGE 619) / PROTECTION FORCE DISABLE 3 (PAGE 619).

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Mains 10min Avg >V Protection

Setpoint group	Protections	Related FW	1.1.0														
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	13233	Related applications	MCB														
Config level	Advanced																
Setpoint visibility	Always																
Description																	
This setpoint enables or disables Mains 10min Avg >V Protection.																	
Behavior of protection is adjusted via setpoint Mains 10min Avg >V (page 316) . When measured value exceeds limit set by Mains 10min Avg >V (page 316) and the Mains 10min Avg >V Delay (page 317) is elapsed the relevant history records is written to the history and MCB is opened if:																	
<div>> Controller mode (page 271) = OFF and MCB Opens On (page 287) = Mains Fail</div> <div>> Controller mode (page 271) = MAN and Breaker state (page 494) = ParalOper</div> <div>> Controller mode (page 271) = AUTO</div>																	
<table><tr><td>Value</td><td>History Record</td></tr><tr><td>Mains Voltage 10min Avg L1-N (page 459)</td><td>MP Mains 10minAvg >V L1-N</td></tr><tr><td>Mains Voltage 10min Avg L2-N (page 459)</td><td>MP Mains 10minAvg >V L2-N</td></tr><tr><td>Mains Voltage 10min Avg L3-N (page 459)</td><td>MP Mains 10minAvg >V L3-N</td></tr><tr><td>Mains Voltage 10min Avg L1-L2 (page 460)</td><td>MP Mains 10minAvg >V L1-L2</td></tr><tr><td>Mains Voltage 10min Avg L2-L3 (page 460)</td><td>MP Mains 10minAvg >V L2-L3</td></tr><tr><td>Mains Voltage 10min Avg L3-L1 (page 460)</td><td>MP Mains 10minAvg >V L3-L1</td></tr></table>				Value	History Record	Mains Voltage 10min Avg L1-N (page 459)	MP Mains 10minAvg >V L1-N	Mains Voltage 10min Avg L2-N (page 459)	MP Mains 10minAvg >V L2-N	Mains Voltage 10min Avg L3-N (page 459)	MP Mains 10minAvg >V L3-N	Mains Voltage 10min Avg L1-L2 (page 460)	MP Mains 10minAvg >V L1-L2	Mains Voltage 10min Avg L2-L3 (page 460)	MP Mains 10minAvg >V L2-L3	Mains Voltage 10min Avg L3-L1 (page 460)	MP Mains 10minAvg >V L3-L1
Value	History Record																
Mains Voltage 10min Avg L1-N (page 459)	MP Mains 10minAvg >V L1-N																
Mains Voltage 10min Avg L2-N (page 459)	MP Mains 10minAvg >V L2-N																
Mains Voltage 10min Avg L3-N (page 459)	MP Mains 10minAvg >V L3-N																
Mains Voltage 10min Avg L1-L2 (page 460)	MP Mains 10minAvg >V L1-L2																
Mains Voltage 10min Avg L2-L3 (page 460)	MP Mains 10minAvg >V L2-L3																
Mains Voltage 10min Avg L3-L1 (page 460)	MP Mains 10minAvg >V L3-L1																
Setpoint options:																	
<div>> Enabled / Disabled: Protection is enabled / disabled.</div> <div>> Protection Force Disable 1 / 2 / 3: Protection is enabled or disabled by the state of LBI PROTECTION FORCE DISABLE 1 (PAGE 618) / PROTECTION FORCE DISABLE 2 (PAGE 619) / PROTECTION FORCE DISABLE 3 (PAGE 619).</div>																	

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Mains <V Protection

Setpoint group	Protections	Related FW	1.1.0														
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	20807	Related applications	MCB														
Config level	Advanced																
Setpoint visibility	Always																
Description																	
This setpoint enables or disables Mains <V Protection.																	
Behavior of protection is adjusted via setpoints Mains <V (page 317) , Mains <V Delay (page 318) and Mains <V Hys (page 318) . When Mains voltage drops bellow limit set by Mains <V (page 317) for period longer than Mains <V Delay (page 318) relevant history records is written to the history and MCB is opened if:																	
<div>> Controller mode (page 271) = OFF and MCB Opens On (page 287) = Mains Fail</div> <div>> Controller mode (page 271) = MAN and Breaker state (page 494) = ParalOper</div> <div>> Controller mode (page 271) = AUTO</div>																	
Return from Mains <V can have hysteresis set by Mains <V Hys (page 318) .																	
<table><tr><td>Value</td><td>History Record</td></tr><tr><td>Mains Voltage L1-N (page 454)</td><td>MP MAINS <V L1-N (PAGE 763)</td></tr><tr><td>Mains Voltage L2-N (page 454)</td><td>MP MAINS <V L2-N (PAGE 764)</td></tr><tr><td>Mains Voltage L3-N (page 454)</td><td>MP MAINS <V L3-N (PAGE 764)</td></tr><tr><td>Mains Voltage L1-L2 (page 454)</td><td>MP MAINS <V L1-L2 (PAGE 764)</td></tr><tr><td>Mains Voltage L2-L3 (page 454)</td><td>MP MAINS <V L2-L3 (PAGE 765)</td></tr><tr><td>Mains Voltage L3-L1 (page 455)</td><td>MP MAINS <V L3-L1 (PAGE 765)</td></tr></table>				Value	History Record	Mains Voltage L1-N (page 454)	MP MAINS <V L1-N (PAGE 763)	Mains Voltage L2-N (page 454)	MP MAINS <V L2-N (PAGE 764)	Mains Voltage L3-N (page 454)	MP MAINS <V L3-N (PAGE 764)	Mains Voltage L1-L2 (page 454)	MP MAINS <V L1-L2 (PAGE 764)	Mains Voltage L2-L3 (page 454)	MP MAINS <V L2-L3 (PAGE 765)	Mains Voltage L3-L1 (page 455)	MP MAINS <V L3-L1 (PAGE 765)
Value	History Record																
Mains Voltage L1-N (page 454)	MP MAINS <V L1-N (PAGE 763)																
Mains Voltage L2-N (page 454)	MP MAINS <V L2-N (PAGE 764)																
Mains Voltage L3-N (page 454)	MP MAINS <V L3-N (PAGE 764)																
Mains Voltage L1-L2 (page 454)	MP MAINS <V L1-L2 (PAGE 764)																
Mains Voltage L2-L3 (page 454)	MP MAINS <V L2-L3 (PAGE 765)																
Mains Voltage L3-L1 (page 455)	MP MAINS <V L3-L1 (PAGE 765)																
Setpoint options:																	
<div>> Enabled / Disabled: Protection is enabled / disabled.</div> <div>> Protection Force Disable 1 / 2 / 3: Protection is enabled or disabled by the state of LBI PROTECTION FORCE DISABLE 1 (PAGE 618) / PROTECTION FORCE DISABLE 2 (PAGE 619) / PROTECTION FORCE DISABLE 3 (PAGE 619).</div>																	

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Mains <<V Protection

Setpoint group	Protections	Related FW	1.1.0
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	20808	Related applications	MCB
Config level	Advanced		
Setpoint visibility	Always		

Description

This setpoint enables or disables Mains <<V Protection.

Behavior of protection is adjusted via setpoints **Mains <<V (page 319)**, **Mains <<V Delay (page 319)** and **Mains <<V Hys (page 320)**. When Mains voltage drops below limit set by **Mains <<V (page 319)** for period longer than **Mains <<V Delay (page 319)** relevant history records is written to the history and MCB is opened if:

- **Controller mode (page 271) = OFF**
and **MCB Opens On (page 287) = Mains Fail**
- **Controller mode (page 271) = MAN**
and **Breaker state (page 494) = ParalOper**
- **Controller mode (page 271) = AUTO**

Return from Mains <<V can have hysteresis set by **Mains <<V Hys (page 320)**.

Value	History Record
Mains Voltage L1-N (page 454)	MP MAINS <<V L1-N (PAGE 765)
Mains Voltage L2-N (page 454)	MP MAINS <<V L2-N (PAGE 766)
Mains Voltage L3-N (page 454)	MP MAINS <<V L3-N (PAGE 766)
Mains Voltage L1-L2 (page 454)	MP MAINS <<V L1-L2 (PAGE 766)
Mains Voltage L2-L3 (page 454)	MP MAINS <<V L2-L3 (PAGE 766)
Mains Voltage L3-L1 (page 455)	MP MAINS <<V L3-L1 (PAGE 767)

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 1 (PAGE 618) / PROTECTION FORCE DISABLE 2 (PAGE 619) / PROTECTION FORCE DISABLE 3 (PAGE 619).

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Mains V Unbalance Protection

Setpoint group	Protections	Related FW	1.1.0
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	20798	Related applications	MCB
Config level	Advanced		
Setpoint visibility	Always		

Description

This setpoint enables or disables Mains V Unbalance Protection.

Behavior of protection is adjusted via setpoints **Mains V Unbalance (page 320)** and **Mains V Unbalance Delay (page 321)**. When relative difference between Mains current is over setpoint **Mains V Unbalance (page 320)** for time longer than **Mains V Unbalance Delay (page 321)** alarm **MP Mains V Unbalance Ph-N (page 767)** or **MP Mains V Unbalance Ph-Ph (page 767)** is activated.

IMPORTANT: Behavior of this protection is influenced by setpoint Connection type (page 265)

Connection type (page 265)	Compared values (maximum difference)
3Ph4Wire	Mains Voltage L1-N (page 454), Mains Voltage L2-N (page 454) and Mains Voltage L3-N (page 454) OR Mains Voltage L1-L2 (page 454), Mains Voltage L2-L3 (page 454) and Mains Voltage L3-L1 (page 455)
High Leg D	Mains Voltage L1-L2 (page 454), Mains Voltage L2-L3 (page 454) and Mains Voltage L3-L1 (page 455)
3Ph3Wire	Mains Voltage L1-L2 (page 454), Mains Voltage L2-L3 (page 454) and Mains Voltage L3-L1 (page 455)
SplitPhase	Mains Voltage L1-N (page 454), Mains Voltage L2-N (page 454) and Mains Voltage L3-N (page 454)
MonoPhase	No protection is evaluated.

List of History Records

MPMains V Unbalance Ph-N

MPMains V Unbalance Ph-Ph

Setpoint options:

- > Enabled / Disabled: Protection is enabled / disabled.
- > Protection Force Disable 1 / 2 / 3: Protection is enabled or disabled by the state of LBI PROTECTION FORCE DISABLE 1 (PAGE 618) / PROTECTION FORCE DISABLE 2 (PAGE 619) / PROTECTION FORCE DISABLE 3 (PAGE 619).

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Bus >V Protection

Setpoint group	Protections	Related FW	1.1.0														
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	20818	Related applications	MCB														
Config level	Advanced																
Setpoint visibility	Always																
Description																	
This setpoint enables or disables Bus >V Protection.																	
Protection is enabled. Behavior of protection is adjusted via setpoints Bus >V (page 330) and Bus >V Delay (page 330) . When Bus voltage exceeds limit set by Bus >V (page 330) for time longer than Bus >V Delay (page 330) appropriate alarm is activated.																	
<table><tr><td>Value</td><td>Alarm</td></tr><tr><td>Bus Voltage L1-N (page 466)</td><td>Hst Bus >V L1-N (page 748)</td></tr><tr><td>Bus Voltage L2-N (page 466)</td><td>Hst Bus >V L2-N (page 749)</td></tr><tr><td>Bus Voltage L3-N (page 466)</td><td>Hst Bus >V L3-N (page 749)</td></tr><tr><td>Bus Voltage L1-L2 (page 466)</td><td>Hst Bus >V L1-L2 (page 749)</td></tr><tr><td>Bus Voltage L2-L3 (page 467)</td><td>Hst Bus >V L2-L3 (page 749)</td></tr><tr><td>Bus Voltage L3-L1 (page 467)</td><td>Hst Bus >V L3-L1 (page 750)</td></tr></table>				Value	Alarm	Bus Voltage L1-N (page 466)	Hst Bus >V L1-N (page 748)	Bus Voltage L2-N (page 466)	Hst Bus >V L2-N (page 749)	Bus Voltage L3-N (page 466)	Hst Bus >V L3-N (page 749)	Bus Voltage L1-L2 (page 466)	Hst Bus >V L1-L2 (page 749)	Bus Voltage L2-L3 (page 467)	Hst Bus >V L2-L3 (page 749)	Bus Voltage L3-L1 (page 467)	Hst Bus >V L3-L1 (page 750)
Value	Alarm																
Bus Voltage L1-N (page 466)	Hst Bus >V L1-N (page 748)																
Bus Voltage L2-N (page 466)	Hst Bus >V L2-N (page 749)																
Bus Voltage L3-N (page 466)	Hst Bus >V L3-N (page 749)																
Bus Voltage L1-L2 (page 466)	Hst Bus >V L1-L2 (page 749)																
Bus Voltage L2-L3 (page 467)	Hst Bus >V L2-L3 (page 749)																
Bus Voltage L3-L1 (page 467)	Hst Bus >V L3-L1 (page 750)																
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 1 (PAGE 618) / PROTECTION FORCE DISABLE 2 (PAGE 619) / PROTECTION FORCE DISABLE 3 (PAGE 619) .																	

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Bus <V Protection

Setpoint group	Protections	Related FW	1.1.0														
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	20819	Related applications	MCB														
Config level	Advanced																
Setpoint visibility	Always																
Description																	
This setpoint enables or disables Bus <V Protection.																	
Behavior of protection is adjusted via setpoints Bus <V (page 331) and Bus <V Delay (page 331)																	
When Bus voltage drops below limit set by Bus <V (page 331) for time longer than Bus <V Delay (page 331) appropriate alarm is activated.																	
<table><tr><td>Value</td><td>Alarm</td></tr><tr><td>Bus Voltage L1-N (page 466)</td><td>Hst Bus <V L1-N (page 750)</td></tr><tr><td>Bus Voltage L2-N (page 466)</td><td>Hst Bus <V L2-N (page 750)</td></tr><tr><td>Bus Voltage L3-N (page 466)</td><td>Hst Bus <V L3-N (page 750)</td></tr><tr><td>Bus Voltage L1-L2 (page 466)</td><td>Hst Bus <V L1-L2 (page 751)</td></tr><tr><td>Bus Voltage L2-L3 (page 467)</td><td>Hst Bus <V L2-L3 (page 751)</td></tr><tr><td>Bus Voltage L3-L1 (page 467)</td><td>Hst Bus >V L3-L1 (page 750)</td></tr></table>				Value	Alarm	Bus Voltage L1-N (page 466)	Hst Bus <V L1-N (page 750)	Bus Voltage L2-N (page 466)	Hst Bus <V L2-N (page 750)	Bus Voltage L3-N (page 466)	Hst Bus <V L3-N (page 750)	Bus Voltage L1-L2 (page 466)	Hst Bus <V L1-L2 (page 751)	Bus Voltage L2-L3 (page 467)	Hst Bus <V L2-L3 (page 751)	Bus Voltage L3-L1 (page 467)	Hst Bus >V L3-L1 (page 750)
Value	Alarm																
Bus Voltage L1-N (page 466)	Hst Bus <V L1-N (page 750)																
Bus Voltage L2-N (page 466)	Hst Bus <V L2-N (page 750)																
Bus Voltage L3-N (page 466)	Hst Bus <V L3-N (page 750)																
Bus Voltage L1-L2 (page 466)	Hst Bus <V L1-L2 (page 751)																
Bus Voltage L2-L3 (page 467)	Hst Bus <V L2-L3 (page 751)																
Bus Voltage L3-L1 (page 467)	Hst Bus >V L3-L1 (page 750)																
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 1 (PAGE 618) / PROTECTION FORCE DISABLE 2 (PAGE 619) / PROTECTION FORCE DISABLE 3 (PAGE 619).																	

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Bus V Unbalance Protection

Setpoint group	Protections	Related FW	1.1.0
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	15669	Related applications	MCB
Config level	Advanced		
Setpoint visibility	Always		
Description			
This setpoint enables or disables Bus V Unbalance Protection.			

Behavior of protection is adjusted via setpoints **Bus V Unbalance** (page 332) and **Bus V Unbalance Delay** (page 332). When relative difference between Bus voltages is over setpoint **Bus V Unbalance** (page 332) for time longer than **Bus V Unbalance Delay** (page 332) alarm **Hst Bus V Unbalance Ph-N** (page 752) or **Hst Bus V Unbalance Ph-Ph** (page 752) is activated.

IMPORTANT: Behavior of this protection is influenced by setpoint **Connection type** (page 265)

Connection type (page 265)	Compared values (maximum difference)
3Ph4Wire	Bus Voltage L1-N (page 466), Bus Voltage L2-N (page 466) and Bus Voltage L3-N (page 466) OR Bus Voltage L1-L2 (page 466), Bus Voltage L2-L3 (page 467) and Bus Voltage L3-L1 (page 467)
High Leg D	Bus Voltage L1-L2 (page 466), Bus Voltage L2-L3 (page 467) and Bus Voltage L3-L1 (page 467)
3Ph3Wire	Bus Voltage L1-L2 (page 466), Bus Voltage L2-L3 (page 467) and Bus Voltage L3-L1 (page 467)
SplitPhase	Bus Voltage L1-N (page 466), Bus Voltage L2-N (page 466) and Bus Voltage L3-N (page 466)
MonoPhase	No protection is evaluated.

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 1 (PAGE 618) / PROTECTION FORCE DISABLE 2 (PAGE 619) / PROTECTION FORCE DISABLE 3 (PAGE 619).

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Subgroup: Frequency Protection

Mains >f Protection

Setpoint group	Protections	Related FW	1.1.0
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	20802	Related applications	MCB
Config level	Advanced		
Setpoint visibility	Always		
Description			
<p>This setpoint adjusts the behavior Mains >f Protection.</p> <p>Behavior of protection is adjusted via setpoints Mains >f (page 321), Mains >f Delay (page 321) and Mains >f Hys (page 322). When Mains Frequency (page 453) exceeds maximal accepted frequency for period longer than Mains >f Delay (page 321)alarm MP MAINS >F (PAGE 768) is activated.</p> <ul style="list-style-type: none">➤ Controller mode (page 271) = OFF and MCB Opens On (page 287) = Mains Fail➤ Controller mode (page 271) = MAN and Breaker state (page 494) = ParalOper➤ Controller mode (page 271) = AUTO <p>Return from Mains >f can have hysteresis set by Mains >f Hys (page 322).</p>			
Note: $f_{max} = \text{Nominal Frequency (page 270)} + \text{Mains >f (page 321)}$			
Setpoint options:			
<ul style="list-style-type: none">➤ 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 1 (PAGE 618) / PROTECTION FORCE DISABLE 2 (PAGE 619) / PROTECTION FORCE DISABLE 3 (PAGE 619).			

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Mains >>f Protection

Setpoint group	Protections	Related FW	1.1.0
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	20801	Related applications	MCB
Config level	Advanced		
Setpoint visibility	Always		
Description			
<p>This setpoint adjusts the behavior Mains >>f Protection.</p> <p>Behavior of protection is adjusted via setpoints Mains >>f (page 322), Mains >>f Delay (page 322) and Mains >>f Hys (page 323). When Mains Frequency (page 453) exceeds maximal accepted frequency for period longer than Mains >>f Delay (page 322) alarm MP MAINS >>F (PAGE 768) is activated.</p> <ul style="list-style-type: none">> Controller mode (page 271) = OFF and MCB Opens On (page 287) = Mains Fail> Controller mode (page 271) = MAN and Breaker state (page 494) = ParalOper> Controller mode (page 271) = AUTO <p>Return from Mains >>f can have hysteresis set by Mains >>f Hys (page 323).</p> <div>Note: $f_{max} = \text{Nominal Frequency (page 270)} + \text{Mains >>f (page 322)}$</div> <p>Setpoint options:</p> <ul style="list-style-type: none">> 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 1 (PAGE 618) / PROTECTION FORCE DISABLE 2 (PAGE 619) / PROTECTION FORCE DISABLE 3 (PAGE 619).			

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Mains <f Protection

Setpoint group	Protections	Related FW	1.1.0
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	20803	Related applications	MCB
Config level	Advanced		
Setpoint visibility	Always		
Description			
<p>This setpoint adjusts the behavior Mains <f Protection.</p> <p>Behavior of protection is adjusted via setpoints Mains <f (page 323), Mains <f Delay (page 323) and Mains <f Hys (page 324). When Mains Frequency (page 453) drops bellow minimal accepted frequency for period longer than Mains <f Delay (page 323) alarm MP MAINS <F (PAGE 768) is activated.</p> <ul style="list-style-type: none">➤ Controller mode (page 271) = OFF and MCB Opens On (page 287) = Mains Fail➤ Controller mode (page 271) = MAN and Breaker state (page 494) = ParalOper➤ Controller mode (page 271) = AUTO <p>Return from Mains <f can have hysteresis set by Mains <f Hys (page 324).</p> <p>Note: f_{min} = Nominal Frequency (page 270) - Mains <f (page 323)</p>			
Setpoint options:			
<ul style="list-style-type: none">➤ 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 1 (PAGE 618) / PROTECTION FORCE DISABLE 2 (PAGE 619) / PROTECTION FORCE DISABLE 3 (PAGE 619).			

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Mains <<f Protection

Setpoint group	Protections	Related FW	1.1.0
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	20804	Related applications	MCB
Config level	Advanced		
Setpoint visibility	Always		
Description			
<p>This setpoint adjusts the behavior Mains <<f Protection.</p> <p>Behavior of protection is adjusted via setpoints Mains <<f (page 324), Mains <<f Delay (page 324) and Mains <<f Hys (page 325). When Mains Frequency (page 453) drops bellow minimal accepted frequency for period longer than Mains <<f Delay (page 324) alarm MP MAINS <<F (PAGE 769) is activated.</p> <ul style="list-style-type: none">➤ Controller mode (page 271) = OFF and MCB Opens On (page 287) = Mains Fail➤ Controller mode (page 271) = MAN and Breaker state (page 494) = ParalOper➤ Controller mode (page 271) = AUTO <p>Return from Mains <<f can have hysteresis set by Mains <<f Hys (page 325).</p> <p>Note: f_{min} = Nominal Frequency (page 270) - Mains <<f (page 324)</p>			
Setpoint options:			
<ul style="list-style-type: none">➤ 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 1 (PAGE 618) / PROTECTION FORCE DISABLE 2 (PAGE 619) / PROTECTION FORCE DISABLE 3 (PAGE 619).			

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Bus >f Protection

Setpoint group	Protections	Related FW	1.1.0
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	20809	Related applications	MCB
Config level	Advanced		
Setpoint visibility	Always		
Description			
This setpoint enables or disables Bus >f Protection.			
Behavior of protection is adjusted via setpoints Bus >f (page 332) and Bus >f Delay (page 333). When Bus Frequency (page 466) exceeds maximal accepted frequency for period longer than Bus >f Delay (page 333) alarm Hst Bus >f (page 751) is activated.			
Note: $f_{max} = \text{Nominal Frequency (page 270)} + \text{Bus >f (page 332)}$			
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 1 (PAGE 618) / PROTECTION FORCE DISABLE 2 (PAGE 619) / PROTECTION FORCE DISABLE 3 (PAGE 619).			

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Bus <f Protection

Setpoint group	Protections	Related FW	1.1.0
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	20810	Related applications	MCB
Config level	Advanced		
Setpoint visibility	Always		
Description			
This setpoint enables or disables Bus <f Protection.			
Behavior of protection is adjusted via setpoints Bus <f (page 333) and Bus <f Delay (page 333) . When Bus Frequency (page 466) drops below minimal accepted frequency for period longer than Bus <f Delay (page 333) alarm Hst Bus <f (page 752) is activated.			
Note: $f_{min} = \text{Nominal Frequency (page 270)} + \text{Bus <f (page 333)}$			
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 1 (PAGE 618) / PROTECTION FORCE DISABLE 2 (PAGE 619) / PROTECTION FORCE DISABLE 3 (PAGE 619) .			

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Subgroup: Minimal Power PTM Protection

Minimal Power PTM Protection

Setpoint group	Protections	Related FW	1.1.0
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	17012	Related applications	MCB
Config level	Standard		
Setpoint visibility	Always		
Description			
This setpoint enables or disables Minimal Power PTM protection.			
The LBO MINIMAL POWER PTM LIMITATION (PAGE 644) is closed always when the System Required P Target is below Minimal Power PTM (page 334) .			
Enabled	Protection is enabled. Alarm SP Request Under MinPowerPTM (page 771) is activated if controller detects that the System Required P Target is below Minimal Power PTM (page 334) while Parallel To Mains operation and Minimal Power PTM Protection Del (page 334) elapsed.		
Disabled	Protection is disabled.		
Protection Force Disable 1	Protection is enabled or disabled by the state of LBI PROTECTION FORCE DISABLE 1 (PAGE 618) .		
Protection Force Disable 2	Protection is enabled or disabled by the state of LBI PROTECTION FORCE DISABLE 2 (PAGE 619) .		
Protection Force Disable 3	Protection is enabled or disabled by the state of LBI PROTECTION FORCE DISABLE 3 (PAGE 619) .		
Note: This protections is not evaluated if System power goes under Minimal Power because of Import/Export Limitation (page 291) .			

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Subgroup: Bus Meas Error

Bus Meas Error


Setpoint group	Protections	Related FW	1.1.0
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	10558	Related applications	MCB
Config level	Advanced		
Setpoint visibility	Always		
Description			
This setpoint enables or disables Bus Measurement Error protection.			
Alarm Bus Meas Error (page 752) is activated if controller detects a mismatch between the expected and currently measured voltage on the bus for period longer than 20 s. Mismatch means that measured voltage is lower/higher than Bus Dead Level (page 269) , although the controller receives information about closed/opened breaker.			
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 1 (PAGE 618) / PROTECTION FORCE DISABLE 2 (PAGE 619) / PROTECTION FORCE DISABLE 3 (PAGE 619) .			

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Subgroup: Loss of Mains Protections

Vector Shift Protection

Setpoint group	Protections	Related FW	1.1.0
Range [units]	Enabled / Parallel Only / Disabled [-]		
Default value	Disabled	Force value	YES
Step	[-]		
Comm object	10551	Related applications	MCB
Config level	Standard		
Setpoint visibility	Always		
Description			
<p>This setpoint enables or disables the function of the built-in Vector Shift protection.</p> <p>Behavior of protection is adjusted via setpoint Vector Shift Limit (page 325). When measured vector shift on Mains Voltage L1-N (page 454) is over the Vector Shift Limit (page 325), breaker is opened and history record Vector Shift is written to the history.</p> <p>Note: <i>If a vector shift is detected and consequently the MCB is opened, however mains voltage and frequency remain in limits, the MCB is reclosed again, as the mains is evaluated as healthy.</i></p>			
Enabled	Protection is always active while MCB is closed.		
Parallel Only	Protection is active only if Breaker state (page 494) = ParalOper.		
Disabled	Protection is disabled.		

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ROCOF1 Protection

Setpoint group	Protections	Related FW	1.1.0						
Range [units]	Enabled / Parallel Only / Disabled [-]								
Default value	Disabled	Force value	YES						
Step	[-]								
Comm object	9840	Related applications	MCB						
Config level	Standard								
Setpoint visibility	Always								
Description									
<p>This setpoint enables or disables the function of the built-in ROCOF1 Protection.</p> <p>Behavior of protection is adjusted via setpoints ROCOF1 Windows Length (page 326) and ROCOF1 df/dt (page 326).</p> <p>When measured ROCOF1 (page 461) on Mains Frequency (page 453) is over ROCOF1 df/dt (page 326) in respective period given by ROCOF1 Windows Length (page 326), breaker is opened and history record ROCOF is written to the history. Maximal ROCOF is stored in Max ROCOF1 (page 461) which is reset every time when the breaker is closed again.</p> <p>Note: <i>If a ROCOF is detected and consequently the MCB is opened, however mains voltage and frequency remain in limits, the MCB is reclosed again, as the mains is evaluated as healthy.</i></p>									
<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 Breaker state (page 494) = 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 Breaker state (page 494) = ParalOper.	Disabled	Protection is disabled.
Enabled	Protection is always active while MCB is closed.								
Parallel Only	Protection is active only if Breaker state (page 494) = ParalOper.								
Disabled	Protection is disabled.								

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ROCOF2 Protection

Setpoint group	Protections	Related FW	1.1.0
Range [units]	Enabled / Parallel Only / Disabled [-]		
Default value	Disabled	Force value	YES
Step	[-]		
Comm object	16145	Related applications	MCB
Config level	Standard		
Setpoint visibility	Always		
Description			
<p>This setpoint enables or disables the function of the built-in ROCOF2 Protection.</p> <p>Behavior of protection is adjusted via setpoints ROCOF2 Windows Length (page 327) and ROCOF2 df/dt (page 327).</p> <p>When measured ROCOF2 (page 462) on Mains Frequency (page 453) is over ROCOF2 df/dt (page 327) in respective time given by ROCOF2 Windows Length (page 327), breaker is opened and history record ROCOF is written to the history. Maximal ROCOF is stored in Max ROCOF2 (page 462) which is reset every time when the breaker is closed again.</p> <p>Note: <i>If a ROCOF is detected and consequently the MCB is opened, however mains voltage and frequency remain in limits, the MCB is reclosed again, as the mains is evaluated as healthy.</i></p>			
Enabled	Protection is always active while MCB is closed.		
Parallel Only	Protection is active only if Breaker state (page 494) = ParalOper.		
Disabled	Protection is disabled.		

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ROCOF3 Protection

Setpoint group	Protections	Related FW	1.1.0
Range [units]	Enabled / Parallel Only / Disabled [-]		
Default value	Disabled	Force value	YES
Step	[-]		
Comm object	16146	Related applications	MCB
Config level	Standard		
Setpoint visibility	Always		
Description			
<p>This setpoint enables or disables the function of the built-in ROCOF3 Protection.</p> <p>Behavior of protection is adjusted via setpoints ROCOF3 Windows Length (page 328) and ROCOF3 df/dt (page 328).</p> <p>When measured ROCOF3 (page 462) on Mains Frequency (page 453) is over ROCOF3 df/dt (page 328) in respective time given by ROCOF3 Windows Length (page 328), breaker is opened and history record ROCOF is written to the history. Maximal ROCOF is stored in Max ROCOF3 (page 463) which is reset every time when the breaker is closed again.</p> <p>Note: <i>If a ROCOF is detected and consequently the MCB is opened, however mains voltage and frequency remain in limits, the MCB is reclosed again, as the mains is evaluated as healthy.</i></p>			
Enabled	Protection is always active while MCB is closed.		
Parallel Only	Protection is active only if Breaker state (page 494) = ParalOper.		
Disabled	Protection is disabled.		

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ROCOF4 Protection

Setpoint group	Protections	Related FW	1.1.0						
Range [units]	Enabled / Parallel Only / Disabled [-]								
Default value	Disabled	Force value	YES						
Step	[-]								
Comm object	16147	Related applications	MCB						
Config level	Standard								
Setpoint visibility	Always								
Description									
<p>This setpoint enables or disables the function of the built-in ROCOF4 Protection.</p> <p>Behavior of protection is adjusted via setpoints ROCOF4 Windows Length (page 329) and ROCOF4 df/dt (page 329).</p> <p>When measured ROCOF4 (page 463) on Mains Frequency (page 453) is over ROCOF4 df/dt (page 329) in respective time given by ROCOF4 Windows Length (page 329), breaker is opened and history record ROCOF is written to the history. Maximal ROCOF is stored in Max ROCOF4 (page 463) which is reset every time when the breaker is closed again.</p> <p>Note: <i>If a ROCOF is detected and consequently the MCB is opened, however mains voltage and frequency remain in limits, the MCB is reclosed again, as the mains is evaluated as healthy.</i></p>									
<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 Breaker state (page 494) = 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 Breaker state (page 494) = ParalOper.	Disabled	Protection is disabled.
Enabled	Protection is always active while MCB is closed.								
Parallel Only	Protection is active only if Breaker state (page 494) = ParalOper.								
Disabled	Protection is disabled.								

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Group: Communication Settings

Subgroup: Controller Address

CAN Controller Address

Setpoint group	Communication Settings	Related FW	1.1.0
Range [units]	1 .. 64 [-]		
Default value	1 [-]	Force value	NO
Step	1 [-]		
Comm object	23999	Related applications	MCB
Config level	Standard		
Setpoint visibility	Always		
Description			
This setpoint adjusts Controller's CAN Address which is used for CAN Intercontroller Communication (page 123) .			
This type of communication is used to share information between other ComAp controllers via CAN interface (Communication peripherals (page 18)).			
Note: Each controller connected via CAN has to have unique address, i.e. maximally 64 controllers can be connected together.			
Note: There is an exception, if the function Hot Swap Redundancy (page 141) is used, the Master and Backup controllers has to have same address because they act like one controller unit for the rest of the site.			

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Terminal Comm Address

Setpoint group	Communication Settings	Related FW	1.1.0
Range [units]	1 .. 32 [-]		
Default value	1 [-]	Force value	NO
Step	1 [-]		
Comm object	24019	Related applications	MCB
Config level	Standard		
Setpoint visibility	Always		
Description			
This setpoint adjusts Controller's Terminal Address which is used for communication with other devices using terminals ETH1, ETH2, and RS485 (Communication peripherals (page 18)). This type of communication is used fore remote or local connection of the computer (InteliConfig), Display, Modbus Server, etc.			

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Subgroup: RS485 Settings

RS485 Modbus Speed

Setpoint group	Communication Settings	Related FW	1.1.0
Range [units]	9600 / 19200 / 38400 / 57600 / 115200 [bps]		
Default value	9600 bps	Force value	NO
Step	[-]		
Comm object	24141	Related applications	MCB
Config level	Standard		
Setpoint visibility	Always		
Description			
This setpoint adjusts communication speed of Modbus-RTU, Modbus/TCP (page 233) .			

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RS485 Modbus Mode

Setpoint group	Communication Settings	Related FW	1.1.0
Range [units]	8N1 / 8N2 / 8E1 [-]		
Default value	8N1	Force value	NO
Step	[-]		
Comm object	24020	Related applications	MCB
Config level	Standard		
Setpoint visibility	Always		
Description			
This setpoint adjusts communication mode of Modbus-RTU, Modbus/TCP (page 233) .			
Possible options			
8N1	8 data bits, 1 stop bit, no parity		
8N2	8 data bits, 2 stop bits, no parity		
8E1	8 data bits, 1 stop bit, even parity		

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Subgroup: History Settings

LB/UART Log

Setpoint group	Communication Settings	Related FW	1.1.0
Range [units]	Disabled / Enabled [-]		
Default value	Disabled	Force value	NO
Step	[-]		
Comm object	11327	Related applications	MCB
Config level	Standard		
Setpoint visibility	Always		
Description			
This setpoint enables/disables logging of connection/disconnection of each remote terminal. The record is written to the history.			
<i>Note: The terminal is disconnected automatically after 1 min of inactivity and next communication request from the same terminal is considered as a new connection. When logging is enabled in certain conditions the history may be filled up with large number of records related to the communication and important record may be overwritten quite fast.</i>			
Disabled	Logging is disabled.		
Enabled	Logging is enabled. Connection/Disconnection over ETH1, ETH2 or USB (Communication peripherals (page 18)) causes history log. <i>Note: Connection over USB is recognized after reading of/writing to a communication object.</i>		

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Subgroup: Intercontroller Settings

CAN Intercontroller Comm Redundancy

Setpoint group	Communication Settings	Related FW	1.1.0
Range [units]	Enabled / Disabled [-]		
Default value	Disabled	Force value	NO
Step	[-]		
Comm object	24026	Related applications	MCB
Config level	Standard		
Setpoint visibility	Always		
Description			
This setpoint enables or disables CAN Intercontroller Communication Redundancy (page 124) .			
Note: In case that there is a mismatch between this setpoint and actual state of ⓘ CAN2B (page 43) alarm ALI Redundant CAN Error (page 745) is activated.			

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CAN Intercontroller Comm Mode

Setpoint group	Communication Settings	Related FW	1.1.0
Range [units]	32C / 16C / 8C / 64C CAN FD / 32C CAN FD / 8C CAN FD [-]		
Default value	8C	Force value	NO
Step	[-]		
Comm object	24499	Related applications	MCB
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 IntelliMains1010 SC and older controllers such as IGS-NT, IG2GSC, IG200, IG500. Options 64C CAN FD, 32C CAN FD and 8C CAN FD are compatible only with controllers which support the CAN FD communication.

Note: It is strongly recommended to use CAN FD modes if all controllers on-site support the CAN FD communication.

Mode	Arbitration Bit-Rate	Data Bit-Rate	Maximal Bus Length	Max Bus Length With Repeater
32C	250 kbit	250 kbit	200 m	800 m
16C	125 kbit	125 kbit	400 m	1600 m
8C	50 kbit	50 kbit	900 m	3600 m
64C CAN FD	250 kb	2 Mbit	200 m	Not tested
32C CAN FD	125 kb	1 Mbit	400 m	Not tested
8C CAN FD	50 kb	400 kbit	900 m	Not tested

IMPORTANT: All controllers communicating on common CAN have to use the same mode of this setpoint.

IMPORTANT: All changes made to the setpoint takes effect after the restart of the controller.

Note: In case that there is a mismatch between this setpoint and value **CAN Intercontroller Comm Mode** (page 496), alarm **ALI CAN Mode Inconsistency** (page 745) is activated.

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CAN Intercontroller Empty Check

Setpoint group	Communication Settings	Related FW	1.1.0				
Range [units]	Enabled / Disabled [-]						
Default value	Disabled	Force value	YES				
Step	[-]						
Comm object	9921	Related applications	MCB				
Config level	Standard						
Setpoint visibility	Always						
Description							
This setpoint enable or disable CAN2 Intercontroller Empty Check.							
<table><tr><td>Disabled</td><td>Detection of CAN Intercontroller Empty Check is disabled.</td></tr><tr><td>Enabled</td><td>Detection of CAN Intercontroller Empty Check is enabled. If controller does not see any other controller on the⑥ CAN2A (page 43) or⑦ CAN2B (page 43) theWrn CAN2 Empty (page 711) will be activated.</td></tr></table>				Disabled	Detection of CAN Intercontroller Empty Check is disabled.	Enabled	Detection of CAN Intercontroller Empty Check is enabled. If controller does not see any other controller on the⑥ CAN2A (page 43) or⑦ CAN2B (page 43) theWrn CAN2 Empty (page 711) will be activated.
Disabled	Detection of CAN Intercontroller Empty Check is disabled.						
Enabled	Detection of CAN Intercontroller Empty Check is enabled. If controller does not see any other controller on the⑥ CAN2A (page 43) or⑦ CAN2B (page 43) theWrn CAN2 Empty (page 711) will be activated.						

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Subgroup: SD Card Settings

SD Card File System

Setpoint group	Communication Settings	Related FW	1.1.0
Range [units]	Unmount / Mount / Format [-]		
Default value	Unmount	Force value	NO
Step	[-]		
Comm object	23997	Related applications	MCB
Config level	Standard		
Setpoint visibility	Always		
Description			
This setpoint determines whether the SD card is mounted, unmounted, or should be formatted. After formatting, the setpoint is automatically switched to the mount option. If the setpoint is set to unmount no interaction with the SD card is allowed, the controller will only detect that the SD card is inserted.			
IMPORTANT: This setpoint has to be set to Mount in order to allow any writing function to the SD card.			

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Long Term History

Setpoint group	Communication Settings	Related FW	1.1.0
Range [units]	Disabled / Enabled [-]		
Default value	Disabled	Force value	NO
Step	[-]		
Comm object	23995	Related applications	MCB
Config level	Standard		
Setpoint visibility	Always		
Description			
This setpoint enables/disables writing of long term history onto the SD card.			
Note: Setpoint SD Card File System (page 367) - has to be adjusted to Mount.			
Disabled	Long Term History is not written onto the SD card.		
Enabled	Long Term History is written onto the SD card.		

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Subgroup: CAN1 ECU/IO Modules Split

CAN1 ECU/IOModules Split


Setpoint group	Communication Settings	Related FW	1.1.0
Range [units]	Disabled/Enabled		
Default value	Disabled	Force value	NO
Step	-		
Comm object	17339	Related applications	MCB
Config level	Standard		
Setpoint visibility	When setpoint Hot Swap Redundancy (page 274) = Disabled		
Description			
This setpoint allows to change the behavior on CAN1 communication terminals.			
By default, CAN1A terminal is used for communication with ECU and IO Modules, CAN1B terminal is used for Hot Swap Redundancy (page 141) . By enabling this setpoint, the CAN1A terminal can be used only for ECU, the CAN1B can be used only for IO Modules.			
Note: <i>In case that CAN1 ECU/IOModules Split (page 368) is enabled, the Hot Swap Redundancy (page 141) is disabled (and vice versa).</i>			

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Group: ETH Port Configuration

Ethernet port 1

Setpoint group	ETH Port Configuration	Related FW	1.1.0
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	MCB
Config level	Standard		
Setpoint visibility	Always		
Description			
This setpoint is used to select the interface type on ethernet slot 1.			
Trusted Interface - It is expected that these interfaces are operated locally inside a closed environment / infrastructure where additional measures against misuse or attack take place (e.g. physical access limitation). Due to nature of this interface less strict cybersecurity rules apply at it and that is why Implicit account is introduced here to make working with the controller simpler.			
Untrusted Interface - This interface is a general-purpose one and it is expected that it may be exposed to public networks, such as Internet, which are not under control of the entity operating the controller. Thus, strict cybersecurity rules apply for this type of interface.			
Modbus Interface - This type of interface is used for Modbus communication. It is not possible to connect to the controller using this interface.			
Trusted Mirroring/Untrusted Mirroring/Modbus Mirroring - If mirroring mode is selected for a socket, the switch will be configured that except sending traffic belonging normally to that socket, it will also copy to that socket all traffic from other sockets assigned to the same network.			
Note: Only one socket can be adjusted to mirroring function. If multiple sockets are adjusted to mirroring function the alarm ALI Ethernet Port Inconsistency will be still displayed after the CU restart.			

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Ethernet port 2

Setpoint group	ETH Port Configuration	Related FW	1.1.0
Range [units]	Trusted Interface / Untrusted Interface / Modbus Interface / Trusted Mirroring / Untrusted Mirroring / Modbus Mirroring [-]		
Default value	Trusted Interface	Force value	NO
Step	[-]		
Comm object	23872	Related applications	MCB
Config level	Standard		
Setpoint visibility	Always		
Description			
This setpoint is used to select the interface type on ethernet slot 2.			
Trusted Interface - It is expected that these interfaces are operated locally inside a closed environment / infrastructure where additional measures against misuse or attack take place (e.g. physical access limitation). Due to nature of this interface less strict cybersecurity rules apply at it and that is why Implicit account is introduced here to make working with the controller simpler.			
Untrusted Interface - This interface is a general-purpose one and it is expected that it may be exposed to public networks, such as Internet, which are not under control of the entity operating the controller. Thus, strict cybersecurity rules apply for this type of interface.			
Modbus Interface - This type of interface is used for Modbus communication. It is not possible to connect to the controller using this interface.			
Trusted Mirroring/Untrusted Mirroring/Modbus Mirroring - If mirroring mode is selected for a socket, the switch will be configured that except sending traffic belonging normally to that socket, it will also copy to that socket all traffic from other sockets assigned to the same network.			
Note: Only one socket can be adjusted to mirroring function. If multiple sockets are adjusted to mirroring function the alarm ALI Ethernet Port Inconsistency will be still displayed after the CU restart.			

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Ethernet port 3

Setpoint group	ETH Port Configuration	Related FW	1.1.0
Range [units]	Trusted Interface / Untrusted Interface / Modbus Interface / Trusted Mirroring / Untrusted Mirroring / Modbus Mirroring [-]		
Default value	Modbus Interface	Force value	NO
Step	[-]		
Comm object	23871	Related applications	MCB
Config level	Standard		
Setpoint visibility	Always		
Description			
This setpoint is used to select the interface type on ethernet slot 3.			
Trusted Interface - It is expected that these interfaces are operated locally inside a closed environment / infrastructure where additional measures against misuse or attack take place (e.g. physical access limitation). Due to nature of this interface less strict cybersecurity rules apply at it and that is why Implicit account is introduced here to make working with the controller simpler.			
Untrusted Interface - This interface is a general-purpose one and it is expected that it may be exposed to public networks, such as Internet, which are not under control of the entity operating the controller. Thus, strict cybersecurity rules apply for this type of interface.			
Modbus Interface -This type of interface is used for Modbus communication. It is not possible to connect to the controller using this interface.			
Trusted Mirroring/Untrusted Mirroring/Modbus Mirroring - If mirroring mode is selected for a socket, the switch will be configured that except sending traffic belonging normally to that socket, it will also copy to that socket all traffic from other sockets assigned to the same network.			
Note: Only one socket can be adjusted to mirroring function. If multiple sockets are adjusted to mirroring function the alarm ALI Ethernet Port Inconsistency will be still displayed after the CU restart.			

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Group: ETH Interface 1 - Trusted

Subgroup: TCP/IP Settings

IP Address Mode

Setpoint group	ETH Interface 1 - Trusted	Related FW	1.1.0
Range [units]	Manual / Automatic / Disabled [-]		
Default value	Automatic	Force value	YES
Step	[-]		
Comm object	24063	Related applications	MCB
Config level	Standard		
Setpoint visibility	Always		
Description			
This setpoint is used to select the method how the ethernet connection is adjusted on Ethernet 1 (page 18) .			
Manual:	Manual: The Ethernet connection is fixed by means of the setpoints IP Address (page 373) , Subnet Mask (page 373) , Gateway IP (page 374) . 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.		
IMPORTANT: When the mode is switched from Automatic to Manual the TCP/IP settings will be changed to the values in the related setpoints. In case you are using Ethernet 1 to connect the CU you will be disconnected. Turn off the setpoint hiding function to manually change the TCP/IP settings to same values obtained via DHCP so you will not be disconnected when changing mode.			

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IP Address

Setpoint group	ETH Interface 1 - Trusted	Related FW	1.1.0
Range [units]	0 .. 15 characters [-]		
Default value	192.168.1.1	Force value	NO
Step	[-]		
Comm object	24061	Related applications	MCB
Config level	Standard		
Setpoint visibility	Only if IP Address Mode (page 372) = Manual		
Description			
<p>The setpoint is used to select the method how the IP Address is adjusted on Ethernet 1 (page 18).</p> <p>If IP Address Mode (page 372) = Manual, this setpoint is used to adjust the IP address of the Ethernet 1 (page 18) interface of the controller. Ask your IT specialist for help with this setting.</p> <p>If IP Address Mode (page 372) = Automatic this setpoint is inactive. The IP address is assigned by the DHCP server.</p>			
Note: Only valid IP address can be inserted.			

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Subnet Mask

Setpoint group	ETH Interface 1 - Trusted	Related FW	1.1.0
Range [units]	0 .. 15 characters [-]		
Default value	255.255.255.0	Force value	NO
Step	[-]		
Comm object	24059	Related applications	MCB
Config level	Standard		
Setpoint visibility	Only if IP Address Mode (page 377) = Manual		
Description			
<p>The setpoint is used to select the method how the Subnet Mask is adjusted on Ethernet 1 (page 18).</p> <p>If IP Address Mode (page 372) = Manual, this setpoint is used to adjust the Subnet Mask. Ask your IT specialist for help.</p> <p>If IP Address Mode (page 372) = Automatic this setpoint is inactive. The Subnet Mask is assigned by the DHCP server.</p>			
Note: Only valid IP address can be inserted.			

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Gateway IP

Setpoint group	ETH Interface 1 - Trusted	Related FW	1.1.0
Range [units]	0 .. 15 characters [-]		
Default value	192.168.1.1	Force value	NO
Step	[-]		
Comm object	24057	Related applications	MCB
Config level	Standard		
Setpoint visibility	Only if IP Address Mode (page 372) = Manual		
Description			
<p>This setpoint is used to select the method how the Gateway IP is adjusted on Ethernet 1 (page 18) .</p> <p>If IP Address Mode (page 372) = Manual, this setpoint is used to adjust the IP address of the gateway of the network segment where the controller is connected.</p> <p>If IP Address Mode (page 372) = Automatic this setpoint is used to display the gateway IP which has been assigned by the DHCP server.</p> <p>A gateway is a device which connects the respective segment with the other segments and/or the internet.</p>			
Note: Only valid IP address can be inserted.			

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IP Firewall

Setpoint group	ETH Interface 1 - Trusted	Related FW	1.1.0				
Range [units]	Enabled / Disabled [-]						
Default value	Disabled	Force value	NO				
Step	[-]						
Comm object	24029	Related applications	MCB				
Config level	Standard						
Setpoint visibility	Always						
Description							
This setpoints enables or disables the built-in Firewall (page 139) functionality for Ethernet 1 (page 18) .							
<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.						
IMPORTANT: Loss of connection can happen when enabling the firewall and using remote connection via Internet							

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Subgroup: Modbus Server Settings

Modbus Server

Setpoint group	ETH Interface 1 - Trusted	Related FW	1.1.0
Range [units]	Disabled / Enabled [-]		
Default value	Disabled	Force value	NO
Step	[-]		
Comm object	24034	Related applications	MCB
Config level	Standard		
Setpoint visibility	Always		
Description			
This setpoint enables or disables Modbus communication via Ethernet 1 (page 18) .			

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Modbus Client Inactivity Timeout

Setpoint group	ETH Interface 1 - Trusted	Related FW	1.1.0
	ETH Interface 2 - Untrusted		
	ETH Interface 3 - Modbus		
Range [units]	0 .. 65535 [s]		
Default value	60 s	Force value	NO
Step	1 s		
Comm object	24097	Related applications	MCB
Config level	Standard		
Setpoint visibility	Always		
Description			
Modbus connection (TCP socket) is closed by controller, if a Modbus client does not communicate for this time.			
Note: This setpoint is shared with other Modbus Client Inactivity Timeout setpoints.			

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Subgroup: ComAp Client Settings

Direct Connection Port

Setpoint group	ETH Interface 1 - Trusted	Related FW	1.1.0
Range [units]	0 .. 65535 [-]		
Default value	23 [-]	Force value	YES
Step	1 [-]		
Comm object	24035	Related applications	MCB
Config level	Standard		
Setpoint visibility	Always		
Description			
This port is used to listen for an incoming TCP connection on Ethernet 1 (page 18) .			

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ComAp Client Inactivity Timeout

Setpoint group	ETH Interface 1 - TrustedETH Interface 2 - Untrusted	Related FW	1.1.0
Range [units]	0 .. 65535 [s]		
Default value	60 s	Force value	YES
Step	1 s		
Comm object	24098	Related applications	MCB
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.			
Note: This setpoint is shared with ComAp Client Inactivity Timeout (page 376) .			


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Group: ETH Interface 2 - Untrusted

Subgroup: TCP/IP Settings

IP Address Mode

Setpoint group	ETH Interface 2 - Untrusted Ethernet	Related FW	1.1.0
Range [units]	Manual / Automatic / Disabled [-]		
Default value	Automatic	Force value	NO
Step	[-]		
Comm object	24259	Related applications	MCB
Config level	Standard		
Setpoint visibility	Always		
Description			
This setpoint is used to select the method how the ethernet connection is adjusted on Ethernet 2 (page 19) .			
Manual:	The Ethernet connection is fixed by means of the setpoints IP Address (page 378) , Subnet Mask (page 378) , Gateway IP (page 379) , DNS IP Address 1 (page 380) , DNS IP Address 2 (page 381) . 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.		
IMPORTANT: When the mode is switched from Automatic to Manual the TCP/IP settings will be changed to the values in the related setpoints. In case you are using Ethernet 2 to connect the CU you will be disconnected. Turn off the setpoint hiding function to manually change the TCP/IP settings to same values obtained via DHCP so you will not be disconnected when changing mode.			

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IP Address

Setpoint group	ETH Interface 2 - Untrusted	Related FW	1.1.0
Range [units]	0 .. 15 characters [-]		
Default value	192.168.2.254	Force value	NO
Step	[-]		
Comm object	24376	Related applications	MCB
Config level	Standard		
Setpoint visibility	Only if IP Address Mode (page 377) = Manual		
Description			
<p>The setpoint is used to select the method how the IP Address is adjusted on Ethernet 2 (page 19).</p> <p>If IP Address Mode (page 377) = Manual, this setpoint is used to adjust the IP address of the Ethernet 2 (page 19) interface of the controller. Ask your IT specialist for help with this setting.</p> <p>If IP Address Mode (page 377) = Automatic this setpoint is inactive. The IP address is assigned by the DHCP server.</p>			
Note: Only valid IP address can be inserted.			

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Subnet Mask

Setpoint group	ETH Interface 2 - Untrusted	Related FW	1.1.0
Range [units]	0 .. 15 characters [-]		
Default value	255.255.255.0	Force value	NO
Step	[-]		
Comm object	24375	Related applications	MCB
Config level	Standard		
Setpoint visibility	Only if IP Address Mode (page 377) = Manual		
Description			
<p>The setpoint is used to select the method how the Subnet Mask is adjusted on Ethernet 2 (page 19).</p> <p>If IP Address Mode (page 377) = Manual this setpoint is used to adjust the Subnet Mask. Ask your IT specialist for help with this setting.</p> <p>If IP Address Mode (page 377) = Automatic this setpoint is inactive. The Subnet Mask is assigned by the DHCP server.</p>			
Note: Only valid IP address can be inserted.			

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Gateway IP

Setpoint group	ETH Interface 2 - Untrusted	Related FW	1.1.0
Range [units]	0 .. 15 characters [-]		
Default value	192.168.2.1	Force value	NO
Step	[-]		
Comm object	24373	Related applications	MCB
Config level	Standard		
Setpoint visibility	Only if IP Address Mode (page 377) = Manual		
Description			
<p>This setpoint is used to select the method how the Gateway IP is adjusted.</p> <p>If IP Address Mode (page 377) = Manual, this setpoint is used to adjust the Gateway IP address of the Ethernet 2 (page 19) interface of the controller. Ask your IT specialist for help with this setting.</p> <p>If IP Address Mode (page 377) = 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>Note: Only valid IP address can be inserted.</p>			

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IP Firewall

Setpoint group	ETH Interface 2 - Untrusted Ethernet	Related FW	1.1.0				
Range [units]	Disabled / Enabled [-]						
Default value	Disabled	Force value	NO				
Step	[-]						
Comm object	24092	Related applications	MCB				
Config level	Standard						
Setpoint visibility	Always						
Description							
This setpoints enables or disables the built-in Firewall (page 139) functionality for Ethernet 2 (page 19) .							
<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.						
IMPORTANT: Loss of connection can happen when enabling the firewall and using remote connection via Internet							

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DNS Mode

Setpoint group	ETH Interface 2 - Untrusted Ethernet	Related FW	1.1.0
Range [units]	Manual / Automatic [-]		
Default value	Automatic	Force value	
Step	[-]		
Comm object	24101	Related applications	MCB
Config level	Standard		
Setpoint visibility	Only if IP Address Mode (page 377) = Automatic		
Description			
This setpoint enables to enter DNS server addresses for Ethernet 2 (page 19) manually, even with the IP Address Mode (page 377) set to Automatic.			
Automatic:	DNS server addresses are automatically obtained from a DHCP server.		
Manual:	DNS IP Address 1 (page 380) and DNS IP Address 2 (page 381) can be adjusted manually. Use this option to resolve e.g. internet access policy related issue, if local DNS server addresses automatically obtained from a DHCP server do not work		

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DNS IP Address 1

Setpoint group	ETH Interface 2 - Untrusted	Related FW	1.1.0
Range [units]	0 .. 15 characters [-]		
Default value	8.8.8.8	Force value	NO
Step	[-]		
Comm object	24362	Related applications	MCB
Config level	Standard		
Setpoint visibility	Only if IP Address Mode (page 377) = Manual OR (IP Address Mode (page 377) = Automatic AND DNS Mode (page 380) = Manual)		
Description			
This setpoint allows to set DNS IP Address 1 for Ethernet 2 (page 19) manually.			
Note: Only valid IP address can be inserted.			

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DNS IP Address 2

Setpoint group	ETH Interface 2 - Untrusted	Related FW	1.1.0
Range [units]	0 .. 15 characters [-]		
Default value	4.4.4.4	Force value	NO
Step	[-]		
Comm object	24331	Related applications	MCB
Config level	Standard		
Setpoint visibility	Only if IP Address Mode (page 377) = Manual OR (IP Address Mode (page 377) = Automatic AND DNS Mode (page 380) = Manual)		
Description			
This setpoint allows to set DNS IP Address 2 for Ethernet 2 (page 19) manually.			
Note: Only valid IP address can be inserted.			

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Subgroup: AirGate Settings

AirGate Connection

Setpoint group	ETH Interface 2 - Untrusted	Related FW	1.1.0
Range [units]	Disabled / Enabled [-]		
Default value	Enabled	Force value	YES
Step	[-]		
Comm object	24365	Related applications	MCB
Config level	Standard		
Setpoint visibility	Always		
Description			
This setpoint enables or disables AirGate connection (page 114) function.			

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AirGate Address

Setpoint group	ETH Interface 2 - Untrusted	Related FW	1.1.0
Range [units]	0 .. 31 characters [-]		
Default value	global.airgate.link	Force value	NO
Step	[-]		
Comm object	24364	Related applications	MCB
Config level	Standard		
Setpoint visibility	Always		
Description			
This setpoint is used for entering the domain name or IP address of the AirGate server. Use the free AirGate server provided by ComAp at global.airgate.link.			

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AirGate Port

Setpoint group	ETH Interface 2 - Untrusted	Related FW	1.1.0
Range [units]	0 .. 65535 [-]		
Default value	54440 [-]	Force value	NO
Step	1 [-]		
Comm object	24096	Related applications	MCB
Config level	Standard		
Setpoint visibility	Always		
Description			
This port is used for TCP communication with the AirGate server.			
Note: Use port 5440 for standard ComAp AirGate service.			

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Subgroup: Messages Settings

Event Message

Setpoint group	ETH Interface 2 - Untrusted	Related FW	1.1.0
Range [units]	Enabled / Disabled [-]		
Default value	Enabled	Force value	YES
Step	[-]		
Comm object	10926	Related applications	MCB
Config level	Standard		
Setpoint visibility	Always		
Description			
This setpoint enables or disables sending of Event Messages.			

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Wrn Message

Setpoint group	ETH Interface 2 - Untrusted	Related FW	1.1.0
Range [units]	Enabled / Disabled [-]		
Default value	Enabled	Force value	YES
Step	[-]		
Comm object	8482	Related applications	MCB
Config level	Standard		
Setpoint visibility	Always		
Description			
This setpoint enables or disables sending of Warning Messages.			

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MPR Message

Setpoint group	ETH Interface 2 - Untrusted CM-4G-GPS Ethernet	Related FW	1.1.0
Range [units]	Enabled / Disabled [-]		
Default value	Enabled	Force value	YES
Step	[-]		
Comm object	8484	Related applications	MCB
Config level	Standard		
Setpoint visibility	Always		
Description			
This setpoint enables or disables sending of Mains Protection + FltRes Messages.			

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E-mail Language

Setpoint group	ETH Interface 2 - Untrusted	Related FW	1.1.0
Range [units]	Depends on controller's supported languages. [-]		
Default value	English	Force value	NO
Step	[-]		
Comm object	24299	Related applications	MCB
Config level	Standard		
Setpoint visibility	Always		
Description			
Use this setpoint to set the language of Event, Warning, etc. e-mails.			

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Subgroup: E-mail Settings

E-mail Address 1

Setpoint group	ETH Interface 2 - Untrusted	Related FW	1.1.0
Range [units]	0..63 characters [-]		
Default value	[-]	Force value	NO
Step	[-]		
Comm object	24298	Related applications	MCB
Config level	Standard		
Setpoint visibility	Always		
Description			
Enter a valid e-mail address where event and alarm messages will be sent.			

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E-mail Address 2

Setpoint group	ETH Interface 2 - Untrusted	Related FW	1.1.0
Range [units]	0..63 characters [-]		
Default value	[-]	Force value	NO
Step	[-]		
Comm object	24297	Related applications	MCB
Config level	Standard		
Setpoint visibility	Always		
Description			
Enter a valid e-mail address where event and alarm messages will be sent.			

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E-mail Address 3

Setpoint group	ETH Interface 2 - Untrusted	Related FW	1.1.0
Range [units]	0..63 characters [-]		
Default value	[-]	Force value	NO
Step	[-]		
Comm object	24145	Related applications	MCB
Config level	Standard		
Setpoint visibility	Always		
Description			
Enter a valid e-mail address where event and alarm messages will be sent.			

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E-mail Address 4

Setpoint group	ETH Interface 2 - Untrusted	Related FW	1.1.0
Range [units]	0..63 characters [-]		
Default value	[-]	Force value	NO
Step	[-]		
Comm object	24144	Related applications	MCB
Config level	Standard		
Setpoint visibility	Always		
Description			
Enter a valid e-mail address where event and alarm messages will be sent.			

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SMTP User Name

Setpoint group	ETH Interface 2 - Untrusted	Related FW	1.1.0
Range [units]	0..31 characters [-]		
Default value	[-]	Force value	NO
Step	[-]		
Comm object	23877	Related applications	MCB
Config level	Standard		
Setpoint visibility	Always		
Description			
Use this setpoint to enter the username for the SMTP server. Leave the setpoint blank if the SMTP server does not require authentication.			

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SMTP User Password

Setpoint group	ETH Interface 2 - Untrusted	Related FW	1.1.0
Range [units]	0..15 characters [-]		
Default value	[-]	Force value	NO
Step	[-]		
Comm object	23876	Related applications	MCB
Config level	Standard		
Setpoint visibility	Always		
Description			
Use this setpoint to enter the password for the SMTP server. Leave the setpoint blank if the SMTP server does not require authentication.			

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SMTP Server Address

Setpoint group	ETH Interface 2 - Untrusted	Related FW	1.1.0
Range [units]	0..31 characters [-]		
Default value	global.airgate.link:9925	Force value	NO
Step	[-]		
Comm object	24093	Related applications	MCB
Config level	Standard		
Setpoint visibility	Always		
Description			
This setpoint is used for entering the domain name (e.g. smtp.yourprovider.com) or IP address (e.g. 74.125.39.109) and port number (e.g. :9925) of the SMTP server. Ask your internet provider or IT manager for this information.			
<div><div></div><div>Example: Enter the IP address "74.125.39.109" and port number "9925" as "74.125.39.109:9925".</div></div>			
<div>Note: You may use also any public SMTP server which does not require connection over SSL/TLS channels.</div>			

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SMTP Sender Address

Setpoint group	ETH Interface 2 - Untrusted	Related FW	1.1.0
Range [units]	0..31 characters [-]		
Default value	[-]	Force value	NO
Step	[-]		
Comm object	23878	Related applications	MCB
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>Note: It is not needed to enter an existing email address, nevertheless valid email format needs to be followed.</i>			
IMPORTANT: This item is obligatory when emails are configured.			

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SMTP Encryption Type

Setpoint group	ETH Interface 2 - Untrusted	Related FW	1.1.0						
Range [units]	NONE / SSL/TLS / STARTTLS [-]								
Default value	NONE	Force value	NO						
Step	[-]								
Comm object	24076	Related applications	MCB						
Config level	Standard								
Setpoint visibility	Always								
Description									
This setpoint selects encryption type for SMTP session.									
<table><tr><td>NONE</td><td>Session is without of any encryption.</td></tr><tr><td>SSL/TLS</td><td>Encrypted channel is created first and only after that session is created.</td></tr><tr><td>STARTTLS</td><td>Session is created without of encryption and after command STARTTLS it is switched to encrypted session.</td></tr></table>				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.
NONE	Session is without of any encryption.								
SSL/TLS	Encrypted channel is created first and only after that session is created.								
STARTTLS	Session is created without of encryption and after command STARTTLS it is switched to encrypted session.								

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Subgroup: SNMP Settings

SNMP Agent

Setpoint group	ETH Interface 2 - Untrusted	Related FW	1.1.0
Range [units]	Disabled / SNMP v1/v2c / SNMP v3 [-]		
Default value	Disabled	Force value	NO
Step	[-]		
Comm object	24336	Related applications	MCB
Config level	Standard		
Setpoint visibility	Always		
Description			
This setpoints Enables or disables Simple Network Management Protocol (SNMP) Agent.			
Note: <i>SNMP v3 has upgraded encryption, remote configuration, and security (extra setpoints are available).</i>			
Note: <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	ETH Interface 2 - Untrusted	Related FW	1.1.0
Range [units]	v1 Trap / v2 Notific / v2 Inform [-]		
Default value	v2 Inform	Force value	NO
Step	[-]		
Comm object	24136	Related applications	MCB
Config level	Standard		
Setpoint visibility	Only if SNMP Agent (page 389) != Disabled		
Description			
This setpoint selects format of the SNMP trap messages.			
v1 Trap		SNMPv1 trap format is used	
v2 Notific		SNMPv2c Notification format is used	
v2 Inform		SNMPv2c Inform format is used	

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SNMP RD Community String

Setpoint group	ETH Interface 2 - Untrusted	Related FW	1.1.0
Range [units]	0..31 characters [-]		
Default value	public	Force value	NO
Step	[-]		
Comm object	24335	Related applications	MCB
Config level	Standard		
Setpoint visibility	Only if SNMP Agent (page 389) != Disabled		
Description			
SNMP Community String only for reading.			

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SNMP WR Community String

Setpoint group	ETH Interface 2 - Untrusted	Related FW	1.1.0
Range [units]	0..31 characters [-]		
Default value	private	Force value	NO
Step	[-]		
Comm object	24334	Related applications	MCB
Config level	Standard		
Setpoint visibility	Only if SNMP Agent (page 389) = SNMP v1/v2c		
Description			
SNMP Community String for writing and reading.			

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SNMP Traps IP Address 1

Setpoint group	ETH Interface 2 - Untrusted	Related FW	1.1.0
Range [units]	0 .. 63 characters [-]		
Default value	-	Force value	NO
Step	[-]		
Comm object	24095	Related applications	MCB
Config level	Standard		
Setpoint visibility	Only if SNMP Agent (page 389) != Disabled		
Description			
IP address 1 for receiving SNMP Traps. Leave this setpoint blank if SNMP traps should not be send.			

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SNMP Traps IP Address 2

Setpoint group	ETH Interface 2 - Untrusted	Related FW	1.1.0
Range [units]	Valid IP address [-]		
Default value	-	Force value	NO
Step	[-]		
Comm object	24094	Related applications	MCB
Config level	Standard		
Setpoint visibility	Only if SNMP Agent (page 389) != Disabled		
Description			
IP address 2 for receiving SNMP Traps. Leave this setpoint blank if SNMP traps should not be send.			

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SNMP Engine User Name

Setpoint group	ETH Interface 2 - Untrusted	Related FW	1.1.0
Range [units]	0 .. 31 characters [-]		
Default value	-	Force value	NO
Step	[-]		
Comm object	23851	Related applications	MCB
Config level	Standard		
Setpoint visibility	Only if SNMP Agent (page 389) = SNMP v3		
Description			
Defines SNMP v3 Engine User Name.			

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SNMP Privacy Protocol

Setpoint group	ETH Interface 2 - Untrusted	Related FW	1.1.0
Range [units]	DES / 3DES / AES128 / AES256 [-]		
Default value	AES128	Force value	NO
Step	[-]		
Comm object	23856	Related applications	MCB
Config level	Standard		
Setpoint visibility	Only if SNMP Agent (page 389) = SNMP v3		
Description			
Selects SNMP v3 Privacy Protocol.			

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SNMP Authentication Protocol

Setpoint group	ETH Interface 2 - Untrusted	Related FW	1.1.0
Range [units]	MD5 / SHA / SHA256[-]		
Default value	SHA	Force value	NO
Step	[-]		
Comm object	23857	Related applications	MCB
Config level	Standard		
Setpoint visibility	Only if SNMP Agent (page 389) = SNMP v3		
Description			
Selects SNMP v3 Authentication Protocol.			

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SNMP Security Level

Setpoint group	ETH Interface 2 - Untrusted	Related FW	1.1.0
Range [units]	NONE/ AUTH-NOPRIV / AUTH-PRIV [-]		
Default value	NONE	Force value	NO
Step	[-]		
Comm object	23855	Related applications	MCB
Config level	Standard		
Setpoint visibility	Only if SNMP Agent (page 389) = SNMP v3		
Description			
Selects SNMP v3 security level. If NONE the agent will work in SNMP v2c mode..			

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Subgroup: Modbus Server Settings

Modbus Server

Setpoint group	ETH Interface 2 - Untrusted	Related FW	1.1.0
Range [units]	Disabled / Enabled [-]		
Default value	Disabled	Force value	NO
Step	[-]		
Comm object	24337	Related applications	MCB
Config level	Standard		
Setpoint visibility	Always		
Description			
Enables or disables Modbus communication via Ethernet 2 (page 19).			

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Modbus Client Inactivity Timeout

Setpoint group	ETH Interface 1 - Trusted	Related FW	1.1.0
	ETH Interface 2 - Untrusted		
	ETH Interface 3 - Modbus		
Range [units]	0 .. 65535 [s]		
Default value	60 s	Force value	NO
Step	1 s		
Comm object	24097	Related applications	MCB
Config level	Standard		
Setpoint visibility	Always		
Description			
Modbus connection (TCP socket) is closed by controller, if a Modbus client does not communicate for this time.			
Note: This setpoint is shared with other Modbus Client Inactivity Timeout setpoints.			

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Subgroup: ComAp Client Settings

Direct Connection

Setpoint group	ETH Interface 2 - Untrusted	Related FW	1.1.0
Range [units]	Disabled / Enabled [-]		
Default value	Enabled	Force value	NO
Step	[-]		
Comm object	24099	Related applications	MCB
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.			
Note: For Direct connection the controller IP address must be reachable from the client IP address.			

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Direct Connection Port

Setpoint group	ETH Interface 2 - Untrusted	Related FW	1.1.0
Range [units]	0 .. 65535 [-]		
Default value	23 [-]	Force value	NO
Step	1 [-]		
Comm object	24374	Related applications	MCB
Config level	Standard		
Setpoint visibility	Always		
Description			
This port is used to listen for an incoming TCP connection on Ethernet 2 (page 19) .			

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ComAp Client Inactivity Timeout

Setpoint group	ETH Interface 1 - TrustedETH Interface 2 - Untrusted	Related FW	1.1.0
Range [units]	0 .. 65535 [s]		
Default value	60 s	Force value	YES
Step	1 s		
Comm object	24098	Related applications	MCB
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.			
Note: This setpoint is shared with ComAp Client Inactivity Timeout (page 394) .			

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Subgroup: NTP Settings

NTP Clock Synchronization

Setpoint group	ETH Interface 2 - Untrusted	Related FW	1.1.0
Range [units]	Disabled / Enabled [-]		
Default value	Disabled	Force value	NO
Step	[-]		
Comm object	24075	Related applications	MCB
Config level	Standard		
Setpoint visibility	Always		
Description			
This setpoint is used to enable/disable synchronization of the controller's time with the exact time from a NTP server.			

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NTP Server

Setpoint group	ETH Interface 2 - Untrusted	Related FW	1.1.0
Range [units]	0 .. 63 characters [-]		
Default value	pool.ntp.org	Force value	NO
Step	[-]		
Comm object	24074	Related applications	MCB
Config level	Standard		
Setpoint visibility	Always		
Description			
NTP server address for time synchronization.			
Note: Only valid IP address or domain can be inserted.			

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Group: ETH Interface 3 - Modbus

Subgroup: TCP/IP Settings

IP Address Mode

Setpoint group	ETH Interface 3 - Modbus	Related FW	1.1.0
Range [units]	Manual / Automatic / Disabled [-]		
Default value	Automatic	Force value	NO
Step	[-]		
Comm object	24049	Related applications	MCB

Config level	Standard
Setpoint visibility	Only if relevant module is installed
Description	
This setpoint is used to select the method how the ethernet connection is adjusted on Ethernet 3 (page 19) .	
Manual:	The Ethernet connection is fixed by means of the setpoints IP Address (page 396) , Subnet Mask (page 396) and Gateway IP (page 397) . 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.

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IP Address

Setpoint group	ETH Interface 3 - Modbus	Related FW	1.1.0
Range [units]	0 .. 15 characters [-]		
Default value	192.168.3.254	Force value	NO
Step	[-]		
Comm object	24047	Related applications	MCB
Config level	Standard		
Setpoint visibility	Only if IP Address Mode (page 395) = Manual		
Description			
<p>The setpoint is used to select the method how the IP Address is adjusted on Ethernet 3 (page 19).</p> <p>If IP Address Mode (page 395) = Manual, this setpoint is used to adjust the IP address of the Ethernet 3 (page 19) interface of the controller. Ask your IT specialist for help with this setting.</p> <p>If IP Address Mode (page 395) = Automatic this setpoint is inactive. The IP address is assigned by the DHCP server.</p>			
Note: Only valid IP address can be inserted.			

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Subnet Mask

Setpoint group	ETH Interface 3 - Modbus	Related FW	1.1.0
Range [units]	0 .. 15 characters [-]		
Default value	255.255.255.0	Force value	NO

Step	[-]		
Comm object	24045	Related applications	MCB
Config level	Standard		
Setpoint visibility	Only if IP Address Mode (page 395) = Manual		
Description			
<p>The setpoint is used to select the method how the Subnet Mask is adjusted on Ethernet 3 (page 19).</p> <p>If IP Address Mode (page 395) = Manual this setpoint is used to adjust the Subnet Mask. Ask your IT specialist for help with this setting.</p> <p>If IP Address Mode (page 395) = Automatic this setpoint is inactive. The Subnet Mask is assigned by the DHCP server.</p>			
Note: Only valid IP address can be inserted.			

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Gateway IP

Setpoint group	ETH Interface 3 - Modbus	Related FW	1.1.0
Range [units]	0 .. 15 characters [-]		
Default value	192.168.3.1	Force value	NO
Step	[-]		
Comm object	24043	Related applications	MCB
Config level	Standard		
Setpoint visibility	Only if IP Address Mode (page 395) = Manual		
Description			
<p>This setpoint is used to select the method how the Gateway IP is adjusted.</p> <p>If IP Address Mode (page 395) = Manual, this setpoint is used to adjust the Gateway IP address of the Ethernet 3 (page 19) interface of the controller. Ask your IT specialist for help with this setting.</p> <p>If IP Address Mode (page 395) = 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>Note: Only valid IP address can be inserted.</p>			

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Subgroup: Modbus Settings

Modbus Type

Setpoint group	ETH Interface 3 - Modbus	Related FW	1.1.0
Range [units]	Modbus Client / Modbus Server / Disabled [-]		
Default value	Disabled	Force value	NO
Step	[-]		
Comm object	23868	Related applications	MCB
Config level	Standard		
Setpoint visibility	Always		
Description			
This setpoint enables the Modbus Client or Server on the Modbus Interface.			

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Modbus Client Inactivity Timeout

Setpoint group	ETH Interface 1 - Trusted	Related FW	1.1.0
	ETH Interface 2 - Untrusted		
	ETH Interface 3 - Modbus		
Range [units]	0 .. 65535 [s]		
Default value	60 s	Force value	NO
Step	1 s		
Comm object	24097	Related applications	MCB
Config level	Standard		
Setpoint visibility	Always		
Description			
Modbus connection (TCP socket) is closed by controller, if a Modbus client does not communicate for this time.			
Note: This setpoint is shared with other Modbus Client Inactivity Timeout setpoints.			

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Group: User Buttons

Subgroup: User Buttons

User Button 1

Setpoint group	User Buttons	Related FW	1.1.0
Range [units]	COMMAND / MAN ON / MAN OFF [-]		
Default value	COMMAND	Force value	YES
Step	[-]		
Comm object	20826	Related applications	MCB
Config level	Standard		
Setpoint visibility	Always		
Description			
This setpoint adjusts behavior of User Button 1 which is part of User Buttons (page 173) .			
COMMAND	User Button 1 is controlled by command from External display (page 77) .		
MAN ON	Value of the User Button 1 is still 1. Note: You should always switch from MAN ON to MAN OFF before switching to COMMAND, otherwise value of the User Button 1 will be 1 until command is received.		
MAN OFF	Value of the User Button 1 is still 0.		

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User Button 2

Setpoint group	User Buttons	Related FW	1.1.0
Range [units]	COMMAND / MAN ON / MAN OFF [-]		
Default value	COMMAND	Force value	YES
Step	[-]		
Comm object	20827	Related applications	MCB
Config level	Standard		
Setpoint visibility	Always		
Description			
This setpoint adjusts behavior of User Button 2 which is part of User Buttons (page 173) .			
COMMAND	User Button 2 is controlled by command from External display (page 77) .		
MAN ON	Value of the User Button 2 is still 1. Note: You should always switch from MAN ON to MAN OFF before switching to COMMAND, otherwise value of the User Button 1 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	1.1.0
Range [units]	COMMAND / MAN ON / MAN OFF [-]		
Default value	COMMAND	Force value	YES
Step	[-]		
Comm object	20828	Related applications	MCB
Config level	Standard		
Setpoint visibility	Always		
Description			
This setpoint adjusts behavior of User Button 3 which is part of User Buttons (page 173) .			
COMMAND	User Button 3 is controlled by command from External display (page 77) .		
MAN ON	Value of the User Button 3 is still 1. Note: You should always switch from MAN ON to MAN OFF before switching to COMMAND, otherwise value of the User Button 1 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	1.1.0
Range [units]	COMMAND / MAN ON / MAN OFF [-]		
Default value	COMMAND	Force value	YES
Step	[-]		
Comm object	20829	Related applications	MCB
Config level	Standard		
Setpoint visibility	Always		
Description			
This setpoint adjusts behavior of User Button 4 which is part of User Buttons (page 173) .			
COMMAND	User Button 4 is controlled by command from External display (page 77) .		
MAN ON	Value of the User Button 4 is still 1. Note: You should always switch from MAN ON to MAN OFF before switching to COMMAND, otherwise value of the User Button 1 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	1.1.0
Range [units]	COMMAND / MAN ON / MAN OFF [-]		
Default value	COMMAND	Force value	YES
Step	[-]		
Comm object	20830	Related applications	MCB
Config level	Standard		
Setpoint visibility	Always		
Description			
This setpoint adjusts behavior of User Button 5 which is part of User Buttons (page 173) .			
COMMAND	User Button 5 is controlled by command from External display (page 77) .		
MAN ON	Value of the User Button 5 is still 1. Note: You should always switch from MAN ON to MAN OFF before switching to COMMAND, otherwise value of the User Button 1 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	1.1.0
Range [units]	COMMAND / MAN ON / MAN OFF [-]		
Default value	COMMAND	Force value	YES
Step	[-]		
Comm object	20831	Related applications	MCB
Config level	Standard		
Setpoint visibility	Always		
Description			
This setpoint adjusts behavior of User Button 6 which is part of User Buttons (page 173) .			
COMMAND	User Button 6 is controlled by command from External display (page 77) .		
MAN ON	Value of the User Button 6 is still 1. Note: You should always switch from MAN ON to MAN OFF before switching to COMMAND, otherwise value of the User Button 1 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	1.1.0
Range [units]	COMMAND / MAN ON / MAN OFF [-]		
Default value	COMMAND	Force value	YES
Step	[-]		
Comm object	20832	Related applications	MCB
Config level	Standard		
Setpoint visibility	Always		
Description			
This setpoint adjusts behavior of User Button 7 which is part of User Buttons (page 173) .			
COMMAND	User Button 7 is controlled by command from External display (page 77) .		
MAN ON	Value of the User Button 7 is still 1. Note: You should always switch from MAN ON to MAN OFF before switching to COMMAND, otherwise value of the User Button 1 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	1.1.0
Range [units]	COMMAND / MAN ON / MAN OFF [-]		
Default value	COMMAND	Force value	YES
Step	[-]		
Comm object	20833	Related applications	MCB
Config level	Standard		
Setpoint visibility	Always		
Description			
This setpoint adjusts behavior of User Button 8 which is part of User Buttons (page 173) .			
COMMAND	User Button 8 is controlled by command from External display (page 77) .		
MAN ON	Value of the User Button 8 is still 1. Note: You should always switch from MAN ON to MAN OFF before switching to COMMAND, otherwise value of the User Button 1 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	1.1.0
Range [units]	COMMAND / MAN ON / MAN OFF [-]		
Default value	COMMAND	Force value	YES
Step	[-]		
Comm object	20834	Related applications	MCB
Config level	Standard		
Setpoint visibility	Always		
Description			
This setpoint adjusts behavior of User Button 9 which is part of User Buttons (page 173) .			
COMMAND	User Button 9 is controlled by command from External display (page 77) .		
MAN ON	Value of the User Button 9 is still 1. Note: You should always switch from MAN ON to MAN OFF before switching to COMMAND, otherwise value of the User Button 1 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	1.1.0
Range [units]	COMMAND / MAN ON / MAN OFF [-]		
Default value	COMMAND	Force value	YES
Step	[-]		
Comm object	20835	Related applications	MCB
Config level	Standard		
Setpoint visibility	Always		
Description			
This setpoint adjusts behavior of User Button 10 which is part of User Buttons (page 173) .			
COMMAND	User Button 10 is controlled by command from External display (page 77) .		
MAN ON	Value of the User Button 10 is still 1. Note: You should always switch from MAN ON to MAN OFF before switching to COMMAND, otherwise value of the User Button 1 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	1.1.0
Range [units]	COMMAND / MAN ON / MAN OFF [-]		
Default value	COMMAND	Force value	YES
Step	[-]		
Comm object	20836	Related applications	MCB
Config level	Standard		
Setpoint visibility	Always		
Description			
This setpoint adjusts behavior of User Button 11 which is part of User Buttons (page 173) .			
COMMAND	User Button 11 is controlled by command from External display (page 77) .		
MAN ON	Value of the User Button 11 is still 1. Note: You should always switch from MAN ON to MAN OFF before switching to COMMAND, otherwise value of the User Button 1 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	1.1.0
Range [units]	COMMAND / MAN ON / MAN OFF [-]		
Default value	COMMAND	Force value	YES
Step	[-]		
Comm object	20837	Related applications	MCB
Config level	Standard		
Setpoint visibility	Always		
Description			
This setpoint adjusts behavior of User Button 12 which is part of User Buttons (page 173) .			
COMMAND	User Button 12 is controlled by command from External display (page 77) .		
MAN ON	Value of the User Button 12 is still 1. Note: You should always switch from MAN ON to MAN OFF before switching to COMMAND, otherwise value of the User Button 1 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	1.1.0
Range [units]	COMMAND / MAN ON / MAN OFF [-]		
Default value	COMMAND	Force value	YES
Step	[-]		
Comm object	20838	Related applications	MCB
Config level	Standard		
Setpoint visibility	Always		
Description			
This setpoint adjusts behavior of User Button 13 which is part of User Buttons (page 173) .			
COMMAND	User Button 13 is controlled by command from External display (page 77) .		
MAN ON	Value of the User Button 13 is still 1. <i>Note: You should always switch from MAN ON to MAN OFF before switching to COMMAND, otherwise value of the User Button 1 will be 1 until command is received.</i>		
MAN OFF	Value of the User Button 13 is still 0.		

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User Button 14

Setpoint group	User Buttons	Related FW	1.1.0
Range [units]	COMMAND / MAN ON / MAN OFF [-]		
Default value	COMMAND	Force value	YES
Step	[-]		
Comm object	20839	Related applications	MCB
Config level	Standard		
Setpoint visibility	Always		
Description			
This setpoint adjusts behavior of User Button 14 which is part of User Buttons (page 173) .			
COMMAND	User Button 14 is controlled by command from External display (page 77) .		
MAN ON	Value of the User Button 14 is still 1. Note: You should always switch from MAN ON to MAN OFF before switching to COMMAND, otherwise value of the User Button 1 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	1.1.0
Range [units]	COMMAND / MAN ON / MAN OFF [-]		
Default value	COMMAND	Force value	YES
Step	[-]		
Comm object	20840	Related applications	MCB
Config level	Standard		
Setpoint visibility	Always		
Description			
This setpoint adjusts behavior of User Button 15 which is part of User Buttons (page 173) .			
COMMAND	User Button 15 is controlled by command from External display (page 77) .		
MAN ON	Value of the User Button 15 is still 1. Note: You should always switch from MAN ON to MAN OFF before switching to COMMAND, otherwise value of the User Button 1 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	1.1.0
Range [units]	COMMAND / MAN ON / MAN OFF [-]		
Default value	COMMAND	Force value	YES
Step	[-]		
Comm object	20841	Related applications	MCB
Config level	Standard		
Setpoint visibility	Always		
Description			
This setpoint adjusts behavior of User Button 16 which is part of User Buttons (page 173) .			
COMMAND	User Button 16 is controlled by command from External display (page 77) .		
MAN ON	Value of the User Button 16 is still 1. Note: You should always switch from MAN ON to MAN OFF before switching to COMMAND, otherwise value of the User Button 1 will be 1 until command is received.		
MAN OFF	Value of the User Button 16 is still 0.		

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User Button 17

Setpoint group	User Buttons	Related FW	1.1.0
Range [units]	COMMAND / MAN ON / MAN OFF [-]		
Default value	COMMAND	Force value	YES
Step	[-]		
Comm object	20842	Related applications	MCB
Config level	Standard		
Setpoint visibility	Always		
Description			
This setpoint adjusts behavior of User Button 17 which is part of User Buttons (page 173) .			
COMMAND	User Button 17 is controlled by command from External display (page 77) .		
MAN ON	Value of the User Button 17 is still 1. Note: You should always switch from MAN ON to MAN OFF before switching to COMMAND, otherwise value of the User Button 1 will be 1 until command is received.		
MAN OFF	Value of the User Button 17 is still 0.		

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User Button 18

Setpoint group	User Buttons	Related FW	1.1.0
Range [units]	COMMAND / MAN ON / MAN OFF [-]		
Default value	COMMAND	Force value	YES
Step	[-]		
Comm object	20843	Related applications	MCB
Config level	Standard		
Setpoint visibility	Always		
Description			
This setpoint adjusts behavior of User Button 18 which is part of User Buttons (page 173) .			
COMMAND	User Button 18 is controlled by command from External display (page 77) .		
MAN ON	Value of the User Button 18 is still 1. Note: You should always switch from MAN ON to MAN OFF before switching to COMMAND, otherwise value of the User Button 1 will be 1 until command is received.		
MAN OFF	Value of the User Button 18 is still 0.		

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User Button 19

Setpoint group	User Buttons	Related FW	1.1.0
Range [units]	COMMAND / MAN ON / MAN OFF [-]		
Default value	COMMAND	Force value	YES
Step	[-]		
Comm object	20844	Related applications	MCB
Config level	Standard		
Setpoint visibility	Always		
Description			
This setpoint adjusts behavior of User Button 19 which is part of User Buttons (page 173) .			
COMMAND	User Button 19 is controlled by command from External display (page 77) .		
MAN ON	Value of the User Button 19 is still 1. Note: You should always switch from MAN ON to MAN OFF before switching to COMMAND, otherwise value of the User Button 1 will be 1 until command is received.		
MAN OFF	Value of the User Button 19 is still 0.		

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User Button 20

Setpoint group	User Buttons	Related FW	1.1.0
Range [units]	COMMAND / MAN ON / MAN OFF [-]		
Default value	COMMAND	Force value	YES
Step	[-]		
Comm object	20845	Related applications	MCB
Config level	Standard		
Setpoint visibility	Always		
Description			
This setpoint adjusts behavior of User Button 20 which is part of User Buttons (page 173) .			
COMMAND	User Button 20 is controlled by command from External display (page 77) .		
MAN ON	Value of the User Button 20 is still 1. Note: You should always switch from MAN ON to MAN OFF before switching to COMMAND, otherwise value of the User Button 1 will be 1 until command is received.		
MAN OFF	Value of the User Button 20 is still 0.		

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User Button 21

Setpoint group	User Buttons	Related FW	1.1.0
Range [units]	COMMAND / MAN ON / MAN OFF [-]		
Default value	COMMAND	Force value	YES
Step	[-]		
Comm object	20846	Related applications	MCB
Config level	Standard		
Setpoint visibility	Always		
Description			
This setpoint adjusts behavior of User Button 21 which is part of User Buttons (page 173) .			
COMMAND	User Button 21 is controlled by command from External display (page 77) .		
MAN ON	Value of the User Button 21 is still 1. Note: You should always switch from MAN ON to MAN OFF before switching to COMMAND, otherwise value of the User Button 1 will be 1 until command is received.		
MAN OFF	Value of the User Button 21 is still 0.		

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User Button 22

Setpoint group	User Buttons	Related FW	1.1.0
Range [units]	COMMAND / MAN ON / MAN OFF [-]		
Default value	COMMAND	Force value	YES
Step	[-]		
Comm object	20847	Related applications	MCB
Config level	Standard		
Setpoint visibility	Always		
Description			
This setpoint adjusts behavior of User Button 22 which is part of User Buttons (page 173) .			
COMMAND	User Button 22 is controlled by command from External display (page 77) .		
MAN ON	Value of the User Button 22 is still 1. Note: You should always switch from MAN ON to MAN OFF before switching to COMMAND, otherwise value of the User Button 1 will be 1 until command is received.		
MAN OFF	Value of the User Button 22 is still 0.		

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User Button 23

Setpoint group	User Buttons	Related FW	1.1.0
Range [units]	COMMAND / MAN ON / MAN OFF [-]		
Default value	COMMAND	Force value	YES
Step	[-]		
Comm object	20848	Related applications	MCB
Config level	Standard		
Setpoint visibility	Always		
Description			
This setpoint adjusts behavior of User Button 23 which is part of User Buttons (page 173) .			
COMMAND	User Button 23 is controlled by command from External display (page 77) .		
MAN ON	Value of the User Button 23 is still 1. Note: You should always switch from MAN ON to MAN OFF before switching to COMMAND, otherwise value of the User Button 1 will be 1 until command is received.		
MAN OFF	Value of the User Button 23 is still 0.		

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User Button 24

Setpoint group	User Buttons	Related FW	1.1.0
Range [units]	COMMAND / MAN ON / MAN OFF [-]		
Default value	COMMAND	Force value	YES
Step	[-]		
Comm object	20849	Related applications	MCB
Config level	Standard		
Setpoint visibility	Always		
Description			
This setpoint adjusts behavior of User Button 24 which is part of User Buttons (page 173) .			
COMMAND	User Button 24 is controlled by command from External display (page 77) .		
MAN ON	Value of the User Button 24 is still 1. Note: You should always switch from MAN ON to MAN OFF before switching to COMMAND, otherwise value of the User Button 1 will be 1 until command is received.		
MAN OFF	Value of the User Button 24 is still 0.		

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User Button 25

Setpoint group	User Buttons	Related FW	1.1.0
Range [units]	COMMAND / MAN ON / MAN OFF [-]		
Default value	COMMAND	Force value	YES
Step	[-]		
Comm object	20850	Related applications	MCB
Config level	Standard		
Setpoint visibility	Always		
Description			
This setpoint adjusts behavior of User Button 25 which is part of User Buttons (page 173) .			
COMMAND	User Button 25 is controlled by command from External display (page 77) .		
MAN ON	Value of the User Button 25 is still 1. Note: You should always switch from MAN ON to MAN OFF before switching to COMMAND, otherwise value of the User Button 1 will be 1 until command is received.		
MAN OFF	Value of the User Button 25 is still 0.		

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User Button 26

Setpoint group	User Buttons	Related FW	1.1.0
Range [units]	COMMAND / MAN ON / MAN OFF [-]		
Default value	COMMAND	Force value	YES
Step	[-]		
Comm object	20851	Related applications	MCB
Config level	Standard		
Setpoint visibility	Always		
Description			
This setpoint adjusts behavior of User Button 26 which is part of User Buttons (page 173) .			
COMMAND	User Button 26 is controlled by command from External display (page 77) .		
MAN ON	Value of the User Button 26 is still 1. Note: You should always switch from MAN ON to MAN OFF before switching to COMMAND, otherwise value of the User Button 1 will be 1 until command is received.		
MAN OFF	Value of the User Button 26 is still 0.		

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User Button 27

Setpoint group	User Buttons	Related FW	1.1.0
Range [units]	COMMAND / MAN ON / MAN OFF [-]		
Default value	COMMAND	Force value	YES
Step	[-]		
Comm object	20852	Related applications	MCB
Config level	Standard		
Setpoint visibility	Always		
Description			
This setpoint adjusts behavior of User Button 27 which is part of User Buttons (page 173) .			
COMMAND	User Button 27 is controlled by command from External display (page 77) .		
MAN ON	Value of the User Button 27 is still 1. Note: You should always switch from MAN ON to MAN OFF before switching to COMMAND, otherwise value of the User Button 1 will be 1 until command is received.		
MAN OFF	Value of the User Button 27 is still 0.		

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User Button 28

Setpoint group	User Buttons	Related FW	1.1.0
Range [units]	COMMAND / MAN ON / MAN OFF [-]		
Default value	COMMAND	Force value	YES
Step	[-]		
Comm object	20853	Related applications	MCB
Config level	Standard		
Setpoint visibility	Always		
Description			
This setpoint adjusts behavior of User Button 28 which is part of User Buttons (page 173) .			
COMMAND	User Button 28 is controlled by command from External display (page 77) .		
MAN ON	Value of the User Button 28 is still 1. Note: You should always switch from MAN ON to MAN OFF before switching to COMMAND, otherwise value of the User Button 1 will be 1 until command is received.		
MAN OFF	Value of the User Button 28 is still 0.		

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User Button 29

Setpoint group	User Buttons	Related FW	1.1.0
Range [units]	COMMAND / MAN ON / MAN OFF [-]		
Default value	COMMAND	Force value	YES
Step	[-]		
Comm object	20854	Related applications	MCB
Config level	Standard		
Setpoint visibility	Always		
Description			
This setpoint adjusts behavior of User Button 29 which is part of User Buttons (page 173) .			
COMMAND	User Button 29 is controlled by command from External display (page 77) .		
MAN ON	Value of the User Button 29 is still 1. Note: You should always switch from MAN ON to MAN OFF before switching to COMMAND, otherwise value of the User Button 1 will be 1 until command is received.		
MAN OFF	Value of the User Button 29 is still 0.		

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User Button 30

Setpoint group	User Buttons	Related FW	1.1.0
Range [units]	COMMAND / MAN ON / MAN OFF [-]		
Default value	COMMAND	Force value	YES
Step	[-]		
Comm object	20855	Related applications	MCB
Config level	Standard		
Setpoint visibility	Always		
Description			
This setpoint adjusts behavior of User Button 30 which is part of User Buttons (page 173) .			
COMMAND	User Button 30 is controlled by command from External display (page 77) .		
MAN ON	Value of the User Button 30 is still 1. Note: You should always switch from MAN ON to MAN OFF before switching to COMMAND, otherwise value of the User Button 1 will be 1 until command is received.		
MAN OFF	Value of the User Button 30 is still 0.		

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User Button 31

Setpoint group	User Buttons	Related FW	1.1.0
Range [units]	COMMAND / MAN ON / MAN OFF [-]		
Default value	COMMAND	Force value	YES
Step	[-]		
Comm object	20856	Related applications	MCB
Config level	Standard		
Setpoint visibility	Always		
Description			
This setpoint adjusts behavior of User Button 31 which is part of User Buttons (page 173) .			
COMMAND	User Button 31 is controlled by command from External display (page 77) .		
MAN ON	Value of the User Button 31 is still 1. Note: You should always switch from MAN ON to MAN OFF before switching to COMMAND, otherwise value of the User Button 1 will be 1 until command is received.		
MAN OFF	Value of the User Button 31 is still 0.		

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User Button 32

Setpoint group	User Buttons	Related FW	1.1.0
Range [units]	COMMAND / MAN ON / MAN OFF [-]		
Default value	COMMAND	Force value	YES
Step	[-]		
Comm object	20857	Related applications	MCB
Config level	Standard		
Setpoint visibility	Always		
Description			
This setpoint adjusts behavior of User Button 32 which is part of User Buttons (page 173) .			
COMMAND	User Button 32 is controlled by command from External display (page 77) .		
MAN ON	Value of the User Button 32 is still 1. Note: You should always switch from MAN ON to MAN OFF before switching to COMMAND, otherwise value of the User Button 1 will be 1 until command is received.		
MAN OFF	Value of the User Button 32 is still 0.		

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Group: Timers & Counters

Subgroup: Pulse counters

Conversion Coeff. Fast Pulse 1

Setpoint group	Timers & Counters	Related FW	1.1.0
Range [units]	OFF / 0 .. 65000 [-]		
Default value	OFF	Force value	YES
Step	1 [-]		
Comm object	20307	Related applications	MCB
Config level	Advanced		
Setpoint visibility	Always		
Description			
<p>This setpoint adjusts the rate of increasing of the Fast Pulse Counter 1 (page 492) which is physically configured to binary input 9.</p> <p>Set this setpoint to OFF to turn the function off. See the chapter Pulse Counters (page 169) for more information.</p>			

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Conversion Coeff. Fast Pulse 2

Setpoint group	Timers & Counters	Related FW	1.1.0
Range [units]	OFF / 0 .. 65000 [-]		
Default value	OFF	Force value	YES
Step	1 [-]		
Comm object	20308	Related applications	MCB
Config level	Advanced		
Setpoint visibility	Always		
Description			
<p>This setpoint adjusts the rate of increasing of the Fast Pulse Counter 2 (page 492) which is physically configured to binary input 10.</p> <p>Set this setpoint to OFF to turn the function off. See the chapter Pulse Counters (page 169) for more information.</p>			

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Conversion Coefficient Pulse 1

Setpoint group	Timers & Counters	Related FW	1.1.0
Range [units]	OFF / 0 .. 65000 [-]		
Default value	OFF	Force value	NO
Step	1 [-]		
Comm object	10994	Related applications	MCB
Config level	Advanced		
Setpoint visibility	Always		
Description			
This setpoint adjusts the rate of increasing of the "slow" Pulse Counter 1 (page 493) which is connected with LBI PULSE COUNTER 1 (PAGE 620) .			
Set this setpoint to OFF to turn the function off. See the chapter Pulse Counters (page 169) for more information.			

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Conversion Coefficient Pulse 2

Setpoint group	Timers & Counters	Related FW	1.1.0
Range [units]	OFF / 0 .. 65000 [-]		
Default value	OFF	Force value	NO
Step	1 [-]		
Comm object	10995	Related applications	MCB
Config level	Advanced		
Setpoint visibility	Always		
Description			
This setpoint adjusts the rate of increasing of the "slow" Pulse Counter 2 (page 493) which is connected with LBI PULSE COUNTER 2 (PAGE 620) .			
Set this setpoint to OFF to turn the function off. See the chapter Pulse Counters (page 169) for more information.			

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Subgroup: Timer 1

Timer 1 Function

Setpoint group	Timers & Counters	Related FW	1.1.0
Range [units]	Disabled / Manual On / No Func / Mode OFF / TEST / Test OnLd / MFail Blk [-]		
Default value	Disable	Force value	YES
Step	[-]		
Comm object	15358	Related applications	MCB
Config level	Standard		
Setpoint visibility	Always		

Description

This setpoint defines and enables the function of the Timer 1. The functions which are supposed to change the Controller Mode requires controller running in AUTO mode. The activation condition of the Timer is configured via setpoint **Timer 1 Setup (page 418)**.

Once the Timer is activated the **LBO EXERCISE TIMER 1 (PAGE 633)** is closed regardless of chosen timer function. If the CU is switched off when the Timer should be activated, the Timer will be activated immediately after the CU is switched on if the Timer condition is still fulfilled.

IMPORTANT: The LBO is activated always when the Timer should be activated e.g. even when controller is in different mode than AUTO.

IMPORTANT: In case that Timer 1, Timer 2, etc. should be activated at the same time, the Timer with selected higher priority function is executed.

Disabled	The Timer is disabled.
Manual On	The Timer is disabled but his binary output is activated (can be used for testing purposes).
No Func	There is no any other function, only binary output of the Timer is activated once the condition is fulfilled.
Mode OFF	The binary output of the Timer is internally connected to the Remote OFF binary input.
Rem Start/Stop	The binary output of the Timer is internally connected to the binary input Remote Start/Stop.
TEST	The binary output of the Timer is internally connected to the binary input Remote TEST.
TEST OnLd	The binary output of the Timer is internally connected to the Remote TEST On Load binary input.
MFail Blk	The binary output of the Timer is internally connected to the Mains Fail Block binary input.

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Timer 1 Setup

Setpoint group	Timers & Counters	Related FW	1.1.0
Range [units]	N/A [-]		
Default value	N/A [-]	Force value	NO
Step	N/A [-]		
Comm object	10969	Related applications	MCB
Config level	Standard		
Setpoint visibility	Only if Timer 1 Function (page 417) != Disabled or Manual On		
Description			
Use this setpoint to setup the exercise Timer 1. See Exercise Timers (page 131) for step by step manual.			

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Subgroup: Timer 2

Timer 2 Function

Setpoint group	Timers & Counters	Related FW	1.1.0
Range [units]	Disabled / Manual On / No Func / Mode OFF / TEST / Test OnLd / MFail Blk [-]		
Default value	Disabled [-]	Force value	YES
Step	[-]		
Comm object	15359	Related applications	MCB
Config level	Standard		
Setpoint visibility	Always		

Description

This setpoint defines and enables the function of the Timer 2. The functions which are supposed to change the Controller Mode requires controller running in AUTO mode. The activation condition of the Timer is configured via setpoint **Timer 2 Setup (page 420)**.

Once the Timer is activated the **LBO EXERCISE TIMER 2 (PAGE 633)** is closed regardless of chosen timer function. If the CU is switched off when the Timer should be activated, the Timer will be activated immediately after the CU is switched on if the Timer condition is still fulfilled.

IMPORTANT: The LBO is activated always when the Timer should be activated e.g. even when controller is in different mode than AUTO.

IMPORTANT: In case that Timer 1, Timer 2, etc. should be activated at the same time, the Timer with selected higher priority function is executed.

Disabled	The Timer is disabled.
Manual On	The Timer is disabled but his binary output is activated (can be used for testing purposes).
No Func	There is no any other function, only binary output of the Timer is activated once the condition is fulfilled.
Mode OFF	The binary output of the Timer is internally connected to the Remote OFF binary input.
Rem Start/Stop	The binary output of the Timer is internally connected to the binary input Remote Start/Stop.
TEST	The binary output of the Timer is internally connected to the binary input Remote TEST.
TEST OnLd	The binary output of the Timer is internally connected to the Remote TEST On Load binary input.
MFail Blk	The binary output of the Timer is internally connected to the Mains Fail Block binary input.

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Timer 2 Setup

Setpoint group	Timers & Counters	Related FW	1.1.0
Range [units]	N/A [-]		
Default value	N/A [-]	Force value	NO
Step	N/A [-]		
Comm object	10970	Related applications	MCB
Config level	Standard		
Setpoint visibility	Only if Timer 2 Function (page 419) != Disabled or Manual On		
Description			
Use this setpoint to setup the exercise Timer 2. See Exercise Timers (page 131) for step by step manual.			

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Subgroup: Timer 3

Timer 3 Function

Setpoint group	Timers & Counters	Related FW	1.1.0
Range [units]	Disabled / Manual On / No Func / Mode OFF / TEST / Test OnLd / MFail Blk [-]		
Default value	Disable	Force value	YES
Step	[-]		
Comm object	15360	Related applications	MCB
Config level	Standard		
Setpoint visibility	Always		

Description

This setpoint defines and enables the function of the Timer 3. The functions which are supposed to change the Controller Mode requires controller running in AUTO mode. The activation condition of the Timer is configured via setpoint **Timer 3 Setup (page 422)**.

Once the Timer is activated the **LBO EXERCISE TIMER 3 (PAGE 634)** is closed regardless of chosen timer function. If the CU is switched off when the Timer should be activated, the Timer will be activated immediately after the CU is switched on if the Timer condition is still fulfilled.

IMPORTANT: The LBO is activated always when the Timer should be activated e.g. even when controller is in different mode than AUTO.

IMPORTANT: In case that Timer 1, Timer 2, etc. should be activated at the same time, the Timer with selected higher priority function is executed.

Disabled	The Timer is disabled.
Manual On	The Timer is disabled but his binary output is activated (can be used for testing purposes).
No Func	There is no any other function, only binary output of the Timer is activated once the condition is fulfilled.
Mode OFF	The binary output of the Timer is internally connected to the Remote OFF binary input.
Rem Start/Stop	The binary output of the Timer is internally connected to the binary input Remote Start/Stop.
TEST	The binary output of the Timer is internally connected to the binary input Remote TEST.
TEST OnLd	The binary output of the Timer is internally connected to the Remote TEST On Load binary input.
MFail Blk	The binary output of the Timer is internally connected to the Mains Fail Block binary input.

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Timer 3 Setup

Setpoint group	Timers & Counters	Related FW	1.1.0
Range [units]	N/A [-]		
Default value	N/A [-]	Force value	NO
Step	N/A [-]		
Comm object	10971	Related applications	MCB
Config level	Standard		
Setpoint visibility	Only if Timer 3 Function (page 421) != Disabled or Manual On		
Description			
Use this setpoint to setup the exercise Timer 3. See Exercise Timers (page 131) for step by step manual.			

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Subgroup: Timer 4

Timer 4 Function

Setpoint group	Timers & Counters	Related FW	1.1.0
Range [units]	Disabled / Manual On / No Func / Mode OFF / TEST / Test OnLd / MFail Blk [-]		
Default value	Disable	Force value	YES
Step	[-]		
Comm object	15361	Related applications	MCB
Config level	Standard		
Setpoint visibility	Always		

Description

This setpoint defines and enables the function of the Timer 4. The functions which are supposed to change the Controller Mode requires controller running in AUTO mode. The activation condition of the Timer is configured via setpoint **Timer 4 Setup (page 424)**.

Once the Timer is activated the **LBO EXERCISE TIMER 4 (PAGE 634)** is closed regardless of chosen timer function. If the CU is switched off when the Timer should be activated, the Timer will be activated immediately after the CU is switched on if the Timer condition is still fulfilled.

IMPORTANT: The LBO is activated always when the Timer should be activated e.g. even when controller is in different mode than AUTO.


IMPORTANT: In case that Timer 1, Timer 2, etc. should be activated at the same time, the Timer with selected higher priority function is executed.

Disabled	The Timer is disabled.
Manual On	The Timer is disabled but his binary output is activated (can be used for testing purposes).
No Func	There is no any other function, only binary output of the Timer is activated once the condition is fulfilled.
Mode OFF	The binary output of the Timer is internally connected to the Remote OFF binary input.
Rem Start/Stop	The binary output of the Timer is internally connected to the binary input Remote Start/Stop.
TEST	The binary output of the Timer is internally connected to the binary input Remote TEST.
TEST OnLd	The binary output of the Timer is internally connected to the Remote TEST On Load binary input.
MFail Blk	The binary output of the Timer is internally connected to the Mains Fail Block binary input.

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Timer 4 Setup

Setpoint group	Timers & Counters	Related FW	1.1.0
Range [units]	N/A [-]		
Default value	N/A [-]	Force value	NO
Step	N/A [-]		
Comm object	10973	Related applications	MCB
Config level	Standard		
Setpoint visibility	Only if Timer 4 Function (page 423) != Disabled or Manual On		
Description			
Use this setpoint to setup the exercise Timer 4. See Exercise Timers (page 131) for step by step manual.			

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Subgroup: Timer 5

Timer 5 Function

Setpoint group	Timers & Counters	Related FW	1.1.0
Range [units]	Disabled / Manual On / No Func / Mode OFF / TEST / Test OnLd / MFail Blk [-]		
Default value	Disable	Force value	YES
Step	[-]		
Comm object	15362	Related applications	MCB
Config level	Standard		
Setpoint visibility	Always		

Description

This setpoint defines and enables the function of the Timer 5. The functions which are supposed to change the Controller Mode requires controller running in AUTO mode. The activation condition of the Timer is configured via setpoint **Timer 5 Setup (page 426)**.

Once the Timer is activated the **LBO EXERCISE TIMER 5 (PAGE 634)** is closed regardless of chosen timer function. If the CU is switched off when the Timer should be activated, the Timer will be activated immediately after the CU is switched on if the Timer condition is still fulfilled.

IMPORTANT: The LBO is activated always when the Timer should be activated e.g. even when controller is in different mode than AUTO.

IMPORTANT: In case that Timer 1, Timer 2, etc. should be activated at the same time, the Timer with selected higher priority function is executed.

Disabled	The Timer is disabled.
Manual On	The Timer is disabled but his binary output is activated (can be used for testing purposes).
No Func	There is no any other function, only binary output of the Timer is activated once the condition is fulfilled.
Mode OFF	The binary output of the Timer is internally connected to the Remote OFF binary input.
Rem Start/Stop	The binary output of the Timer is internally connected to the binary input Remote Start/Stop.
TEST	The binary output of the Timer is internally connected to the binary input Remote TEST.
TEST OnLd	The binary output of the Timer is internally connected to the Remote TEST On Load binary input.
MFail Blk	The binary output of the Timer is internally connected to the Mains Fail Block binary input.

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Timer 5 Setup

Setpoint group	Timers & Counters	Related FW	1.1.0
Range [units]	N/A [-]		
Default value	N/A [-]	Force value	NO
Step	N/A [-]		
Comm object	10974	Related applications	MCB
Config level	Standard		
Setpoint visibility	Only if Timer 5 Function (page 425) != Disabled or Manual On		
Description			
Use this setpoint to setup the exercise Timer 5. See Exercise Timers (page 131) for step by step manual.			

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Subgroup: Timer 6

Timer 6 Function

Setpoint group	Timers & Counters	Related FW	1.1.0
Range [units]	Disabled / Manual On / No Func / Mode OFF / TEST / Test OnLd / MFail Blk [-]		
Default value	Disable	Force value	YES
Step	[-]		
Comm object	15363	Related applications	MCB
Config level	Standard		
Setpoint visibility	Always		

Description

This setpoint defines and enables the function of the Timer 6. The functions which are supposed to change the Controller Mode requires controller running in AUTO mode. The activation condition of the Timer is configured via setpoint **Timer 6 Setup (page 428)**.

Once the Timer is activated the **LBO EXERCISE TIMER 6 (PAGE 635)** is closed regardless of chosen timer function. If the CU is switched off when the Timer should be activated, the Timer will be activated immediately after the CU is switched on if the Timer condition is still fulfilled.

IMPORTANT: The LBO is activated always when the Timer should be activated e.g. even when controller is in different mode than AUTO.

IMPORTANT: In case that Timer 1, Timer 2, etc. should be activated at the same time, the Timer with selected higher priority function is executed.

Disabled	The Timer is disabled.
Manual On	The Timer is disabled but his binary output is activated (can be used for testing purposes).
No Func	There is no any other function, only binary output of the Timer is activated once the condition is fulfilled.
Mode OFF	The binary output of the Timer is internally connected to the Remote OFF binary input.
Rem Start/Stop	The binary output of the Timer is internally connected to the binary input Remote Start/Stop.
TEST	The binary output of the Timer is internally connected to the binary input Remote TEST.
TEST OnLd	The binary output of the Timer is internally connected to the Remote TEST On Load binary input.
MFail Blk	The binary output of the Timer is internally connected to the Mains Fail Block binary input.

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Timer 6 Setup

Setpoint group	Timers & Counters	Related FW	1.1.0
Range [units]	N/A [-]		
Default value	N/A [-]	Force value	NO
Step	N/A [-]		
Comm object	10975	Related applications	MCB
Config level	Standard		
Setpoint visibility	Only if Timer 6 Function (page 427) != Disabled or Manual On		
Description			
Use this setpoint to setup the exercise Timer 6. See Exercise Timers (page 131) for step by step manual.			

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Subgroup: Timer 7

Timer 7 Function

Setpoint group	Timers & Counters	Related FW	1.1.0
Range [units]	Disabled / Manual On / No Func / Mode OFF / TEST / Test OnLd / MFail Blk [-]		
Default value	Disable	Force value	YES
Step	[-]		
Comm object	15364	Related applications	MCB
Config level	Standard		
Setpoint visibility	Always		

Description

This setpoint defines and enables the function of the Timer 7. The functions which are supposed to change the Controller Mode requires controller running in AUTO mode. The activation condition of the Timer is configured via setpoint **Timer 7 Setup (page 430)**.

Once the Timer is activated the LBO EXERCISE TIMER 7 (PAGE 635) is closed regardless of chosen timer function. If the CU is switched off when the Timer should be activated, the Timer will be activated immediately after the CU is switched on if the Timer condition is still fulfilled.

IMPORTANT: The LBO is activated always when the Timer should be activated e.g. even when controller is in different mode than AUTO.

IMPORTANT: In case that Timer 1, Timer 2, etc. should be activated at the same time, the Timer with selected higher priority function is executed.

Disabled	The Timer is disabled.
Manual On	The Timer is disabled but his binary output is activated (can be used for testing purposes).
No Func	There is no any other function, only binary output of the Timer is activated once the condition is fulfilled.
Mode OFF	The binary output of the Timer is internally connected to the Remote OFF binary input.
Rem Start/Stop	The binary output of the Timer is internally connected to the binary input Remote Start/Stop.
TEST	The binary output of the Timer is internally connected to the binary input Remote TEST.
TEST OnLd	The binary output of the Timer is internally connected to the Remote TEST On Load binary input.
MFail Blk	The binary output of the Timer is internally connected to the Mains Fail Block binary input.

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Timer 7 Setup

Setpoint group	Timers & Counters	Related FW	1.1.0
Range [units]	N/A [-]		
Default value	N/A [-]	Force value	NO
Step	N/A [-]		
Comm object	10976	Related applications	MCB
Config level	Standard		
Setpoint visibility	Only if Timer 7 Function (page 429) != Disabled or Manual On		
Description			
Use this setpoint to setup the exercise Timer 7. See Exercise Timers (page 131) for step by step manual.			

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Subgroup: Timer 8

Timer 8 Function

Setpoint group	Timers & Counters	Related FW	1.1.0
Range [units]	Disabled / Manual On / No Func / Mode OFF / TEST / Test OnLd / MFail Blk [-]		
Default value	Disable	Force value	YES
Step	[-]		
Comm object	15365	Related applications	MCB
Config level	Standard		
Setpoint visibility	Always		

Description

This setpoint defines and enables the function of the Timer 8. The functions which are supposed to change the Controller Mode requires controller running in AUTO mode. The activation condition of the Timer is configured via setpoint **Timer 8 Setup (page 432)**.

Once the Timer is activated the **LBO EXERCISE TIMER 8 (PAGE 635)** is closed regardless of chosen timer function. If the CU is switched off when the Timer should be activated, the Timer will be activated immediately after the CU is switched on if the Timer condition is still fulfilled.

IMPORTANT: The LBO is activated always when the Timer should be activated e.g. even when controller is in different mode than AUTO.


IMPORTANT: In case that Timer 1, Timer 2, etc. should be activated at the same time, the Timer with selected higher priority function is executed.

Disabled	The Timer is disabled.
Manual On	The Timer is disabled but his binary output is activated (can be used for testing purposes).
No Func	There is no any other function, only binary output of the Timer is activated once the condition is fulfilled.
Mode OFF	The binary output of the Timer is internally connected to the Remote OFF binary input.
Rem Start/Stop	The binary output of the Timer is internally connected to the binary input Remote Start/Stop.
TEST	The binary output of the Timer is internally connected to the binary input Remote TEST.
TEST OnLd	The binary output of the Timer is internally connected to the Remote TEST On Load binary input.
MFail Blk	The binary output of the Timer is internally connected to the Mains Fail Block binary input.

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Timer 8 Setup

Setpoint group	Timers & Counters	Related FW	1.1.0
Range [units]	N/A [-]		
Default value	N/A [-]	Force value	NO
Step	N/A [-]		
Comm object	10977	Related applications	MCB
Config level	Standard		
Setpoint visibility	Only if Timer 8 Function (page 431) != Disabled or Manual On		
Description			
Use this setpoint to setup the exercise Timer 8. See Exercise Timers (page 131) for step by step manual.			

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Subgroup: Timer 9

Timer 9 Function

Setpoint group	Timers & Counters	Related FW	1.1.0
Range [units]	Disabled / Manual On / No Func / Mode OFF / TEST / Test OnLd / MFail Blk [-]		
Default value	Disable	Force value	YES
Step	[-]		
Comm object	15366	Related applications	MCB
Config level	Standard		
Setpoint visibility	Always		

Description

This setpoint defines and enables the function of the Timer 9. The functions which are supposed to change the Controller Mode requires controller running in AUTO mode. The activation condition of the Timer is configured via setpoint **Timer 9 Setup (page 434)**.

Once the Timer is activated the LBO **EXERCISE TIMER 9 (PAGE 636)** is closed regardless of chosen timer function. If the CU is switched off when the Timer should be activated, the Timer will be activated immediately after the CU is switched on if the Timer condition is still fulfilled.

IMPORTANT: The LBO is activated always when the Timer should be activated e.g. even when controller is in different mode than AUTO.


IMPORTANT: In case that Timer 1, Timer 2, etc. should be activated at the same time, the Timer with selected higher priority function is executed.

Disabled	The Timer is disabled.
Manual On	The Timer is disabled but his binary output is activated (can be used for testing purposes).
No Func	There is no any other function, only binary output of the Timer is activated once the condition is fulfilled.
Mode OFF	The binary output of the Timer is internally connected to the Remote OFF binary input.
Rem Start/Stop	The binary output of the Timer is internally connected to the binary input Remote Start/Stop.
TEST	The binary output of the Timer is internally connected to the binary input Remote TEST.
TEST OnLd	The binary output of the Timer is internally connected to the Remote TEST On Load binary input.
MFail Blk	The binary output of the Timer is internally connected to the Mains Fail Block binary input.

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Timer 9 Setup

Setpoint group	Timers & Counters	Related FW	1.1.0
Range [units]	N/A [-]		
Default value	N/A [-]	Force value	NO
Step	N/A [-]		
Comm object	10978	Related applications	MCB
Config level	Standard		
Setpoint visibility	Only if Timer 9 Function (page 433) != Disabled or Manual On		
Description			
Use this setpoint to setup the exercise Timer 9. See Exercise Timers (page 131) for step by step manual.			

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Subgroup: Timer 10

Timer 10 Function

Setpoint group	Timers & Counters	Related FW	1.1.0
Range [units]	Disabled / Manual On / No Func / Mode OFF / TEST / Test OnLd / MFail Blk [-]		
Default value	Disable	Force value	YES
Step	[-]		
Comm object	15367	Related applications	MCB
Config level	Standard		
Setpoint visibility	Always		

Description

This setpoint defines and enables the function of the Timer 10. The functions which are supposed to change the Controller Mode requires controller running in AUTO mode. The activation condition of the Timer is configured via setpoint **Timer 10 Setup (page 436)**.

Once the Timer is activated the **LBO EXERCISE TIMER 10 (PAGE 636)** is closed regardless of chosen timer function. If the CU is switched off when the Timer should be activated, the Timer will be activated immediately after the CU is switched on if the Timer condition is still fulfilled.

IMPORTANT: The LBO is activated always when the Timer should be activated e.g. even when controller is in different mode than AUTO.

IMPORTANT: In case that Timer 1, Timer 2, etc. should be activated at the same time, the Timer with selected higher priority function is executed.

Disabled	The Timer is disabled.
Manual On	The Timer is disabled but his binary output is activated (can be used for testing purposes).
No Func	There is no any other function, only binary output of the Timer is activated once the condition is fulfilled.
Mode OFF	The binary output of the Timer is internally connected to the Remote OFF binary input.
Rem Start/Stop	The binary output of the Timer is internally connected to the binary input Remote Start/Stop.
TEST	The binary output of the Timer is internally connected to the binary input Remote TEST.
TEST OnLd	The binary output of the Timer is internally connected to the Remote TEST On Load binary input.
MFail Blk	The binary output of the Timer is internally connected to the Mains Fail Block binary input.

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Timer 10 Setup

Setpoint group	Timers & Counters	Related FW	1.1.0
Range [units]	N/A [-]		
Default value	N/A [-]	Force value	NO
Step	N/A [-]		
Comm object	10979	Related applications	MCB
Config level	Standard		
Setpoint visibility	Only if Timer 10 Function (page 435) != Disabled or Manual On		
Description			
Use this setpoint to setup the exercise Timer 10. See Exercise Timers (page 131) for step by step manual.			

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Subgroup: Timer 11

Timer 11 Function

Setpoint group	Timers & Counters	Related FW	1.1.0
Range [units]	Disabled / Manual On / No Func / Mode OFF / TEST / Test OnLd / MFail Blk [-]		
Default value	Disable	Force value	YES
Step	[-]		
Comm object	15368	Related applications	MCB
Config level	Standard		
Setpoint visibility	Always		

Description

This setpoint defines and enables the function of the Timer 11. The functions which are supposed to change the Controller Mode requires controller running in AUTO mode. The activation condition of the Timer is configured via setpoint **Timer 11 Setup (page 438)**.

Once the Timer is activated the **LBO EXERCISE TIMER 11 (PAGE 636)** is closed regardless of chosen timer function. If the CU is switched off when the Timer should be activated, the Timer will be activated immediately after the CU is switched on if the Timer condition is still fulfilled.

IMPORTANT: The LBO is activated always when the Timer should be activated e.g. even when controller is in different mode than AUTO.

IMPORTANT: In case that Timer 1, Timer 2, etc. should be activated at the same time, the Timer with selected higher priority function is executed.

Disabled	The Timer is disabled.
Manual On	The Timer is disabled but his binary output is activated (can be used for testing purposes).
No Func	There is no any other function, only binary output of the Timer is activated once the condition is fulfilled.
Mode OFF	The binary output of the Timer is internally connected to the Remote OFF binary input.
Rem Start/Stop	The binary output of the Timer is internally connected to the binary input Remote Start/Stop.
TEST	The binary output of the Timer is internally connected to the binary input Remote TEST.
TEST OnLd	The binary output of the Timer is internally connected to the Remote TEST On Load binary input.
MFail Blk	The binary output of the Timer is internally connected to the Mains Fail Block binary input.

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Timer 11 Setup

Setpoint group	Timers & Counters	Related FW	1.1.0
Range [units]	N/A [-]		
Default value	N/A [-]	Force value	NO
Step	N/A [-]		
Comm object	10980	Related applications	MCB
Config level	Standard		
Setpoint visibility	Only if Timer 11 Function (page 437) != Disabled or Manual On		
Description			
Use this setpoint to setup the exercise Timer 11. See Exercise Timers (page 131) for step by step manual.			

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Subgroup: Timer 12

Timer 12 Function

Setpoint group	Timers & Counters	Related FW	1.1.0
Range [units]	Disabled / Manual On / No Func / Mode OFF / TEST / Test OnLd / MFail Blk [-]		
Default value	Disable	Force value	YES
Step	[-]		
Comm object	15369	Related applications	MCB
Config level	Standard		
Setpoint visibility	Always		

Description

This setpoint defines and enables the function of the Timer 12. The functions which are supposed to change the Controller Mode requires controller running in AUTO mode. The activation condition of the Timer is configured via setpoint **Timer 12 Setup (page 440)**.

Once the Timer is activated the LBO EXERCISE TIMER 12 (PAGE 637) is closed regardless of chosen timer function. If the CU is switched off when the Timer should be activated, the Timer will be activated immediately after the CU is switched on if the Timer condition is still fulfilled.

IMPORTANT: The LBO is activated always when the Timer should be activated e.g. even when controller is in different mode than AUTO.

IMPORTANT: In case that Timer 1, Timer 2, etc. should be activated at the same time, the Timer with selected higher priority function is executed.

Disabled	The Timer is disabled.
Manual On	The Timer is disabled but his binary output is activated (can be used for testing purposes).
No Func	There is no any other function, only binary output of the Timer is activated once the condition is fulfilled.
Mode OFF	The binary output of the Timer is internally connected to the Remote OFF binary input.
Rem Start/Stop	The binary output of the Timer is internally connected to the binary input Remote Start/Stop.
TEST	The binary output of the Timer is internally connected to the binary input Remote TEST.
TEST OnLd	The binary output of the Timer is internally connected to the Remote TEST On Load binary input.
MFail Blk	The binary output of the Timer is internally connected to the Mains Fail Block binary input.

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Timer 12 Setup

Setpoint group	Timers & Counters	Related FW	1.1.0
Range [units]	N/A [-]		
Default value	N/A [-]	Force value	NO
Step	N/A [-]		
Comm object	10981	Related applications	MCB
Config level	Standard		
Setpoint visibility	Only if Timer 12 Function (page 439) != Disabled or Manual On		
Description			
Use this setpoint to setup the exercise Timer 12. See Exercise Timers (page 131) for step by step manual.			

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8.1.4 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 (page 442)**

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.

List of group of values

Group: Mains	448
Group: Load	464
Group: Bus	466
Group: Gen-sets	468
Group: Power Management	481
Group: Load Control	484
Group: VAR Control	486
Group: Controller I/O	488
Group: Statistics	490
Group: Info	494
Group: Log Bout	505
Group: Ethernet	506
Group: Remote Control	514
Group: User Buttons	518
Group: ECU	518
Group: PLC	519
Group: PLC	541
Group: DIST-IN 1-32	571
Group: DIST-IN 33-64	578
Group: SH Modules	585
Group: Virtual Shared OUT	593

List of values

Group: Mains	448	+Mains Voltage	456	ROCOF4	463
Mains Import P	448	+Mains Voltage Relative	456	Max ROCOF4	463
Mains Import P L1	448	Mains Current L1	456	Group: Load	464
Mains Import P L2	448	Mains Current L2	456	Load P	464
Mains Import P L3	448	Mains Current L3	456	Load Q	464
Mains Import Q	448	Mains Current Unbalance	457	Load Power Factor	464
Mains Import Q L1	449	Slip Frequency	457	Load Character	464
Mains Import Q L2	449	Slip Angle	457	Aux Current	465
Mains Import Q L3	449	Mains Voltage 1min Avg		Aux Power	465
Mains Import S	449	L1-N	457	Group: Bus	466
Mains Import S L1	449	Mains Voltage 1min Avg		Bus Frequency	466
Mains Import S L2	450	L2-N	458	Bus Voltage L1-N	466
Mains Import S L3	450	Mains Voltage 1min Avg		Bus Voltage L2-N	466
Mains Power Factor	450	L3-N	458	Bus Voltage L3-N	466
Mains Load Character	450	Mains Voltage 1min Avg		Bus Voltage L1-L2	466
Mains Power Factor L1	451	L1-L2	458	Bus Voltage L2-L3	467
Mains Load Character L1	451	Mains Voltage 1min Avg		Bus Voltage L3-L1	467
Mains Power Factor L2	451	L2-L3	458	Bus Voltage	467
Mains Load Character L2	451	Mains Voltage 1min Avg		Bus Voltage THD L1	467
Mains Power Factor L3	452	L3-L1	459	Bus Voltage THD L2	467
Mains Load Character L3	452	Mains Voltage 10min Avg		Bus Voltage THD L3	468
Mains Voltage THD L1	452	L1-N	459	Bus V Unbalance Ph-N	468
Mains Voltage THD L2	452	Mains Voltage 10min Avg		Bus V Unbalance Ph-Ph	468
Mains Voltage THD L3	453	L2-N	459	Group: Gen-sets	468
Mains Current THD L1	453	Mains Voltage 10min Avg		Gen-set 1 Power	468
Mains Current THD L2	453	L3-N	459	Gen-set 2 Power	469
Mains Current THD L3	453	Mains Voltage 10min Avg		Gen-set 3 Power	469
Mains Frequency	453	L1-L2	460	Gen-set 4 Power	469
Mains Voltage L1-N	454	Mains Voltage 10min Avg		Gen-set 5 Power	469
Mains Voltage L2-N	454	L2-L3	460	Gen-set 6 Power	469
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Group: Mains

Mains Import P

Value group	Mains	Related FW	1.1.0
Units	kW		
Comm object	8703	Related applications	MCB
Description			
Imported active power [kW] from Mains.			

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Mains Import P L1

Value group	Mains	Related FW	1.1.0
Units	kW		
Comm object	8805	Related applications	MCB
Description			
Imported active power [kW] from L1 phase of the Mains.			

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Mains Import P L2

Value group	Mains	Related FW	1.1.0
Units	kW		
Comm object	8806	Related applications	MCB
Description			
Imported active power [kW] from L2 phase of the Mains.			

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Mains Import P L3

Value group	Value Group Mains	Related FW	1.1.0
Units	kW		
Comm object	8807	Related applications	MCB
Description			
Imported active power [kW] from L3 phase of the Mains.			

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Mains Import Q

Value group	Value Group Mains	Related FW	1.1.0
Units	kVAr		
Comm object	8704	Related applications	MCB
Description			
Imported reactive power [kVAr] from Mains.			

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Mains Import Q L1

Value group	Value Group Mains	Related FW	1.1.0
Units	kW		
Comm object	8808	Related applications	MCB
Description			
Imported reactive power [kVAr] from L1 phase of the Mains.			

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Mains Import Q L2

Value group	Value Group Mains	Related FW	1.1.0
Units	kW		
Comm object	8809	Related applications	MCB
Description			
Imported reactive power [kVAr] from L2 phase of the Mains.			

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Mains Import Q L3

Value group	Value Group Mains	Related FW	1.1.0
Units	kW		
Comm object	8810	Related applications	MCB
Description			
Imported reactive power [kVAr] from L3 phase of the Mains.			

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Mains Import S

Value group	Value Group Mains	Related FW	1.1.0
Units	kVA		
Comm object	8811	Related applications	MCB
Description			
Imported apparent power [kVA] from Mains.			

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Mains Import S L1

Value group	Value Group Mains	Related FW	1.1.0
Units	kVA		
Comm object	8812	Related applications	MCB
Description			
Imported apparent power [kVA] from L1 phase of the Mains.			

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Mains Import S L2

Value group	Value Group Mains	Related FW	1.1.0
Units	kVA		
Comm object	8813	Related applications	MCB
Description			
Imported apparent power [kVA] from L2 phase of the Mains.			

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Mains Import S L3

Value group	Value Group Mains	Related FW	1.1.0
Units	kVA		
Comm object	8814	Related applications	MCB
Description			
Imported apparent power [kVA] from L3 phase of the Mains.			

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Mains Power Factor

Value group	Value Group Mains	Related FW	1.1.0
Units	[-]		
Comm object	16157	Related applications	MCB
Description			
Power factor of the Mains.			

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Mains Load Character

Value group	Value Group Mains	Related FW	1.1.0
Units	[-]		
Comm object	8709	Related applications	MCB
Description			
Character of Mains load. "L" means inductive load, "C" is capacitive and "R" is resistive load (Mains Power Factor (page 450) = 1).			
Load character of the Mains.			
L = inductive load, C = capacitive load, and R = resistive load (Mains Power Factor (page 450) = 1).			

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Mains Power Factor L1

Value group	Value Group Mains	Related FW	1.1.0
Units	[-]		
Comm object	20580	Related applications	MCB
Description			
Power factor of the L1 phase of the Mains.			

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Mains Load Character L1

Value group	Value Group Mains	Related FW	1.1.0
Units	[-]		
Comm object	8818	Related applications	MCB
Description			
Load character of the L1 phase of the Mains.			
L = inductive load, C = capacitive load, and R = resistive load (Mains Power Factor L1 (page 451) = 1).			

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Mains Power Factor L2

Value group	Value Group Mains	Related FW	1.1.0
Units	[-]		
Comm object	20581	Related applications	MCB
Description			
Power factor of the L2 phase of the Mains.			

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Mains Load Character L2

Value group	Value Group Mains	Related FW	1.1.0
Units	[-]		
Comm object	8819	Related applications	MCB
Description			
Load character of the L2 phase of the Mains.			
L = inductive load, C = capacitive load, and R = resistive load (Mains Power Factor L2 (page 451) = 1).			

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Mains Power Factor L3

Value group	Value Group Mains	Related FW	1.1.0
Units	[-]		
Comm object	20582	Related applications	MCB
Description			
Power factor of the L3 phase of the Mains.			

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Mains Load Character L3

Value group	Value Group Mains	Related FW	1.1.0
Units	[-]		
Comm object	8820	Related applications	MCB
Description			
Load character of the L3 phase of the Mains.			
L = inductive load, C = capacitive load, and R = resistive load (Mains Power Factor L3 (page 452) = 1).			

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Mains Voltage THD L1

Value group	Value Group Mains	Related FW	1.1.0
Units	%		
Comm object	16060	Related applications	MCB
Description			
This value represents Voltage Total Harmonic Distortion (page 17) Mains Voltage L1-N (page 454) .			

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Mains Voltage THD L2

Value group	Value Group Mains	Related FW	1.1.0
Units	%		
Comm object	16061	Related applications	MCB
Description			
This value represents Voltage Total Harmonic Distortion (page 17) of Mains Voltage L2-N (page 454) .			

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Mains Voltage THD L3

Value group	Value Group Mains	Related FW	1.1.0
Units	%		
Comm object	16062	Related applications	MCB
Description			
This value represents Voltage Total Harmonic Distortion (page 17) of Mains Voltage L3-N (page 454) .			

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Mains Current THD L1

Value group	Value Group Mains	Related FW	1.1.0
Units	%		
Comm object	16064	Related applications	MCB
Description			
This value represents Current Total Harmonic Distortion (page 18) of Mains Current L1 (page 456) .			

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Mains Current THD L2

Value group	Value Group Mains	Related FW	1.1.0
Units	%		
Comm object	16065	Related applications	MCB
Description			
This value represents Current Total Harmonic Distortion (page 18) of Mains Current L2 (page 456) .			

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Mains Current THD L3

Value group	Value Group Mains	Related FW	1.1.0
Units	%		
Comm object	16066	Related applications	MCB
Description			
This value represents Current Total Harmonic Distortion (page 18) of Mains Current L3 (page 456) .			

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Mains Frequency

Value group	Value Group Mains	Related FW	1.1.0
Units	Hz		
Comm object	20800	Related applications	MCB
Description			
Frequency of Mains.			

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Mains Voltage L1-N

Value group	Value Group Mains	Related FW	1.1.0
Units	V		
Comm object	8195	Related applications	MCB
Description			
Value of Mains voltage on phase 1.			

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Mains Voltage L2-N

Value group	Value Group Mains	Related FW	1.1.0
Units	V		
Comm object	8196	Related applications	MCB
Description			
Value of Mains voltage on phase 2.			

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Mains Voltage L3-N

Value group	Value Group Mains	Related FW	1.1.0
Units	V		
Comm object	8197	Related applications	MCB
Description			
Value of Mains voltage on phase 3.			

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Mains Voltage L1-L2

Value group	Value Group Mains	Related FW	1.1.0
Units	V		
Comm object	9631	Related applications	MCB
Description			
Value of Mains phase to phase voltage between L1 and L2 phases.			

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Mains Voltage L2-L3

Value group	Value Group Mains	Related FW	1.1.0
Units	V		
Comm object	9632	Related applications	MCB
Description			
Value of Mains phase to phase voltage between L2 and L3 phases.			

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Mains Voltage L3-L1

Value group	Value Group Mains	Related FW	1.1.0
Units	V		
Comm object	9633	Related applications	MCB
Description			
Value of Mains phase to phase voltage between L3 and L1 phases.			

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Mains Voltage

Value group	Value Group Mains	Related FW	1.1.0
Units	V		
Comm object	10666	Related applications	MCB
Description			
Average value of all Mains Voltage phases.			

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Mains V Unbalance Ph-N

Value group	Value Group Mains	Related FW	1.1.0
Units	V		
Comm object	10549	Related applications	MCB
Description			
This value contains the maximum difference of values Mains Voltage L1-N (page 454) , Mains Voltage L2-N (page 454) , Mains Voltage L3-N (page 454) at a given moment.			
Note: Difference of the values and the evaluation of the protection is influenced by the setpoint Connection type (page 265) .			

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Mains V Unbalance Ph-Ph

Value group	Value Group Mains	Related FW	1.1.0
Units	V		
Comm object	17337	Related applications	MCB
Description			
This value contains the maximum difference of values Mains Voltage L1-L2 (page 454) , Mains Voltage L2-L3 (page 454) , Mains Voltage L3-L1 (page 455) at a given moment.			
Note: Difference of the values and the evaluation of the protection is influenced by the setpoint Connection type (page 265) .			

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+Mains Voltage

Value group	Value Group Mains	Related FW	1.1.0
Units	V		
Comm object	16615	Related applications	MCB
Description			
Value of +Mains voltage measured by Symmetrical components (page 16)			

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+Mains Voltage Relative

Value group	Value Group Mains	Related FW	1.1.0
Units	V		
Comm object	16616	Related applications	MCB
Description			
Value of +Mains voltage measured by Symmetrical components (page 16) which is related to MainsAC Shore Nominal Voltage Ph-N (page 267) or Mains Nominal Voltage Ph-Ph (page 267) .			

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Mains Current L1

Value group	Value Group Mains	Related FW	1.1.0
Units	A		
Comm object	8801	Related applications	MCB
Description			
Current of the L1 phase of the Mains.			

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Mains Current L2

Value group	Value Group Mains	Related FW	1.1.0
Units	A		
Comm object	8802	Related applications	MCB
Description			
Current of the L2 phase of the Mains.			

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Mains Current L3

Value group	Value Group Mains	Related FW	1.1.0
Units	A		
Comm object	8803	Related applications	MCB
Description			
Current of the L3 phase of the Mains.			

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Mains Current Unbalance

Value group	Value Group Mains	Related FW	1.1.0
Units	A		
Comm object	17338	Related applications	MCB
Description			
This value contains the maximum difference of values Mains Current L1 (page 456) , Mains Current L2 (page 456) and Mains Current L3 (page 456) .			
Note: Difference of the values and the evaluation of the protection is influenced by the setpoint Connection type (page 265) .			

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Slip Frequency

Value group	Value Group Bus	Related FW	1.1.0
Units	Hz		
Comm object	8224	Related applications	MCB
Description			
Slip frequency during synchronization.			

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Slip Angle

Value group	Value Group Bus	Related FW	1.1.0
Units	°		
Comm object	8225	Related applications	MCB
Description			
Slip angle during synchronization.			

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Mains Voltage 1min Avg L1-N

Value group	Value Group Mains	Related FW	1.1.0
Units	V		
Comm object	16654	Related applications	MCB
Description			
This value contains 1-minute average of Mains Voltage L1-N (page 454) .			
See 1-minute averages (page 201) for more information.			
Note: Value is reset when controller is switched off.			

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Mains Voltage 1min Avg L2-N

Value group	Value Group Mains	Related FW	1.1.0
Units	V		
Comm object	16655	Related applications	MCB
Description			
This value contains 1-minute average of Mains Voltage L2-N (page 454) . See 1-minute averages (page 201) for more information.			
Note: Value is reset when controller is switched off.			

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Mains Voltage 1min Avg L3-N

Value group	Value Group Mains	Related FW	1.1.0
Units	V		
Comm object	16656	Related applications	MCB
Description			
This value contains 1-minute average of Mains Voltage L3-N (page 454) . See 1-minute averages (page 201) for more information.			
Note: Value is reset when controller is switched off.			

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Mains Voltage 1min Avg L1-L2

Value group	Value Group Mains	Related FW	1.1.0
Units	V		
Comm object	16085	Related applications	MCB
Description			
This value contains 1-minute average of Mains Voltage L1-L2 (page 454) . See 1-minute averages (page 201) for more information.			
Note: Value is reset when controller is switched off.			

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Mains Voltage 1min Avg L2-L3

Value group	Value Group Mains	Related FW	1.1.0
Units	V		
Comm object	16086	Related applications	MCB
Description			
This value contains 1-minute average of Mains Voltage L2-L3 (page 454) . See 1-minute averages (page 201) for more information.			
Note: Value is reset when controller is switched off.			

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Mains Voltage 1min Avg L3-L1

Value group	Value Group Mains	Related FW	1.1.0
Units	V		
Comm object	16087	Related applications	MCB
Description			
This value contains 1-minute average of Mains Voltage L3-L1 (page 455) . See 1-minute averages (page 201) for more information.			
Note: Value is reset when controller is switched off.			

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Mains Voltage 10min Avg L1-N

Value group	Value Group Mains	Related FW	1.1.0
Units	V		
Comm object	16651	Related applications	MCB
Description			
This value contains 10-minutes average of Mains Voltage L1-N (page 454) . See 10-minutes averages (page 201) for more information.			
Note: Value is reset when controller is switched off.			

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Mains Voltage 10min Avg L2-N

Value group	Value Group Mains	Related FW	1.1.0
Units	V		
Comm object	16652	Related applications	MCB
Description			
This value contains 10-minutes average of Mains Voltage L2-N (page 454) . See 10-minutes averages (page 201) for more information.			
Note: Value is reset when controller is switched off.			

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Mains Voltage 10min Avg L3-N

Value group	Value Group Mains	Related FW	1.1.0
Units	V		
Comm object	16653	Related applications	MCB
Description			
This value contains 10-minutes average of Mains Voltage L3-N (page 454) . See 10-minutes averages (page 201) for more information.			
Note: Value is reset when controller is switched off.			

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Mains Voltage 10min Avg L1-L2

Value group	Value Group Mains	Related FW	1.1.0
Units	V		
Comm object	16082	Related applications	MCB
Description			
This value contains 10-minutes average of Mains Voltage L1-L2 (page 454) . See 10-minutes averages (page 201) for more information.			
Note: Value is reset when controller is switched off.			

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Mains Voltage 10min Avg L2-L3

Value group	Value Group Mains	Related FW	1.1.0
Units	V		
Comm object	16083	Related applications	MCB
Description			
This value contains 10-minutes average of Mains Voltage L2-L3 (page 454) . See 10-minutes averages (page 201) for more information.			
Note: Value is reset when controller is switched off.			

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Mains Voltage 10min Avg L3-L1

Value group	Value Group Mains	Related FW	1.1.0
Units	V		
Comm object	16084	Related applications	MCB
Description			
This value contains 10-minutes average of Mains Voltage L3-L1 (page 455) . See 10-minutes averages (page 201) for more information.			
Note: Value is reset when controller is switched off.			

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Max Vector Shift

Value group	Value Group Mains	Related FW	1.1.0
Units	°		
Comm object	9847	Related applications	MCB
Description			
Maximal measured value of Vector shift (page 199) of the Mains. It is reset to zero always when: <ul style="list-style-type: none"> > Vector Shift Protection (page 357) = Parallel Only - controller goes to parallel to mains operation > Vector Shift Protection (page 357) = Enabled - MCB gets closed 			

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ROCOF1

Value group	Value Group Mains	Related FW	1.1.0
Units	Hz/s		
Comm object	9848	Related applications	MCB
Description			
This value contains actual rate of change of frequency measured by ROCOF1 Protection (page 358) . See ROCOF (page 200) for more information.			

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Max ROCOF1

Value group	Value Group Mains	Related FW	1.1.0
Units	Hz/s		
Comm object	10049	Related applications	MCB
Description			
This value contains maximal rate of change of frequency measured by ROCOF1 Protection (page 358) since the protection got active. See ROCOF (page 200) for more information.			
Setting		Reset of value	
ROCOF1 Protection (page 358) = Enabled		When MCB closes.	
ROCOF1 Protection (page 358) = Parallel Only		After entering parallel operation (Breaker state (page 494) = ParalOper)	

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ROCOF2

Value group	Value Group Mains	Related FW	1.1.0
Units	Hz/s		
Comm object	16153	Related applications	MCB
Description			
This value contains actual rate of change of frequency measured by ROCOF2 Protection (page 359) . See ROCOF (page 200) for more information.			

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Max ROCOF2

Value group	Value Group Mains	Related FW	1.1.0
Units	Hz/s		
Comm object	16163	Related applications	MCB
Description			
This value contains maximal rate of change of frequency measured by ROCOF2 Protection (page 359) since the protection got active. See ROCOF (page 200) for more information.			
Setting		Reset of value	
ROCOF2 Protection (page 359) = Enabled		When MCB closes.	
ROCOF2 Protection (page 359) = Parallel Only		After entering parallel operation (Breaker state (page 494) = ParalOper)	

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ROCOF3

Value group	Value Group Mains	Related FW	1.1.0
Units	Hz/s		
Comm object	16154	Related applications	MCB
Description			
This value contains actual rate of change of frequency measured by ROCOF3 Protection (page 360) . See ROCOF (page 200) for more information.			

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Max ROCOF3

Value group	Value Group Mains	Related FW	1.1.0
Units	Hz/s		
Comm object	16164	Related applications	MCB
Description			
This value contains maximal rate of change of frequency measured by ROCOF3 Protection (page 360) since the protection got active. See ROCOF (page 200) for more information.			
Setting		Reset of value	
ROCOF3 Protection (page 360) = Enabled		When MCB closes.	
ROCOF3 Protection (page 360) = Parallel Only		After entering parallel operation (Breaker state (page 494) = ParalOper)	

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ROCOF4

Value group	Value Group Mains	Related FW	1.1.0
Units	Hz/s		
Comm object	16155	Related applications	MCB
Description			
This value contains actual rate of change of frequency measured by ROCOF4 Protection (page 361) . See ROCOF (page 200) for more information.			

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Max ROCOF4

Value group	Value Group Mains	Related FW	1.1.0
Units	Hz/s		
Comm object	16165	Related applications	MCB
Description			
This value contains maximal rate of change of frequency measured by ROCOF4 Protection (page 361) since the protection got active. See ROCOF (page 200) for more information.			
Setting		Reset of value	
ROCOF4 Protection (page 361) = Enabled		When MCB closes.	
ROCOF4 Protection (page 361) = Parallel Only		After entering parallel operation (Breaker state (page 494) = ParalOper)	

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Group: Load

Load P

Value group	Load	Related FW	1.1.0
Units	kW		
Comm object	10601	Related applications	MCB
Description			
Load's active power.			
Note: This value can be also switched into one decimal see <i>Power Formats And Units (page 168)</i> .			

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Load Q

Value group	Load	Related FW	1.1.0
Units	kVAr		
Comm object	10644	Related applications	MCB
Description			
Load's reactive power.			
Note: This value can be also switched into one decimal see <i>Power Formats And Units (page 168)</i> .			

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Load Power Factor

Load	Load	Related FW	1.1.0
Units	[-]		
Comm object	16158	Related applications	MCB
Description			
Load's power factor.			

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Load Character

Value group	Load	Related FW	1.1.0
Units	[-]		
Comm object	9026	Related applications	MCB
Description			
Load's character. "L" means inductive load, "C" is capacitive and "R" is resistive load (Load Power Factor (page 464) = 1).			

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Aux Current

Value group	Load	Related FW	1.1.0
Units	A		
Comm object	14996	Related applications	MCB
Description			
This Value is product of aux current measurement, together with Bus Voltage it is used for calculation of Aux Power (page 465) . There is no function connected with this value, it can be used for any customers needs.			

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Aux Power

Value group	Load	Related FW	1.1.0
Units	kW		
Comm object	16899	Related applications	MCB
Description			
This Value is calculated from the value Aux Current (page 465) and Bus Voltage. There is no function connected with this value, it can be used for any customers needs.			

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Group: Bus

Bus Frequency

Value group	Value Group Bus	Related FW	1.1.0
Units	Hz		
Comm object	20799	Related applications	MCB
Description			
This is the value of Bus frequency.			

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Bus Voltage L1-N

Value group	Value Group Bus	Related FW	1.1.0
Units	V		
Comm object	8192	Related applications	MCB
Description			
Voltage of the L1 phase of the Bus.			

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Bus Voltage L2-N

Value group	Value Group Bus	Related FW	1.1.0
Units	V		
Comm object	8193	Related applications	MCB
Description			
Voltage of the L2 phase of the Bus.			

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Bus Voltage L3-N

Value group	Value Group Bus	Related FW	1.1.0
Units	V		
Comm object	8194	Related applications	MCB
Description			
Voltage of the L3 phase of the Bus.			

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Bus Voltage L1-L2

Value group	Value Group Bus	Related FW	1.1.0
Units	V		
Comm object	9628	Related applications	MCB
Description			
Phase to phase voltage between the L1 and L2 phases of the Bus.			

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Bus Voltage L2-L3

Value group	Value Group Bus	Related FW	1.1.0
Units	V		
Comm object	9629	Related applications	MCB
Description			
Phase to phase voltage between the L2 and L3 phases of the Bus.			

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Bus Voltage L3-L1

Value group	Value Group Bus	Related FW	1.1.0
Units	V		
Comm object	9630	Related applications	MCB
Description			
Phase to phase voltage between the L3 and L1 phases of the Bus.			

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Bus Voltage

Value group	Value Group Bus	Related FW	1.1.0
Units	V		
Comm object	10645	Related applications	MCB
Description			
Average value of all voltage phases of the Bus.			

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Bus Voltage THD L1

Value group	Value Group Bus	Related FW	1.1.0
Units	%		
Comm object	16052	Related applications	MCB
Description			
This value represents Voltage Total Harmonic Distortion (page 17) of Bus Voltage L1-N (page 466).			

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Bus Voltage THD L2

Value group	Value Group Bus	Related FW	1.1.0
Units	%		
Comm object	16053	Related applications	MCB
Description			
This value represents Voltage Total Harmonic Distortion (page 17) of Bus Voltage L2-N (page 466).			

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Bus Voltage THD L3

Value group	Value Group Bus	Related FW	1.1.0
Units	%		
Comm object	16054	Related applications	MCB
Description			
This value represents Voltage Total Harmonic Distortion (page 17) of Bus Voltage L3-N (page 466) .			

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Bus V Unbalance Ph-N

Value group	Value Group Bus	Related FW	1.1.0
Units	V		
Comm object	10548	Related applications	MCB
Description			
This value contains the maximum difference of values Bus Voltage L1-N (page 466) , Bus Voltage L2-N (page 466) , Bus Voltage L3-N (page 466) at a given moment.			
<i>Note: Difference of the values and the evaluation of the protection is influenced by the setpoint Connection type (page 265).</i>			

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Bus V Unbalance Ph-Ph

Value group	Value Group Bus	Related FW	1.1.0
Units	V		
Comm object	17336	Related applications	MCB
Description			
This value contains the maximum difference of values Bus Voltage L1-L2 (page 466) , Bus Voltage L2-L3 (page 467) , Bus Voltage L3-L1 (page 467) at a given moment.			
<i>Note: Difference of the values and the evaluation of the protection is influenced by the setpoint Connection type (page 265).</i>			

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Group: Gen-sets

Gen-set 1 Power

Value group	Gen-sets	Related FW	1.1.0
Units	kW		
Comm object	10935	Related applications	MCB
Description			
Active power of Mains 1.			

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Gen-set 2 Power

Value group	Gen-sets	Related FW	1.1.0
Units	kW		
Comm object	10936	Related applications	MCB
Description			
Active power of Mains 2.			

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Gen-set 3 Power

Value group	Gen-sets	Related FW	1.1.0
Units	kW		
Comm object	10937	Related applications	MCB
Description			
Active power of Mains 3.			

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Gen-set 4 Power

Value group	Gen-sets	Related FW	1.1.0
Units	kW		
Comm object	10938	Related applications	MCB
Description			
Active power of Mains 4.			

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Gen-set 5 Power

Value group	Gen-sets	Related FW	1.1.0
Units	kW		
Comm object	10939	Related applications	MCB
Description			
Active power of Mains 5.			

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Gen-set 6 Power

Value group	Gen-sets	Related FW	1.1.0
Units	kW		
Comm object	10940	Related applications	MCB
Description			
Active power of Mains 6.			

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Gen-set 7 Power

Value group	Gen-sets	Related FW	1.1.0
Units	kW		
Comm object	10941	Related applications	MCB
Description			
Active power of Mains 7.			

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Gen-set 8 Power

Value group	Gen-sets	Related FW	1.1.0
Units	kW		
Comm object	10942	Related applications	MCB
Description			
Active power of Mains 8.			

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Gen-set 9 Power

Value group	Gen-sets	Related FW	1.1.0
Units	kW		
Comm object	10943	Related applications	MCB
Description			
Active power of Mains 9.			

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Gen-set 10 Power

Value group	Gen-sets	Related FW	1.1.0
Units	kW		
Comm object	10944	Related applications	MCB
Description			
Active power of Mains 10.			

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Gen-set 11 Power

Value group	Gen-sets	Related FW	1.1.0
Units	kW		
Comm object	10945	Related applications	MCB
Description			
Active power of Mains 11.			

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Gen-set 12 Power

Value group	Gen-sets	Related FW	1.1.0
Units	kW		
Comm object	10946	Related applications	MCB
Description			
Active power of Mains 12.			

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Gen-set 13 Power

Value group	Gen-sets	Related FW	1.1.0
Units	kW		
Comm object	10947	Related applications	MCB
Description			
Active power of Mains 13.			

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Gen-set 14 Power

Value group	Gen-sets	Related FW	1.1.0
Units	kW		
Comm object	10948	Related applications	MCB
Description			
Active power of Mains 14.			

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Gen-set 15 Power

Value group	Gen-sets	Related FW	1.1.0
Units	kW		
Comm object	10949	Related applications	MCB
Description			
Active power of Mains 15.			

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Gen-set 16 Power

Value group	Gen-sets	Related FW	1.1.0
Units	kW		
Comm object	10950	Related applications	MCB
Description			
Active power of Mains 16.			

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Gen-set 17 Power

Value group	Gen-sets	Related FW	1.1.0
Units	kW		
Comm object	10951	Related applications	MCB
Description			
Active power of Mains 17.			

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Gen-set 18 Power

Value group	Gen-sets	Related FW	1.1.0
Units	kW		
Comm object	10952	Related applications	MCB
Description			
Active power of Mains 18.			

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Gen-set 19 Power

Value group	Gen-sets	Related FW	1.1.0
Units	kW		
Comm object	10953	Related applications	MCB
Description			
Active power of Mains 19.			

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Gen-set 20 Power

Value group	Gen-sets	Related FW	1.1.0
Units	kW		
Comm object	10954	Related applications	MCB
Description			
Active power of Mains 20.			

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Gen-set 21 Power

Value group	Gen-sets	Related FW	1.1.0
Units	kW		
Comm object	10955	Related applications	MCB
Description			
Active power of Mains 21.			

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Gen-set 22 Power

Value group	Gen-sets	Related FW	1.1.0
Units	kW		
Comm object	10956	Related applications	MCB
Description			
Active power of Mains 22.			

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Gen-set 23 Power

Value group	Gen-sets	Related FW	1.1.0
Units	kW		
Comm object	10957	Related applications	MCB
Description			
Active power of Mains 23.			

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Gen-set 24 Power

Value group	Gen-sets	Related FW	1.1.0
Units	kW		
Comm object	10958	Related applications	MCB
Description			
Active power of Mains 24.			

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Gen-set 25 Power

Value group	Gen-sets	Related FW	1.1.0
Units	kW		
Comm object	10959	Related applications	MCB
Description			
Active power of Mains 25.			

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Gen-set 26 Power

Value group	Gen-sets	Related FW	1.1.0
Units	kW		
Comm object	10960	Related applications	MCB
Description			
Active power of Mains 26.			

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Gen-set 27 Power

Value group	Gen-sets	Related FW	1.1.0
Units	kW		
Comm object	10961	Related applications	MCB
Description			
Active power of Mains 27.			

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Gen-set 28 Power

Value group	Gen-sets	Related FW	1.1.0
Units	kW		
Comm object	10962	Related applications	MCB
Description			
Active power of Mains 28.			

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Gen-set 29 Power

Value group	Gen-sets	Related FW	1.1.0
Units	kW		
Comm object	10963	Related applications	MCB
Description			
Active power of Mains 29.			

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Gen-set 30 Power

Value group	Gen-sets	Related FW	1.1.0
Units	kW		
Comm object	10964	Related applications	MCB
Description			
Active power of Mains 30.			

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Gen-set 31 Power

Value group	Gen-sets	Related FW	1.1.0
Units	kW		
Comm object	10965	Related applications	MCB
Description			
Active power of Mains 31.			

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Gen-set 32 Power

Value group	Gen-sets	Related FW	1.1.0
Units	kW		
Comm object	10966	Related applications	MCB
Description			
Active power of Mains 32.			

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Gen-set 33 Power

Value group	Gen-sets	Related FW	1.1.0
Units	kW		
Comm object	20546	Related applications	MCB
Description			
Active power of Mains 33.			

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Gen-set 34 Power

Value group	Gen-sets	Related FW	1.1.0
Units	kW		
Comm object	20547	Related applications	MCB
Description			
Active power of Mains 34.			

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Gen-set 35 Power

Value group	Gen-sets	Related FW	1.1.0
Units	kW		
Comm object	20548	Related applications	MCB
Description			
Active power of Mains 35.			

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Gen-set 36 Power

Value group	Gen-sets	Related FW	1.1.0
Units	kW		
Comm object	20549	Related applications	MCB
Description			
Active power of Mains 36.			

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Gen-set 37 Power

Value group	Gen-sets	Related FW	1.1.0
Units	kW		
Comm object	20550	Related applications	MCB
Description			
Active power of Mains 37.			

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Gen-set 38 Power

Value group	Gen-sets	Related FW	1.1.0
Units	kW		
Comm object	20551	Related applications	MCB
Description			
Active power of Mains 38.			

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Gen-set 39 Power

Value group	Gen-sets	Related FW	1.1.0
Units	kW		
Comm object	20552	Related applications	MCB
Description			
Active power of Mains 39.			

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Gen-set 40 Power

Value group	Gen-sets	Related FW	1.1.0
Units	kW		
Comm object	20553	Related applications	MCB
Description			
Active power of Mains 40.			

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Gen-set 41 Power

Value group	Gen-sets	Related FW	1.1.0
Units	kW		
Comm object	20554	Related applications	MCB
Description			
Active power of Mains 41.			

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Gen-set 42 Power

Value group	Gen-sets	Related FW	1.1.0
Units	kW		
Comm object	20555	Related applications	MCB
Description			
Active power of Mains 42.			

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Gen-set 43 Power

Value group	Gen-sets	Related FW	1.1.0
Units	kW		
Comm object	20556	Related applications	MCB
Description			
Active power of Mains 43.			

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Gen-set 44 Power

Value group	Gen-sets	Related FW	1.1.0
Units	kW		
Comm object	20557	Related applications	MCB
Description			
Active power of Mains 44.			

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Gen-set 45 Power

Value group	Gen-sets	Related FW	1.1.0
Units	kW		
Comm object	20558	Related applications	MCB
Description			
Active power of Mains 45.			

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Gen-set 46 Power

Value group	Gen-sets	Related FW	1.1.0
Units	kW		
Comm object	20559	Related applications	MCB
Description			
Active power of Mains 46.			

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Gen-set 47 Power

Value group	Gen-sets	Related FW	1.1.0
Units	kW		
Comm object	20560	Related applications	MCB
Description			
Active power of Mains 47.			

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Gen-set 48 Power

Value group	Gen-sets	Related FW	1.1.0
Units	kW		
Comm object	20561	Related applications	MCB
Description			
Active power of Mains 48.			

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Gen-set 49 Power

Value group	Gen-sets	Related FW	1.1.0
Units	kW		
Comm object	20562	Related applications	MCB
Description			
Active power of Mains 49.			

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Gen-set 50 Power

Value group	Gen-sets	Related FW	1.1.0
Units	kW		
Comm object	20563	Related applications	MCB
Description			
Active power of Mains 50.			

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Gen-set 51 Power

Value group	Gen-sets	Related FW	1.1.0
Units	kW		
Comm object	20564	Related applications	MCB
Description			
Active power of Mains 51.			

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Gen-set 52 Power

Value group	Gen-sets	Related FW	1.1.0
Units	kW		
Comm object	20565	Related applications	MCB
Description			
Active power of Mains 52.			

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Gen-set 53 Power

Value group	Gen-sets	Related FW	1.1.0
Units	kW		
Comm object	20566	Related applications	MCB
Description			
Active power of Mains 53.			

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Gen-set 54 Power

Value group	Gen-sets	Related FW	1.1.0
Units	kW		
Comm object	20567	Related applications	MCB
Description			
Active power of Mains 54.			

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Gen-set 55 Power

Value group	Gen-sets	Related FW	1.1.0
Units	kW		
Comm object	20568	Related applications	MCB
Description			
Active power of Mains 55.			

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Gen-set 56 Power

Value group	Gen-sets	Related FW	1.1.0
Units	kW		
Comm object	20569	Related applications	MCB
Description			
Active power of Mains 56.			

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rGen-set 57 Power

Value group	Gen-sets	Related FW	1.1.0
Units	kW		
Comm object	20570	Related applications	MCB
Description			
Active power of Mains 57.			

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Gen-set 58 Power

Value group	Gen-sets	Related FW	1.1.0
Units	kW		
Comm object	20571	Related applications	MCB
Description			
Active power of Mains 58.			

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Gen-set 59 Power

Value group	Gen-sets	Related FW	1.1.0
Units	kW		
Comm object	20572	Related applications	MCB
Description			
Active power of Mains 59.			

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Gen-set 60 Power

Value group	Gen-sets	Related FW	1.1.0
Units	kW		
Comm object	20573	Related applications	MCB
Description			
Active power of Mains 60.			

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Gen-set 61 Power

Value group	Gen-sets	Related FW	1.1.0
Units	kW		
Comm object	20574	Related applications	MCB
Description			
Active power of Mains 61.			

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Gen-set 62 Power

Value group	Gen-sets	Related FW	1.1.0
Units	kW		
Comm object	20575	Related applications	MCB
Description			
Active power of Mains 62.			

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Gen-set 63 Power

Value group	Gen-sets	Related FW	1.1.0
Units	kW		
Comm object	20576	Related applications	MCB
Description			
Active power of Mains 63.			

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Gen-set 64 Power

Value group	Gen-sets	Related FW	1.1.0
Units	kW		
Comm object	20577	Related applications	MCB
Description			
Active power of Mains 64.			

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Group: Power Management

Running Nominal Power Of All

Value group	Power Management	Related FW	1.1.0
Units	kW		
Comm object	10658	Related applications	MCB
Description			
Actual nominal power of all running controllers on inter-controller CAN.			

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Running Nominal P In Load Shar

Value group	Power Management	Related FW	1.1.0
Units	kW		
Comm object	15806	Related applications	MCB
Description			
Actual nominal power of all running Gen-sets in Load Sharing connected to the same group.			

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Total Running Samax

Value group	Grid Codes Power Management	Related FW	1.1.0
Units	kVA		
Comm object	16425	Related applications	MCB
Description			
This value show maximal apparent power of running Controllers within the group that are connected to the bus/mains.			
The value is limited due to date type to -32000...32000 in case the sum of all apparent power of Controllers is above this range, the value shows fixed value 32000 and the warning Total Running PQS Value Overflow is activated.			

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Total Running P

Value group	Power Management	Related FW	1.1.0
Units	kW		
Comm object	10657	Related applications	MCB
Description			
Actual value of active power from all controllers connected to the bus.			

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Total Running P In Load Shar

Value group	Power Management	Related FW	1.1.0
Units	kW		
Comm object	15805	Related applications	MCB
Description			
This value shows the active power produced by all Gen-sets in the same group in Load Sharing.			

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Total Running P 10min Avg

Value group	Power Management	Related FW	1.1.0
Units	kW		
Comm object	20365	Related applications	MCB
Description			
This value contains 10-minutes average of Total Running P (page 482).			
See 10-minutes averages (page 201) for more information.			

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Total Running Q

Value group	Power Management	Related FW	1.1.0
Units	kVAr		
Comm object	10656	Related applications	MCB
Description			
Actual value of reactive power from all controllers connected to the bus.			

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Total Running Q 10min Avg

Value group	Power Management	Related FW	1.1.0
Units	kVAr		
Comm object	20366	Related applications	MCB
Description			
This value contains 10-minutes average of Total Running Q (page 483). See 10-minutes averages (page 201) for more information.			

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Total Running S

Value group	Power Management	Related FW	1.1.0
Units	kVA		
Comm object	16424	Related applications	MCB
Description			
Actual value of apparent power from all controllers connected to the bus.			

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Total Running S 10min Avg

Value group	Power Management	Related FW	1.1.0
Units	kVA		
Comm object	20367	Related applications	MCB
Description			
This value contains 10-minutes average of Total Running S (page 483). See 10-minutes averages (page 201) for more information.			

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Total Running Power Factor

Value group	Power Management	Related FW	1.1.0
Units	[-]		
Comm object	14590	Related applications	MCB
Description			
This value represents the total power factor (Cos ϕ) of all running Controllers.			

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Total Running Load Character

Value group	Power Management	Related FW	1.1.0
Units	[-]		
Comm object	9028	Related applications	MCB
Description			
This value represents the total character of all running Controllers.			

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Group: Load Control

Required P Target

Value group	Load Control	Related FW	1.1.0
Units	kW		
Comm object	8663	Related applications	MCB
Description			
This value shows required active power at the end of ramping.			

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Required P

Value group	Load Control	Related FW	1.1.0
Units	kW		
Comm object	13105	Related applications	MCB
Description			
This value shows required active power relative to the ramping procedure i.e. required active power right now.			

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System Load Control

Value group	Load Control	Related FW	1.1.0
Units	[-]		
Comm object	10792	Related applications	MCB
Description			
This value contains the actual LoadControl mode that the System is currently using.			
List of possible states:			
None	No load control is used (Mains/Island Oper).		
Hz Raise	Rated change while system is in the island operation and permissive synchronization is active.		
Hz Lower	Rated change while system is in the island operation and permissive synchronization is active.		
Load Raise	Rated change while system is in the parallel operation.		
Load Lower	Rated change while system is in the parallel operation.		
System Baseload	Gen-sets are loaded by request from Mains controller which is shared with all units in the same group (#System Baseload (page 290) + rated change if Load Raise/Lower is used).		
Ana Sys Baseload	Gen-sets are loaded by request from Mains controller which is shared with all units in the same group (LOAD CONTROL: SYSTEM BASELOAD (PAGE 654) + rated change if Load Raise/Lower is used).		
Import/Export	Gen-sets are loaded by request from Mains controller which is shared with all units in the same group (Import Load (page 290) + rated change if Load Raise/Lower is used).		
Ana Imp/Exp	Gen-sets are loaded by request from Mains controller which is shared with all units in the same group (LOAD CONTROL: IMPORT/EXPORT (PAGE 654) + rated change if Load Raise/Lower is used).		
Process Control	Gen-sets are loaded by process control request (PROCESS CONTROL: P REQUEST (PAGE 656)). Rated change is not available.		

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Loadsharing Output

Value group	Control Loops	Related FW	1.1.0
Units	%		
Comm object	10924	Related applications	MCB
Description			
Internal request of internal loadsharing regulator.			

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Group: VAR Control

Required Q

Value group	VAR Control	Related FW	1.1.0
Units	kVAr		
Comm object	12877	Related applications	MCB
Description			
Required reactive power.			

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Required Qrel

Value group	VAR Control	Related FW	1.1.0
Units	%		
Comm object	13169	Related applications	MCB
Description			
Required relative reactive power.			

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Required PF

Value group	VAR Control	Related FW	1.1.0
Units	[-]		
Comm object	16159	Related applications	MCB
Description			
Required Power Factor.			

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Required PF Character

Value group	VAR Control	Related FW	1.1.0
Units	[-]		
Comm object	9033	Related applications	MCB
Description			
Required Power Factor Character.			

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System PF/Q Control

Value group	VAR Control	Related FW	1.1.0
Units	[-]		
Comm object	10793	Related applications	MCB
Description			
This value contains the actual PF/Q Control mode that the System is currently using.			
List of possible states:			
None	Gen-set is not loaded and rated change is not applied, or the engine is stopped.		
Const Excitation	Constant excitation request for all Gen-sets in Var Shar while rated change or PF/Q control is not active. Usually this state should occur only if rated change is actively used and no rate (regulation) is required at the moment.		
V Raise	Rated change while system is in the island operation and permissive synchronization is active.		
V Lower	Rated change while system is in the island operation and permissive synchronization is active.		
Var Raise	Rated change while system is in the parallel operation.		
Var Lower	Rated change while system is in the parallel operation.		
Base PF	Gen-sets are loaded by request from Mains controller which is shared with all units in the same group (#System Power Factor (page 304) + rated change if Load Raise/Lower is used).		
Base Q	Gen-sets are loaded by request from Mains controller which is shared with all units in the same group (#System Base Q (page 304) + rated change if Load Raise/Lower is used).		
Ana Lc Baseload	Gen-sets are loaded by request from Mains controller which is shared with all units in the same group (PF CONTROL: SYSTEM BASE PF (PAGE 655) + rated change if Var Raise/Lower is used).		
Ana Sys Base PF	Gen-sets are loaded by request from Mains controller which is shared with all units in the same group (Q CONTROL: SYSTEM BASE Q (PAGE 656) + rated change if Var Raise/Lower is used).		
Imp/Exp PF	Gen-sets are loaded by request from Mains controller which is shared with all units in the same group (Import Power Factor (page 303) + rated change if Load Raise/Lower is used).		
Imp/Exp Q	Gen-sets are loaded by request from Mains controller which is shared with all units in the same group (Import Q (page 303) + rated change if Load Raise/Lower is used).		
Ana Imp/Exp PF	Gen-sets are loaded by request from Mains controller which is shared with all units in the same group (PF CONTROL: IMP/EXP PF (PAGE 656) + rated change if Var Raise/Lower is used).		
Ana Imp/Exp Q	Gen-sets are loaded by request from Mains controller which is shared with all units in the same group (Q CONTROL: IMP/EXP Q (PAGE 656) + rated change if Var Raise/Lower is used).		

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Varsharing Output

Value group	VAR Control	Related FW	1.1.0
Units	%		
Comm object	10925	Related applications	MCB
Description			
Internal request of internal varsharing regulator.			

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Group: Controller I/O

Battery Voltage

Value group	Controller I/O	Related FW	1.1.0
Units	V		
Comm object	8213	Related applications	MCB
Description			
Controller's supply voltage.			

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CU-AIN-01

Value group	Controller I/O	Related FW	1.1.0
Units	Configurable		
Comm object	9155	Related applications	MCB
Description			
This is the value of the analog input 1 of the controller.			
Note: Name of this value is changed according to the controller configuration.			

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CU-AIN-02

Value group	Controller I/O	Related FW	1.1.0
Units	Configurable		
Comm object	9156	Related applications	MCB
Description			
This is the value of the analog input 2 of the controller.			
Note: Name of this value is changed according to the controller configuration.			

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CU-AIN-03

Value group	Controller I/O	Related FW	1.1.0
Units	Configurable		
Comm object	9157	Related applications	MCB
Description			
This is the value of the analog input 3 of the controller.			
Note: Name of this value is changed according to the controller configuration.			

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CU-AIN-04

Value group	Controller I/O	Related FW	1.1.0
Units	Configurable		
Comm object	9158	Related applications	MCB
Description			
This is the value of the analog input 4 of the controller.			
Note: Name of this value is changed according to the controller configuration.			

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Binary Inputs

Value group	Controller I/O	Related FW	1.1.0
Units	[-]		
Comm object	8235	Related applications	MCB
Description			
States of the binary inputs of the controller.			
01. CU-BIN-01			
02. CU-BIN-02			
03. CU-BIN-03			
04. CU-BIN-04			
05. CU-BIN-05			
06. CU-BIN-06			
07. CU-BIN-07			
08. CU-BIN-08			
09. CU-BIN-09			
10. CU-BIN-10			
11. CU-BIN-11			
12. CU-BIN-12			
Note: Names are changed based on names of representative binary inputs. See Default configuration (page 116) to see default binary inputs names.			

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Binary Outputs

Value group	Controller I/O	Related FW	1.1.0
Units	[-]		
Comm object	8239	Related applications	MCB
Description State of the binary outputs of the controller. 01. CU-BOUT-01 02. CU-BOUT-02 03. CU-BOUT-03 04. CU-BOUT-04 05. CU-BOUT-05 06. CU-BOUT-06 07. CU-BOUT-07 08. CU-BOUT-08 09. CU-BOUT-09 10. CU-BOUT-10 11. CU-BOUT-11 12. CU-BOUT-12 <i>Note: Names are changed based on names of representative binary outputs. See Default configuration (page 116) to see default binary outputs names.</i>			

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Group: Statistics

Sum MWh

Value group	Statistics	Related FW	1.1.0
Units	MWh		
Comm object	8980	Related applications	MCB
Description This value is the sum of kWh from all Gen-sets (Genset kWh) which are communicating on the intercontroller CAN (CAN2A or CAN2B) and are in the same control group as the IM1010 controller.			

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Sum MVarh

Value group	Statistics	Related FW	1.1.0
Units	MVarh		
Comm object	8981	Related applications	MCB
Description This value is the sum of kVarh from all Gen-sets (Genset kVarh) which are communicating on the intercontroller CAN (CAN2A or CAN2B) and are in the same control group as the IM1010 controller.			

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Sum MVAh

Value group	Statistics	Related FW	1.1.0
Units	MVAh		
Comm object	14021	Related applications	MCB
Description			
This value is the sum of kVAh from all Gen-sets (Genset kVAh) which are communicating on the intercontroller CAN (CAN2A or CAN2B) and are in the same control group as the IM1010 controller.			

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Mains kVAh

Value group	Statistics	Related FW	1.1.0
Units	kVAh		
Comm object	13665	Related applications	MCB
Description			
Total apparent energy imported/exported from/to the Mains through the CB.			

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Mains kWh Exported

Value group	Statistics	Related FW	1.1.0
Units	kVAh		
Comm object	11025	Related applications	MCB
Description			
Counter of Mains Import P (page 448).			
<i>Note: This value can be also switched into one decimal see Power Formats And Units (page 168).</i>			

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Mains kVArh Exported

Value group	Statistics	Related FW	1.1.0
Units	kVArh		
Comm object	11026	Related applications	MCB
Description			
Counter of Mains Import Q (page 448).			
<i>Note: This value can be also switched into one decimal see Power Formats And Units (page 168).</i>			

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Mains kWh Imported

Value group	Statistics	Related FW	1.1.0
Units	kWh		
Comm object	16710	Related applications	MCB
Description			
Active energy imported from the Mains to the Load/Bus.			

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Mains kVArh Imported

Value group	Statistics	Related FW	1.1.0
Units	kWh		
Comm object	16711	Related applications	MCB
Description			
Reactive energy imported from the Mains to the Load/Bus.			

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Fast Pulse Counter 1

Value group	Statistics	Related FW	1.1.0
Units	[-]		
Comm object	20303	Related applications	MCB
Description			
This is the Statistic value of the Fast Pulse Counter 1 which is physically configured to binary input 9. Change the conversion rate via setpoint Conversion Coeff. Fast Pulse 1 (page 415) . See the chapter Pulse Counters (page 169) for more information.			
Note: The Value can be set via IntelliConfig in the interface "Set Statistics".			

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Fast Pulse Counter 2

Value group	Statistics	Related FW	1.1.0
Units	[-]		
Comm object	20304	Related applications	MCB
Description			
This is the Statistic value of the Fast Pulse Counter 2 which is physically configured to binary input 10. Change the conversion rate via setpoint Conversion Coeff. Fast Pulse 2 (page 415) . See the chapter Pulse Counters (page 169) for more information.			
Note: The Value can be set via IntelliConfig in the interface "Set Statistics".			

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Pulse Counter 1

Value group	Statistics	Related FW	1.1.0
Units	[-]		
Comm object	10986	Related applications	MCB
Description			
This is the Statistic value of the Pulse Counter 1 which is connected with LBI PULSE COUNTER 1 (PAGE 620) . Change the conversion rate via setpoint Conversion Coefficient Pulse 1 (page 416) . See the chapter Pulse Counters (page 169) for more information.			
Note: The Value can be set via IntelliConfig in the interface "Set Statistics".			

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Pulse Counter 2

Value group	Statistics	Related FW	1.1.0
Units	[-]		
Comm object	10987	Related applications	MCB
Description			
This is the Statistic value of Pulse the Counter 2 which is connected with LBI PULSE COUNTER 2 (PAGE 620) . Change the conversion rate via setpoint Conversion Coefficient Pulse 2 (page 416) . See the chapter Pulse Counters (page 169) for more information.			
Note: The Value can be set via IntelliConfig in the interface "Set Statistics".			

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Time

Value group	Statistics	Related FW	1.1.0
Units	HH:MM:SS		
Comm object	24554	Related applications	MCB
Description			
Shows setup time.			

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Date

Value group	Statistics	Related FW	1.1.0
Units	DD.MM.YYYY		
Comm object	24553	Related applications	MCB
Description			
Shows setup date.			

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Time Mode

Value group	Statistics	Related FW	1.1.0
Units	[-]		
Comm object	20252	Related applications	MCB
Description			
Shows setup time mode. STD - Standard zone time (e.g GMT+1 for Prague) DST - Daylight Saving Time = STD+1 (e.g. GMT+2 for Prague)			

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Group: Info

Application Mode

Value group	Info	Related FW	1.1.0
Units	[-]		
Comm object	14446	Related applications	MCB
Description			
This value reflects which application is used for the controller at the moment.			

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Controller Mode

Value group	Info	Related FW	1.1.0
Units	[-]		
Comm object	9887	Related applications	MCB
Description			
Controller mode.			

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Breaker state

Value group	Info	Related FW	1.1.0
Units	[-]		
Comm object	9245	Related applications	MCB
Description			
This value contains actual breaker state message.			

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Timer Text

Value group	Info	Related FW	1.1.0
Units	[-]		
Comm object	10040	Related applications	MCB
Description			
This value contains actual timer text message.			

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Connection Type

Value group	Info	Related FW	1.1.0
Units	[-]		
Comm object	12944	Related applications	MCB
Description			
This value contains name of currently selected connection type, which is adjusted via Connection type (page 265).			

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Timer Value

Value group	Info	Related FW	1.1.0
Units	[MM:SS]		
Comm object	14147	Related applications	MCB
Description			
This value contains time of active timer which is counted down, name of the timer is in value Timer Text (page 495).			

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ID String

Value group	Info	Related FW	1.1.0
Units	[-]		
Comm object	24501	Related applications	MCB
Description			
Name of controller which is used in IntelliConfig in command bar.			

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FW Version

Value group	Info	Related FW	1.1.0
Units	[-]		
Comm object	24339	Related applications	MCB
Description			
Major and minor firmware version number.			

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Application

Value group	Info	Related FW	1.1.0
Units	[-]		
Comm object	8480	Related applications	MCB
Description			
The value contains actual application in controller.			

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FW Branch

Value group	Info	Related FW	1.1.0
Units	[-]		
Comm object	8707	Related applications	MCB
Description			
The value contains actual branch of firmware in controller.			

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CAN Intercontroller Comm Mode

Value group	Info	Related FW	1.1.0
Units	[-]		
Comm object	23969	Related applications	MCB
Description			
This value contains actual mode of CAN Intercontroller Communication (page 123) . Note: In case that there is a mismatch between this value and setpoint CAN Intercontroller Comm Mode (page 366) , alarm ALI CAN Mode Inconsistency (page 745) is activated.			

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CAN Intercontroller Comm Redundancy

Value group	Info	Related FW	1.1.0
Units	[-]		
Comm object	23970	Related applications	MCB
Description			
This value informs if CAN Intercontroller communication Redundancy is enabled or not. Note: In case that there is a mismatch between this value and setpoint CAN Intercontroller Comm Mode (page 366) , alarm ALI CAN Mode Inconsistency (page 745) is activated.			

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SD Card Status

Value group	Info	Related FW	1.1.0																						
Units	[-]																								
Comm object	20589	Related applications	MCB																						
Description																									
This value shows the actual status of the SD Card.																									
<table><tr><th>Value</th><th>Meaning</th></tr><tr><td>Mount In Progress</td><td>The SD Card is being booted.</td></tr><tr><td>Not Inserted</td><td>There is no SD Card in the SD card slot detected.</td></tr><tr><td>Unmount</td><td>The SD card is inserted but the setpoint SD Card File System (page 367) is set to Unmount option.</td></tr><tr><td>Ready To Use</td><td>SD Card is mounted and ready to be used.</td></tr><tr><td>Format Required</td><td>The wrong file system format of the SD Card is detected.</td></tr><tr><td>Formatting</td><td>The formatting process of the SD Card is active.</td></tr><tr><td>Formatting Failed</td><td>The formatting process failed.</td></tr><tr><td>Write Protected</td><td>It is not possible to write data on SD Card (Read Only mode).</td></tr><tr><td>Not Supported</td><td>Used SD Card is not supported (wrong parameters of the SD card).</td></tr><tr><td>Error</td><td>This status is used for any other errors which are not covered by the states above.</td></tr></table>				Value	Meaning	Mount In Progress	The SD Card is being booted.	Not Inserted	There is no SD Card in the SD card slot detected.	Unmount	The SD card is inserted but the setpoint SD Card File System (page 367) is set to Unmount option.	Ready To Use	SD Card is mounted and ready to be used.	Format Required	The wrong file system format of the SD Card is detected.	Formatting	The formatting process of the SD Card is active.	Formatting Failed	The formatting process failed.	Write Protected	It is not possible to write data on SD Card (Read Only mode).	Not Supported	Used SD Card is not supported (wrong parameters of the SD card).	Error	This status is used for any other errors which are not covered by the states above.
Value	Meaning																								
Mount In Progress	The SD Card is being booted.																								
Not Inserted	There is no SD Card in the SD card slot detected.																								
Unmount	The SD card is inserted but the setpoint SD Card File System (page 367) is set to Unmount option.																								
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Not Supported	Used SD Card is not supported (wrong parameters of the SD card).																								
Error	This status is used for any other errors which are not covered by the states above.																								

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SD Card Capacity

Value group	Info	Related FW	1.1.0
Units	[GB]		
Comm object	20026	Related applications	MCB
Description			
This value provides information about SD Card storage capacity in GB.			

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SD Card Free Space

Value group	Info	Related FW	1.1.0
Units	[%]		
Comm object	20027	Related applications	MCB
Description			
This value shows relative free space of SD Card storage.			

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History Lifetime

Value group	Info	Related FW	1.1.0																										
Units	[%]																												
Comm object	20284	Related applications	MCB																										
Description																													
This value shows the lifetime usage of non-volatile memory which is used for storing of history records. Please refer to the table below for detailed information.																													
<table><tr><th>Value [%]</th><th>Meaning</th></tr><tr><td>- 1</td><td>Memory's lifetime usage can not be obtained.</td></tr><tr><td>10</td><td>Memory's lifetime usage is between 0-10%.</td></tr><tr><td>20</td><td>Memory's lifetime usage is between 11-20%..</td></tr><tr><td>30</td><td>Memory's lifetime usage is between 21-30%.</td></tr><tr><td>40</td><td>Memory's lifetime usage is between 31-40%.</td></tr><tr><td>50</td><td>Memory's lifetime usage is between 41-50%.</td></tr><tr><td>60</td><td>Memory's lifetime usage is between 51-60%.</td></tr><tr><td>70</td><td>Memory's lifetime usage is between 61-70%.</td></tr><tr><td>80</td><td>Memory's lifetime usage is between 71-80%.</td></tr><tr><td>90</td><td>Memory's lifetime usage is between 81-90%.</td></tr><tr><td>100</td><td>Memory's lifetime usage is between 91-100%.</td></tr><tr><td>110</td><td>Memory's lifetime usage is over 100 %. The memory may fail.</td></tr></table>				Value [%]	Meaning	- 1	Memory's lifetime usage can not be obtained.	10	Memory's lifetime usage is between 0-10%.	20	Memory's lifetime usage is between 11-20%..	30	Memory's lifetime usage is between 21-30%.	40	Memory's lifetime usage is between 31-40%.	50	Memory's lifetime usage is between 41-50%.	60	Memory's lifetime usage is between 51-60%.	70	Memory's lifetime usage is between 61-70%.	80	Memory's lifetime usage is between 71-80%.	90	Memory's lifetime usage is between 81-90%.	100	Memory's lifetime usage is between 91-100%.	110	Memory's lifetime usage is over 100 %. The memory may fail.
Value [%]	Meaning																												
- 1	Memory's lifetime usage can not be obtained.																												
10	Memory's lifetime usage is between 0-10%.																												
20	Memory's lifetime usage is between 11-20%..																												
30	Memory's lifetime usage is between 21-30%.																												
40	Memory's lifetime usage is between 31-40%.																												
50	Memory's lifetime usage is between 41-50%.																												
60	Memory's lifetime usage is between 51-60%.																												
70	Memory's lifetime usage is between 61-70%.																												
80	Memory's lifetime usage is between 71-80%.																												
90	Memory's lifetime usage is between 81-90%.																												
100	Memory's lifetime usage is between 91-100%.																												
110	Memory's lifetime usage is over 100 %. The memory may fail.																												

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Forced Value Status

Value group	Info	Related FW	1.1.0
Units	[-]		
Comm object	20544	Related applications	MCB
Description			
This value contains list of all 32 LBIs for Forced Value (page 140) . Logical 1 means that the respective LBI is currently activated.			

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SW Key Feature List

Value group	Info	Related FW	1.1.0
Units	[-]		
Comm object	20591	Related applications	MCB
Description			
<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">1. Reserved2. Modbus Master3. Hot Swap Redundancy4. PLC ExtendedReserved5. Reserved			

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Hot Swap Redundancy Status

Value group	Info	Related FW	1.1.0
Units	[-]		
Comm object	16887	Related applications	MCB
Description			
This value contains list of status bits related to Hot Swap Redundancy. If Hot Swap Redundancy (page 274) = Master one of bits 01-04 is always active, bits 05-08 are never active. If Hot Swap Redundancy (page 274) = Backup one of bits 05-08 is always active, bits 01-04 are never active. If Hot Swap Redundancy (page 274) = Disabled none of bits is active.			
Master: Backup OK	<ul style="list-style-type: none"> > this controller is the master > the backup is alive and ready to perform Hot Swap > the master is controlling 		
Master: Backup Control	<ul style="list-style-type: none"> > this controller is the master > the master is considered to be dead by the backup controller > the master is forced to the listening mode > the backup is controlling 		
Master: Backup Dead	<ul style="list-style-type: none"> > this controller is the master > the backup is considered to be dead by the master controller > the backup is forced to the listening mode > the master is controlling 		
Master: Backup Not Ready For HS	<ul style="list-style-type: none"> > this controller is the master > backup is not ready to perform Hot Swap 		
Backup: Master OK	<ul style="list-style-type: none"> > this controller is the backup > the master is alive > the master is controlling 		
Backup: Master Control	<ul style="list-style-type: none"> > this controller is the backup > the backup is considered to be dead by the master controller > the backup is forced to the listening mode > the master is controlling 		
Backup: Master Dead	<ul style="list-style-type: none"> > this controller is the backup > the master is considered to be dead by the backup controller > the master is forced to the listening mode > the backup is controlling 		
Backup: Data Synchro Fail	<ul style="list-style-type: none"> > this controller is the backup > data needed for Hot Swap performance are not received from master 		

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CAN16

Value group	Info	Related FW	1.1.0
Units	[-]		
Comm object	8546	Related applications	MCB
Description			
This value contains binary information about controllers connected via CAN2A (page 18) and/or CAN2B (page 18) with CAN Controller Address (page 362) = <1,16>. Each bit represent controller with the same CAN address as number of the bit. <ul style="list-style-type: none">> Log. 1 - this controller receives messages from the controller with specific CAN address> Log. 0 - this controller does not receive messages from the controller with specific CAN address			

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CAN32

Value group	Info	Related FW	1.1.0
Units	[-]		
Comm object	8827	Related applications	MCB
Description			
This value contains binary information about controllers connected via CAN2A (page 18) and/or CAN2B (page 18) with CAN Controller Address (page 362) = <17,32>. Each bit represent controller with the same CAN address as number of the bit. <ul style="list-style-type: none">> Log. 1 - this controller receives messages from the controller with specific CAN address> Log. 0 - this controller does not receive messages from the controller with specific CAN address			

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CAN48

Value group	Info	Related FW	1.1.0
Units	[-]		
Comm object	16684	Related applications	MCB
Description			
This value contains binary information about controllers connected via CAN2A (page 18) and/or CAN2B (page 18) with CAN Controller Address (page 362) = <33,48>. Each bit represent controller with the same CAN address as number of the bit. <ul style="list-style-type: none">> Log. 1 - this controller receives messages from the controller with specific CAN address> Log. 0 - this controller does not receive messages from the controller with specific CAN address			

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CAN64

Value group	Info	Related FW	1.1.0
Units	[-]		
Comm object	16685	Related applications	MCB
Description			
This value contains binary information about controllers connected via CAN2A (page 18) and/or CAN2B (page 18) with CAN Controller Address (page 362) = <49,64>. Each bit represent controller with the same CAN address as number of the bit.			
<ul style="list-style-type: none">> Log. 1 - this controller receives messages from the controller with specific CAN address> Log. 0 - this controller does not receive messages from the controller with specific CAN address			

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Reg16

Value group	Info	Related FW	1.1.0
Units	[-]		
Comm object	11081	Related applications	MCB
Description			
This value contains binary information about controllers connected via CAN2A (page 18) and/or CAN2B (page 18) with CAN Controller Address (page 362) = <1,16>. Each bit represent controller with the same CAN address as number of the bit.			
<ul style="list-style-type: none">> Log. 1 - controller with this CAN address is in the same group (is connected to the same bus).> Log. 0 - controller with this CAN address is NOT in the same group (is NOT connected to the same bus).			

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Reg32

Value group	Info	Related FW	1.1.0
Units	[-]		
Comm object	11082	Related applications	MCB
Description			
This value contains binary information about controllers connected via CAN2A (page 18) and/or CAN2B (page 18) with CAN Controller Address (page 362) = <17,32>. Each bit represent controller with the same CAN address as number of the bit.			
<ul style="list-style-type: none">> Log. 1 - controller with this CAN address is in the same group (is connected to the same bus).> Log. 0 - controller with this CAN address is NOT in the same group (is NOT connected to the same bus).			

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Reg48

Value group	Info	Related FW	1.1.0
Units	[-]		
Comm object	16688	Related applications	MCB
Description			
This value contains binary information about controllers connected via CAN2A (page 18) and/or CAN2B (page 18) with CAN Controller Address (page 362) = <33,48>. Each bit represent controller with the same CAN address as number of the bit. <ul style="list-style-type: none">➤ Log. 1 - controller with this CAN address is in the same group (is connected to the same bus).➤ Log. 0 - controller with this CAN address is NOT in the same group (is NOT connected to the same bus).			

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Reg64

Value group	Info	Related FW	1.1.0
Units	[-]		
Comm object	16689	Related applications	MCB
Description			
This value contains binary information about controllers connected via CAN2A (page 18) and/or CAN2B (page 18) with CAN Controller Address (page 362) = <49,64>. Each bit represent controller with the same CAN address as number of the bit. <ul style="list-style-type: none">➤ Log. 1 - controller with this CAN address is in the same group (is connected to the same bus).➤ Log. 0 - controller with this CAN address is NOT in the same group (is NOT connected to the same bus).			

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Gen Loaded 16

Value group	Info	Related FW	1.1.0
Units	[-]		
Comm object	10196	Related applications	MCB
Description			
This value contains binary information about controllers connected via CAN2A (page 18) and/or CAN2B (page 18) with CAN Controller Address (page 362) = <1,16>. Each bit represent controller with the same CAN address as number of the bit. <ul style="list-style-type: none">➤ Log. 1 - controller with this CAN address is currently loaded➤ Log. 0 - controller with this CAN address is currently not loaded			

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Gen Loaded 32

Value group	Info	Related FW	1.1.0
Units	[-]		
Comm object	10197	Related applications	MCB
Description			
This value contains binary information about controllers connected via CAN2A (page 18) and/or CAN2B (page 18) with CAN Controller Address (page 362) = <17,32>. Each bit represent controller with the same CAN address as number of the bit. <ul style="list-style-type: none">> Log. 1 - controller with this CAN address is currently loaded> Log. 0 - controller with this CAN address is currently not loaded			

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Gen Loaded 48

Value group	Info	Related FW	1.1.0
Units	[-]		
Comm object	16686	Related applications	MCB
Description			
This value contains binary information about controllers connected via CAN2A (page 18) and/or CAN2B (page 18) with CAN Controller Address (page 362) = <33,48>. Each bit represent controller with the same CAN address as number of the bit. <ul style="list-style-type: none">> Log. 1 - controller with this CAN address is currently loaded> Log. 0 - controller with this CAN address is currently not loaded			

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Gen Loaded 64

Value group	Info	Related FW	1.1.0
Units	[-]		
Comm object	16687	Related applications	MCB
Description			
This value contains binary information about controllers connected via CAN2A (page 18) and/or CAN2B (page 18) with CAN Controller Address (page 362) = <49,64>. Each bit represent controller with the same CAN address as number of the bit. <ul style="list-style-type: none">> Log. 1 - controller with this CAN address is currently loaded> Log. 0 - controller with this CAN address is currently not loaded			

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Group: Log Bout

Log Bout 1

Value group	Log Bout	Related FW	1.1.0
Units	[-]		
Comm object	9143	Related applications	MCB
Description			
State of binary outputs.			

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Log Bout 2

Value group	Log Bout	Related FW	1.1.0
Units	[-]		
Comm object	9144	Related applications	MCB
Description			
State of binary outputs.			

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Log Bout 3

Value group	Log Bout	Related FW	1.1.0
Units	[-]		
Comm object	9145	Related applications	MCB
Description			
State of binary outputs.			

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Log Bout 4

Value group	Log Bout	Related FW	1.1.0
Units	[-]		
Comm object	9146	Related applications	MCB
Description			
State of binary outputs.			

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Log Bout 5

Value group	Log Bout	Related FW	1.1.0
Units	[-]		
Comm object	9147	Related applications	MCB
Description			
State of binary outputs.			

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Log Bout 6

Value group	Log Bout	Related FW	1.1.0
Units	[-]		
Comm object	9148	Related applications	MCB
Description			
State of binary outputs.			

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Group: Ethernet

Subgroup: Common For All Interfaces

MAC Address

Value group	Ethernet	Related FW	1.1.0
Units	[-]		
Comm object	24333	Related applications	MCB
Description			
Current MAC address of the controller's ethernet interface.			

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Subgroup: Ethernet Port Status

ETH Port 3 Status

Value group	Ethernet	Related FW	1.1.0										
Units	[-]												
Comm object	24064	Related applications	MCB										
Description													
This value reflects what communication mode is used on the Ethernet Port 3.													
<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												
Note: Note: At one time the Half-Duplex can only send or receive the information whereas Full-Duplex can do both at once.													

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ETH Port 2 Status

Value group	Ethernet	Related FW	1.1.0
Units	[-]		
Comm object	24088	Related applications	MCB
Description			
This value reflects what communication mode is used on the Ethernet Port 2.			
Link Down	There is no connected cable to the Ethernet Port (socket) or the cable is broken.		
10- HD	10 Mbit Half-Duplex		
10- FD	10 Mbit Full-Duplex		
100- HD	100 Mbit Half-Duplex		
100- FD	100 Mbit Full-Duplex		
Note: Note: At one time the Half-Duplex can only send or receive the information whereas Full-Duplex can do both at once.			

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ETH Port 1 Status

Value group	Ethernet	Related FW	1.1.0
Units	[-]		
Comm object	24050	Related applications	MCB
Description			
This value reflects what communication mode is used on the Ethernet Port 1.			
Link Down	There is no connected cable to the Ethernet Port (socket) or the cable is broken.		
10- HD	10 Mbit Half-Duplex		
10- FD	10 Mbit Full-Duplex		
100- HD	100 Mbit Half-Duplex		
100- FD	100 Mbit Full-Duplex		
Note: Note: At one time the Half-Duplex can only send or receive the information whereas Full-Duplex can do both at once.			

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Subgroup: Trusted Interface

Current IP Address

Value group	Ethernet	Related FW	1.1.0
Units	[-]		
Comm object	24060	Related applications	MCB
Description			
Current IP address of the Ethernet 1 (page 18) interface.			

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Current Subnet Mask

Value group	Ethernet	Related FW	1.1.0
Units	[-]		
Comm object	24058	Related applications	MCB
Description			
Current subnet mask of the Ethernet 1 (page 18) interface.			

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Current Gateway

Value group	Ethernet	Related FW	1.1.0
Units	[-]		
Comm object	24056	Related applications	MCB
Description			
Current gateway address the Ethernet 1 (page 18) communication.			

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ETH Interface Status

Value group	Ethernet	Related FW	1.1.0
Units	[-]		
Comm object	24062	Related applications	MCB
Description			
Current status.of the Ethernet 1 (page 18) communication.			

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Subgroup: Untrusted Interface

Current IP Address

Value group	Ethernet	Related FW	1.1.0
Units	[-]		
Comm object	24184	Related applications	MCB
Description			
Current IP address of the Ethernet 2 (page 19) interface.			

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Current Subnet Mask

Value group	Ethernet	Related FW	1.1.0
Units	[-]		
Comm object	24183	Related applications	MCB
Description			
Current subnet mask of the Ethernet 2 (page 19) interface.			

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Current Gateway

Value group	Ethernet	Related FW	1.1.0
Units	[-]		
Comm object	24182	Related applications	MCB
Description			
Current IP gateway address of the Ethernet 2 (page 19) communications.			

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Primary DNS

Value group	Ethernet	Related FW	1.1.0
Units	[-]		
Comm object	24181	Related applications	MCB
Description			
Current domain name server of the Ethernet 2 (page 19) interface.			

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Secondary DNS

Value group	Ethernet	Related FW	1.1.0
Units	[-]		
Comm object	24100	Related applications	MCB
Description			
Backup domain name server of the Ethernet 2 (page 19) interface.			

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ETH Interface Status

Value group	Ethernet	Related FW	1.1.0
Units	[-]		
Comm object	24180	Related applications	MCB
Description			
Current status of the Ethernet 2 (page 19) communication.			

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AirGate Status

Value group	Ethernet	Related FW	1.1.0																		
Units	[-]																				
Comm object	24007	Related applications	MCB																		
Description																					
Diagnostic code for AirGate connection. Helps with troubleshooting.																					
IMPORTANT: If the AirGate key in the Access Administration is empty the controller will not connect to the AirGate despite the function is enabled. Access Administration is available in Tools of the IntelliConfig.																					
<table><tr><th>Code</th><th>Description</th></tr><tr><td>0</td><td>Not defined</td></tr><tr><td>1</td><td>Waiting to connect</td></tr><tr><td>2</td><td>Resolving</td></tr><tr><td>3</td><td>Connecting</td></tr><tr><td>4</td><td>Creating secure channel</td></tr><tr><td>5</td><td>Registrstion</td></tr><tr><td>6</td><td>Connected, inoperable</td></tr><tr><td>7</td><td>Connected, operable</td></tr></table>				Code	Description	0	Not defined	1	Waiting to connect	2	Resolving	3	Connecting	4	Creating secure channel	5	Registrstion	6	Connected, inoperable	7	Connected, operable
Code	Description																				
0	Not defined																				
1	Waiting to connect																				
2	Resolving																				
3	Connecting																				
4	Creating secure channel																				
5	Registrstion																				
6	Connected, inoperable																				
7	Connected, operable																				

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AirGate ID

Value group	Ethernet	Related FW	1.1.0
Units	[-]		
Comm object	24345	Related applications	MCB
Description			
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 Servicing Node

Value group	Info	Related FW	1.1.0
Units	[-]		
Comm object	24010	Related applications	MCB
Description			
This value displays the IP address to Servicing node to which is controller connected in order to use AirGate connection.			

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Last E-mail Result

Value group	Ethernet	Related FW	1.1.0																																																																
Units	[-]																																																																		
Comm object	24332	Related applications	MCB																																																																
Description																																																																			
Result of last email, which was sent by controller.																																																																			
<table><tr><th>Code</th><th>Description</th></tr><tr><td>0</td><td>Email was successfully sent.</td></tr><tr><td>1</td><td>SIMCom declined connection request.</td></tr><tr><td>2</td><td>It is not possible to establish connection with SMTP server.</td></tr><tr><td>3</td><td>SMTP server is not ready for communication.</td></tr><tr><td>4</td><td>Maximum transmitted data length not defined.</td></tr><tr><td>5</td><td>No response from SMTP server.</td></tr><tr><td>6</td><td>Command to SMTP server not sent.</td></tr><tr><td>7</td><td>Did not receive data from SMTP server.</td></tr><tr><td>8</td><td>HELO command was refused.</td></tr><tr><td>9</td><td>EHLO command was refused.</td></tr><tr><td>10</td><td>SMTP server does not support 8-bit encoding.</td></tr><tr><td>11</td><td>AUTH LOGIN command was refused.</td></tr><tr><td>12</td><td>Wrong user name.</td></tr><tr><td>13</td><td>Wrong password.</td></tr><tr><td>14</td><td>MAIL FROM command was refused.</td></tr><tr><td>15</td><td>RCPT TO command was refused.</td></tr><tr><td>16</td><td>DATA command was refused.</td></tr><tr><td>17</td><td>Sending of email failed.</td></tr><tr><td>18</td><td>SMTP server rejected email data.</td></tr><tr><td>19</td><td>SMTP server rejected email data.</td></tr><tr><td>20</td><td>QUIT command was refused.</td></tr><tr><td>21</td><td>There is no valid server IP address.</td></tr><tr><td>22</td><td>Process of sending email aborted.</td></tr><tr><td>23</td><td>Closing connection error.</td></tr><tr><td>24</td><td>Failed to accept server response after connection is established.</td></tr><tr><td>25</td><td>It is impossible to create data for command DATA.</td></tr><tr><td>26</td><td>It is impossible to read data for command DATA.</td></tr><tr><td>27</td><td>Email address can't be read.</td></tr><tr><td>28</td><td>Error during encoding process.</td></tr><tr><td>29</td><td>Error during HMAC MD5 encoding process.</td></tr><tr><td>30</td><td>There is no attempt for sending email yet.</td></tr></table>				Code	Description	0	Email was successfully sent.	1	SIMCom declined connection request.	2	It is not possible to establish connection with SMTP server.	3	SMTP server is not ready for communication.	4	Maximum transmitted data length not defined.	5	No response from SMTP server.	6	Command to SMTP server not sent.	7	Did not receive data from SMTP server.	8	HELO command was refused.	9	EHLO command was refused.	10	SMTP server does not support 8-bit encoding.	11	AUTH LOGIN command was refused.	12	Wrong user name.	13	Wrong password.	14	MAIL FROM command was refused.	15	RCPT TO command was refused.	16	DATA command was refused.	17	Sending of email failed.	18	SMTP server rejected email data.	19	SMTP server rejected email data.	20	QUIT command was refused.	21	There is no valid server IP address.	22	Process of sending email aborted.	23	Closing connection error.	24	Failed to accept server response after connection is established.	25	It is impossible to create data for command DATA.	26	It is impossible to read data for command DATA.	27	Email address can't be read.	28	Error during encoding process.	29	Error during HMAC MD5 encoding process.	30	There is no attempt for sending email yet.
Code	Description																																																																		
0	Email was successfully sent.																																																																		
1	SIMCom declined connection request.																																																																		
2	It is not possible to establish connection with SMTP server.																																																																		
3	SMTP server is not ready for communication.																																																																		
4	Maximum transmitted data length not defined.																																																																		
5	No response from SMTP server.																																																																		
6	Command to SMTP server not sent.																																																																		
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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.																																																																		
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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.																																																																		
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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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Subgroup: Modbus Interface

Current IP Address

Value group	ETH Interface 3 - Modbus	Related FW	1.1.0
Units	[-]		
Comm object	24046	Related applications	MCB
Description			
Current IP address of the Ethernet 3 (page 19) interface.			

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Current Subnet Mask

Value group	ETH Interface 3 - Modbus	Related FW	1.1.0
Units	[-]		
Comm object	24044	Related applications	MCB
Description			
Current subnet mask of the Ethernet 3 (page 19) interface.			

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Current Gateway

Value group	ETH Interface 3 - Modbus	Related FW	1.1.0
Units	[-]		
Comm object	24042	Related applications	MCB
Description			
Current IP gateway address of the Ethernet 3 (page 19) communications.			

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Primary DNS

Value group	ETH Interface 3 - Modbus	Related FW	1.1.0
Units	[-]		
Comm object	24039	Related applications	MCB
Description			
Current domain name server of the Ethernet 3 (page 19) interface.			

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Secondary DNS

Value group	ETH Interface 3 - Modbus	Related FW	1.1.0
Units	[-]		
Comm object	24037	Related applications	MCB
Description			
Backup domain name server of the Ethernet 3 (page 19) interface.			

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ETH Interface Status

Value group	ETH Interface 3 - Modbus	Related FW	1.1.0
Units	[-]		
Comm object	24048	Related applications	MCB
Description			
Current status of the Ethernet 3 (page 19) communication.			

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Group: Remote Control

RemoteControl2B 1

Value group	Remote Control	Related FW	1.1.0
Units	-		
Comm object	16671	Related applications	MCB
Description			
This value contains user data written over Modbus-RTU, Modbus/TCP (page 233). Data type of this value is Int16.			

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RemoteControl2B 2

Value group	Remote Control	Related FW	1.1.0
Units	-		
Comm object	16672	Related applications	MCB
Description			
This value contains user data written over Modbus-RTU, Modbus/TCP (page 233) . Data type of this value is Int16.			

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RemoteControl2B 3

Value group	Remote Control	Related FW	1.1.0
Units	-		
Comm object	16673	Related applications	MCB
Description			
This value contains user data written over Modbus-RTU, Modbus/TCP (page 233) . Data type of this value is Int16.			

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RemoteControl2B 4

Value group	Remote Control	Related FW	1.1.0
Units	-		
Comm object	16674	Related applications	MCB
Description			
This value contains user data written over Modbus-RTU, Modbus/TCP (page 233) . Data type of this value is Int16.			

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RemoteControl2B 5

Value group	Remote Control	Related FW	1.1.0
Units	-		
Comm object	16675	Related applications	MCB
Description			
This value contains user data written over Modbus-RTU, Modbus/TCP (page 233) . Data type of this value is Int16.			

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RemoteControl2B 6

Value group	Remote Control	Related FW	1.1.0
Units	-		
Comm object	16676	Related applications	MCB
Description			
This value contains user data written over Modbus-RTU, Modbus/TCP (page 233) . Data type of this value is Int16.			

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RemoteControl2B 7

Value group	Remote Control	Related FW	1.1.0
Units	-		
Comm object	16677	Related applications	MCB
Description			
This value contains user data written over Modbus-RTU, Modbus/TCP (page 233) . Data type of this value is Int16.			

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RemoteControl2B 8

Value group	Remote Control	Related FW	1.1.0
Units	-		
Comm object	16678	Related applications	MCB
Description			
This value contains user data written over Modbus-RTU, Modbus/TCP (page 233) . Data type of this value is Int16.			

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RemoteControl4B 1

Value group	Remote Control	Related FW	1.1.0
Units	-		
Comm object	16679	Related applications	MCB
Description			
This value contains user data written over Modbus-RTU, Modbus/TCP (page 233) . Data type of this value is Int32.			

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RemoteControl4B 2

Value group	Remote Control	Related FW	1.1.0
Units	-		
Comm object	16680	Related applications	MCB
Description			
This value contains user data written over Modbus-RTU, Modbus/TCP (page 233) . Data type of this value is Int32.			

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RemoteControl4B 3

Value group	Remote Control	Related FW	1.1.0
Units	-		
Comm object	16681	Related applications	MCB
Description			
This value contains user data written over Modbus-RTU, Modbus/TCP (page 233) . Data type of this value is Int32.			

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RemoteControl4B 4

Value group	Remote Control	Related FW	1.1.0
Units	-		
Comm object	16682	Related applications	MCB
Description			
This value contains user data written over Modbus-RTU, Modbus/TCP (page 233) . Data type of this value is Int32.			

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RemoteControlBin

Value group	Remote Control	Related FW	1.1.0
Units	-		
Comm object	16683	Related applications	MCB
Description			
This value contains user data written over Modbus-RTU, Modbus/TCP (page 233) . Data type of this value is Binary16.			

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Group: User Buttons

User Buttons

Value group	User Buttons	Related FW	1.1.0
Units	[-]		
Comm object	20743	Related applications	MCB
Description			
State of User Buttons (page 173) .			
1. User Button 1	11. User Button 11	21. User Button 21	31. User Button 31
2. User Button 2	12. User Button 12	22. User Button 22	32. User Button 32
3. User Button 3	13. User Button 13	23. User Button 23	
4. User Button 4	14. User Button 14	24. User Button 24	
5. User Button 5	15. User Button 15	25. User Button 25	
6. User Button 6	16. User Button 16	26. User Button 26	
7. User Button 7	17. User Button 17	27. User Button 27	
8. User Button 8	18. User Button 18	28. User Button 28	
9. User Button 9	19. User Button 19	29. User Button 29	
10. User Button 10	20. User Button 20	30. User Button 30	

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Group: ECU

ECU Frequency Select

Value group	ECU	Related FW	1.1.0
Units	-		
Comm object	12926	Related applications	MCB
Description			
Shows selected frequency of ECU. The value is calculated from setpoint Nominal Frequency (page 270)			
<div><div>➤</div>If is Nominal Frequency (page 270) in range from 45 Hz to 54 Hz, is considered as 50 Hz application. The value is set to 0.</div>			
<div><div>➤</div>If is Nominal Frequency (page 270) in range from 55 Hz to 65 Hz, is considered as 60 Hz application. The value is set to 1.</div>			

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Group: PLC

PLC-AOUT 1

Value group	PLC	Related FW	1.1.0
Units	[-]		
Comm object	21248	Related applications	MCB
Description			
State of analog output of PLC.			

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PLC-AOUT 2

Value group	PLC	Related FW	1.1.0
Units	[-]		
Comm object	21249	Related applications	MCB
Description			
State of analog output of PLC.			

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PLC-AOUT 3

Value group	PLC	Related FW	1.1.0
Units	[-]		
Comm object	21250	Related applications	MCB
Description			
State of analog output of PLC.			

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PLC-AOUT 4

Value group	PLC	Related FW	1.1.0
Units	[-]		
Comm object	21251	Related applications	MCB
Description			
State of analog output of PLC.			

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PLC-AOUT 5

Value group	PLC	Related FW	1.1.0
Units	[-]		
Comm object	21252	Related applications	MCB
Description			
State of analog output of PLC.			

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PLC-AOUT 6

Value group	PLC	Related FW	1.1.0
Units	[-]		
Comm object	21253	Related applications	MCB
Description			
State of analog output of PLC.			

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PLC-AOUT 7

Value group	PLC	Related FW	1.1.0
Units	[-]		
Comm object	21254	Related applications	MCB
Description			
State of analog output of PLC.			

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PLC-AOUT 8

Value group	PLC	Related FW	1.1.0
Units	[-]		
Comm object	21255	Related applications	MCB
Description			
State of analog output of PLC.			

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PLC-AOUT 9

Value group	PLC	Related FW	1.1.0
Units	[-]		
Comm object	21256	Related applications	MCB
Description			
State of analog output of PLC.			

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PLC-AOUT 10

Value group	PLC	Related FW	1.1.0
Units	[-]		
Comm object	21257	Related applications	MCB
Description			
State of analog output of PLC.			

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PLC-AOUT 11

Value group	PLC	Related FW	1.1.0
Units	[-]		
Comm object	21258	Related applications	MCB
Description			
State of analog output of PLC.			

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PLC-AOUT 12

Value group	PLC	Related FW	1.1.0
Units	[-]		
Comm object	21259	Related applications	MCB
Description			
State of analog output of PLC.			

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PLC-AOUT 13

Value group	PLC	Related FW	1.1.0
Units	[-]		
Comm object	21260	Related applications	MCB
Description			
State of analog output of PLC.			

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PLC-AOUT 14

Value group	PLC	Related FW	1.1.0
Units	[-]		
Comm object	21261	Related applications	MCB
Description			
State of analog output of PLC.			

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PLC-AOUT 15

Value group	PLC	Related FW	1.1.0
Units	[-]		
Comm object	21262	Related applications	MCB
Description			
State of analog output of PLC.			

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PLC-AOUT 16

Value group	PLC	Related FW	1.1.0
Units	[-]		
Comm object	21263	Related applications	MCB
Description			
State of analog output of PLC.			

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PLC-AOUT 17

Value group	PLC	Related FW	1.1.0
Units	[-]		
Comm object	21264	Related applications	MCB
Description			
State of analog output of PLC.			

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PLC-AOUT 18

Value group	PLC	Related FW	1.1.0
Units	[-]		
Comm object	21265	Related applications	MCB
Description			
State of analog output of PLC.			

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PLC-AOUT 19

Value group	PLC	Related FW	1.1.0
Units	[-]		
Comm object	21266	Related applications	MCB
Description			
State of analog output of PLC.			

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PLC-AOUT 20

Value group	PLC	Related FW	1.1.0
Units	[-]		
Comm object	21267	Related applications	MCB
Description			
State of analog output of PLC.			

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PLC-AOUT 21

Value group	PLC	Related FW	1.1.0
Units	[-]		
Comm object	21268	Related applications	MCB
Description			
State of analog output of PLC.			

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PLC-AOUT 22

Value group	PLC	Related FW	1.1.0
Units	[-]		
Comm object	21269	Related applications	MCB
Description			
State of analog output of PLC.			

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PLC-AOUT 23

Value group	PLC	Related FW	1.1.0
Units	[-]		
Comm object	21270	Related applications	MCB
Description			
State of analog output of PLC.			

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PLC-AOUT 24

Value group	PLC	Related FW	1.1.0
Units	[-]		
Comm object	21271	Related applications	MCB
Description			
State of analog output of PLC.			

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PLC-AOUT 25

Value group	PLC	Related FW	1.1.0
Units	[-]		
Comm object	21272	Related applications	MCB
Description			
State of analog output of PLC.			

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PLC-AOUT 26

Value group	PLC	Related FW	1.1.0
Units	[-]		
Comm object	21273	Related applications	MCB
Description			
State of analog output of PLC.			

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PLC-AOUT 27

Value group	PLC	Related FW	1.1.0
Units	[-]		
Comm object	21274	Related applications	MCB
Description			
State of analog output of PLC.			

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PLC-AOUT 28

Value group	PLC	Related FW	1.1.0
Units	[-]		
Comm object	21275	Related applications	MCB
Description			
State of analog output of PLC.			

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PLC-AOUT 29

Value group	PLC	Related FW	1.1.0
Units	[-]		
Comm object	21276	Related applications	MCB
Description			
State of analog output of PLC.			

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PLC-AOUT 30

Value group	PLC	Related FW	1.1.0
Units	[-]		
Comm object	21277	Related applications	MCB
Description			
State of analog output of PLC.			

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PLC-AOUT 31

Value group	PLC	Related FW	1.1.0
Units	[-]		
Comm object	21278	Related applications	MCB
Description			
State of analog output of PLC.			

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PLC-AOUT 32

Value group	PLC	Related FW	1.1.0
Units	[-]		
Comm object	21279	Related applications	MCB
Description			
State of analog output of PLC.			

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PLC-AOUT 33

Value group	PLC	Related FW	1.1.0
Units	[-]		
Comm object	21280	Related applications	MCB
Description			
State of analog output of PLC.			

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PLC-AOUT 34

Value group	PLC	Related FW	1.1.0
Units	[-]		
Comm object	21281	Related applications	MCB
Description			
State of analog output of PLC.			

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PLC-AOUT 35

Value group	PLC	Related FW	1.1.0
Units	[-]		
Comm object	21282	Related applications	MCB
Description			
State of analog output of PLC.			

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PLC-AOUT 36

Value group	PLC	Related FW	1.1.0
Units	[-]		
Comm object	21283	Related applications	MCB
Description			
State of analog output of PLC.			

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PLC-AOUT 37

Value group	PLC	Related FW	1.1.0
Units	[-]		
Comm object	21284	Related applications	MCB
Description			
State of analog output of PLC.			

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PLC-AOUT 38

Value group	PLC	Related FW	1.1.0
Units	[-]		
Comm object	21285	Related applications	MCB
Description			
State of analog output of PLC.			

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PLC-AOUT 39

Value group	PLC	Related FW	1.1.0
Units	[-]		
Comm object	21286	Related applications	MCB
Description			
State of analog output of PLC.			

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PLC-AOUT 4

Value group	PLC	Related FW	1.1.0
Units	[-]		
Comm object	21287	Related applications	MCB
Description			
State of analog output of PLC.			

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PLC-AOUT 41

Value group	PLC	Related FW	1.1.0
Units	[-]		
Comm object	21288	Related applications	MCB
Description			
State of analog output of PLC.			

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PLC-AOUT 42

Value group	PLC	Related FW	1.1.0
Units	[-]		
Comm object	21289	Related applications	MCB
Description			
State of analog output of PLC.			

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PLC-AOUT 43

Value group	PLC	Related FW	1.1.0
Units	[-]		
Comm object	21290	Related applications	MCB
Description			
State of analog output of PLC.			

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PLC-AOUT 44

Value group	PLC	Related FW	1.1.0
Units	[-]		
Comm object	21291	Related applications	MCB
Description			
State of analog output of PLC.			

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PLC-AOUT 45

Value group	PLC	Related FW	1.1.0
Units	[-]		
Comm object	21292	Related applications	MCB
Description			
State of analog output of PLC.			

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PLC-AOUT 46

Value group	PLC	Related FW	1.1.0
Units	[-]		
Comm object	21293	Related applications	MCB
Description			
State of analog output of PLC.			

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PLC-AOUT 47

Value group	PLC	Related FW	1.1.0
Units	[-]		
Comm object	21294	Related applications	MCB
Description			
State of analog output of PLC.			

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PLC-AOUT 48

Value group	PLC	Related FW	1.1.0
Units	[-]		
Comm object	21295	Related applications	MCB
Description			
State of analog output of PLC.			

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PLC-AOUT 49

Value group	PLC	Related FW	1.1.0
Units	[-]		
Comm object	21296	Related applications	MCB
Description			
State of analog output of PLC.			

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PLC-AOUT 50

Value group	PLC	Related FW	1.1.0
Units	[-]		
Comm object	21297	Related applications	MCB
Description			
State of analog output of PLC.			

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PLC-AOUT 51

Value group	PLC	Related FW	1.1.0
Units	[-]		
Comm object	21298	Related applications	MCB
Description			
State of analog output of PLC.			

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PLC-AOUT 52

Value group	PLC	Related FW	1.1.0
Units	[-]		
Comm object	21299	Related applications	MCB
Description			
State of analog output of PLC.			

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PLC-AOUT 53

Value group	PLC	Related FW	1.1.0
Units	[-]		
Comm object	21300	Related applications	MCB
Description			
State of analog output of PLC.			

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PLC-AOUT 54

Value group	PLC	Related FW	1.1.0
Units	[-]		
Comm object	21301	Related applications	MCB
Description			
State of analog output of PLC.			

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PLC-AOUT 55

Value group	PLC	Related FW	1.1.0
Units	[-]		
Comm object	21302	Related applications	MCB
Description			
State of analog output of PLC.			

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PLC-AOUT 56

Value group	PLC	Related FW	1.1.0
Units	[-]		
Comm object	21303	Related applications	MCB
Description			
State of analog output of PLC.			

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PLC-AOUT 57

Value group	PLC	Related FW	1.1.0
Units	[-]		
Comm object	21304	Related applications	MCB
Description			
State of analog output of PLC.			

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PLC-AOUT 58

Value group	PLC	Related FW	1.1.0
Units	[-]		
Comm object	21305	Related applications	MCB
Description			
State of analog output of PLC.			

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PLC-AOUT 59

Value group	PLC	Related FW	1.1.0
Units	[-]		
Comm object	21306	Related applications	MCB
Description			
State of analog output of PLC.			

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PLC-AOUT 60

Value group	PLC	Related FW	1.1.0
Units	[-]		
Comm object	21307	Related applications	MCB
Description			
State of analog output of PLC.			

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PLC-AOUT 61

Value group	PLC	Related FW	1.1.0
Units	[-]		
Comm object	21308	Related applications	MCB
Description			
State of analog output of PLC.			

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PLC-AOUT 62

Value group	PLC	Related FW	1.1.0
Units	[-]		
Comm object	21309	Related applications	MCB
Description			
State of analog output of PLC.			

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PLC-AOUT 63

Value group	PLC	Related FW	1.1.0
Units	[-]		
Comm object	21310	Related applications	MCB
Description			
State of analog output of PLC.			

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PLC-AOUT 64

Value group	PLC	Related FW	1.1.0
Units	[-]		
Comm object	21311	Related applications	MCB
Description			
State of analog output of PLC.			

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PLC-BOUT 1

Value group	PLC	Related FW	1.1.0
Units	[-]		
Comm object	10424	Related applications	MCB
Description			
State of binary outputs of PLC.			

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PLC-BOUT 2

Value group	PLC	Related FW	1.1.0
Units	[-]		
Comm object	10425	Related applications	MCB
Description			
State of binary outputs of PLC.			

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PLC-BOUT 3

Value group	PLC	Related FW	1.1.0
Units	[-]		
Comm object	10426	Related applications	MCB
Description			
State of binary outputs of PLC.			

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PLC-BOUT 4

Value group	PLC	Related FW	1.1.0
Units	[-]		
Comm object	10427	Related applications	MCB
Description			
State of binary outputs of PLC.			

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PLC-BOUT 5

Value group	PLC	Related FW	1.1.0
Units	[-]		
Comm object	10428	Related applications	MCB
Description			
State of binary outputs of PLC.			

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PLC-BOUT 6

Value group	PLC	Related FW	1.1.0
Units	[-]		
Comm object	10429	Related applications	MCB
Description			
State of binary outputs of PLC.			

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PLC-BOUT 7

Value group	PLC	Related FW	1.1.0
Units	[-]		
Comm object	10430	Related applications	MCB
Description			
State of binary outputs of PLC.			

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PLC-BOUT 8

Value group	PLC	Related FW	1.1.0
Units	[-]		
Comm object	10431	Related applications	MCB
Description			
State of binary outputs of PLC.			

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PLC-BOUT 9

Value group	PLC	Related FW	1.1.0
Units	[-]		
Comm object	10432	Related applications	MCB
Description			
State of binary outputs of PLC.			

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PLC-BOUT 10

Value group	PLC	Related FW	1.1.0
Units	[-]		
Comm object	10433	Related applications	MCB
Description			
State of binary outputs of PLC.			

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PLC-BOUT 11

Value group	PLC	Related FW	1.1.0
Units	[-]		
Comm object	10434	Related applications	MCB
Description			
State of binary outputs of PLC.			

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PLC-BOUT 12

Value group	PLC	Related FW	1.1.0
Units	[-]		
Comm object	10435	Related applications	MCB
Description			
State of binary outputs of PLC.			

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PLC-BOUT 13

Value group	PLC	Related FW	1.1.0
Units	[-]		
Comm object	10436	Related applications	MCB
Description			
State of binary outputs of PLC.			

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PLC-BOUT 14

Value group	PLC	Related FW	1.1.0
Units	[-]		
Comm object	10437	Related applications	MCB
Description			
State of binary outputs of PLC.			

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PLC-BOUT 15

Value group	PLC	Related FW	1.1.0
Units	[-]		
Comm object	10438	Related applications	MCB
Description			
State of binary outputs of PLC.			

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PLC-BOUT 16

Value group	PLC	Related FW	1.1.0
Units	[-]		
Comm object	10439	Related applications	MCB
Description			
State of binary outputs of PLC.			

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PLC-BOUT 17

Value group	PLC	Related FW	1.1.0
Units	[-]		
Comm object	14570	Related applications	MCB
Description			
State of binary outputs of PLC.			

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PLC-BOUT 18

Value group	PLC	Related FW	1.1.0
Units	[-]		
Comm object	14571	Related applications	MCB
Description			
State of binary outputs of PLC.			

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PLC-BOUT 19

Value group	PLC	Related FW	1.1.0
Units	[-]		
Comm object	14572	Related applications	MCB
Description			
State of binary outputs of PLC.			

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PLC-BOUT 20

Value group	PLC	Related FW	1.1.0
Units	[-]		
Comm object	14573	Related applications	MCB
Description			
State of binary outputs of PLC.			

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PLC-BOUT 21

Value group	PLC	Related FW	1.1.0
Units	[-]		
Comm object	14574	Related applications	MCB
Description			
State of binary outputs of PLC.			

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PLC-BOUT 22

Value group	PLC	Related FW	1.1.0
Units	[-]		
Comm object	14575	Related applications	MCB
Description			
State of binary outputs of PLC.			

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PLC-BOUT 23

Value group	PLC	Related FW	1.1.0
Units	[-]		
Comm object	14576	Related applications	MCB
Description			
State of binary outputs of PLC.			

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PLC-BOUT 24

Value group	PLC	Related FW	1.1.0
Units	[-]		
Comm object	14577	Related applications	MCB
Description			
State of binary outputs of PLC.			

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PLC-BOUT 25

Value group	PLC	Related FW	1.1.0
Units	[-]		
Comm object	14578	Related applications	MCB
Description			
State of binary outputs of PLC.			

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PLC-BOUT 26

Value group	PLC	Related FW	1.1.0
Units	[-]		
Comm object	14579	Related applications	MCB
Description			
State of binary outputs of PLC.			

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PLC-BOUT 27

Value group	PLC	Related FW	1.1.0
Units	[-]		
Comm object	14580	Related applications	MCB
Description			
State of binary outputs of PLC.			

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PLC-BOUT 28

Value group	PLC	Related FW	1.1.0
Units	[-]		
Comm object	14581	Related applications	MCB
Description			
State of binary outputs of PLC.			

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PLC-BOUT 29

Value group	PLC	Related FW	1.1.0
Units	[-]		
Comm object	14582	Related applications	MCB
Description			
State of binary outputs of PLC.			

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PLC-BOUT 30

Value group	PLC	Related FW	1.1.0
Units	[-]		
Comm object	14583	Related applications	MCB
Description			
State of binary outputs of PLC.			

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PLC-BOUT 31

Value group	PLC	Related FW	1.1.0
Units	[-]		
Comm object	14584	Related applications	MCB
Description			
State of binary outputs of PLC.			

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PLC-BOUT 32

Value group	PLC	Related FW	1.1.0
Units	[-]		
Comm object	14585	Related applications	MCB
Description			
State of binary outputs of PLC.			

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PLC Resource 1

Value group	PLC	Related FW	1.1.0
Units	[-]		
Comm object	21216	Related applications	MCB
Description			
Internal value of PLC block.			

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PLC Resource 2

Value group	PLC	Related FW	1.1.0
Units	[-]		
Comm object	21217	Related applications	MCB
Description			
Internal value of PLC block.			

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PLC Resource 3

Value group	PLC	Related FW	1.1.0
Units	[-]		
Comm object	21218	Related applications	MCB
Description			
Internal value of PLC block.			

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PLC Resource 4

Value group	PLC	Related FW	1.1.0
Units	[-]		
Comm object	21219	Related applications	MCB
Description			
Internal value of PLC block.			

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PLC Resource 5

Value group	PLC	Related FW	1.1.0
Units	[-]		
Comm object	21220	Related applications	MCB
Description			
Internal value of PLC block.			

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PLC Resource 6

Value group	PLC	Related FW	1.1.0
Units	[-]		
Comm object	21221	Related applications	MCB
Description			
Internal value of PLC block.			

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PLC Resource 7

Value group	PLC	Related FW	1.1.0
Units	[-]		
Comm object	21222	Related applications	MCB
Description			
Internal value of PLC block.			

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PLC Resource 8

Value group	PLC	Related FW	1.1.0
Units	[-]		
Comm object	21223	Related applications	MCB
Description			
Internal value of PLC block.			

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PLC Resource 9

Value group	PLC	Related FW	1.1.0
Units	[-]		
Comm object	21224	Related applications	MCB
Description			
Internal value of PLC block.			

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PLC Resource 10

Value group	PLC	Related FW	1.1.0
Units	[-]		
Comm object	21225	Related applications	MCB
Description			
Internal value of PLC block.			

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PLC Resource 11

Value group	PLC	Related FW	1.1.0
Units	[-]		
Comm object	21226	Related applications	MCB
Description			
Internal value of PLC block.			

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PLC Resource 12

Value group	PLC	Related FW	1.1.0
Units	[-]		
Comm object	21227	Related applications	MCB
Description			
Internal value of PLC block.			

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PLC Resource 13

Value group	PLC	Related FW	1.1.0
Units	[-]		
Comm object	21228	Related applications	MCB
Description			
Internal value of PLC block.			

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PLC Resource 14

Value group	PLC	Related FW	1.1.0
Units	[-]		
Comm object	21229	Related applications	MCB
Description			
Internal value of PLC block.			

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PLC Resource 15

Value group	PLC	Related FW	1.1.0
Units	[-]		
Comm object	21230	Related applications	MCB
Description			
Internal value of PLC block.			

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PLC Resource 16

Value group	PLC	Related FW	1.1.0
Units	[-]		
Comm object	21231	Related applications	MCB
Description			
Internal value of PLC block.			

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Group: PLC

PLC-AOUT 1

Value group	PLC	Related FW	1.1.0
Units	[-]		
Comm object	21248	Related applications	MCB
Description			
State of analog output of PLC.			

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PLC-AOUT 2

Value group	PLC	Related FW	1.1.0
Units	[-]		
Comm object	21249	Related applications	MCB
Description			
State of analog output of PLC.			

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PLC-AOUT 3

Value group	PLC	Related FW	1.1.0
Units	[-]		
Comm object	21250	Related applications	MCB
Description			
State of analog output of PLC.			

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PLC-AOUT 4

Value group	PLC	Related FW	1.1.0
Units	[-]		
Comm object	21251	Related applications	MCB
Description			
State of analog output of PLC.			

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PLC-AOUT 5

Value group	PLC	Related FW	1.1.0
Units	[-]		
Comm object	21252	Related applications	MCB
Description			
State of analog output of PLC.			

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PLC-AOUT 6

Value group	PLC	Related FW	1.1.0
Units	[-]		
Comm object	21253	Related applications	MCB
Description			
State of analog output of PLC.			

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PLC-AOUT 7

Value group	PLC	Related FW	1.1.0
Units	[-]		
Comm object	21254	Related applications	MCB
Description			
State of analog output of PLC.			

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PLC-AOUT 8

Value group	PLC	Related FW	1.1.0
Units	[-]		
Comm object	21255	Related applications	MCB
Description			
State of analog output of PLC.			

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PLC-AOUT 9

Value group	PLC	Related FW	1.1.0
Units	[-]		
Comm object	21256	Related applications	MCB
Description			
State of analog output of PLC.			

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PLC-AOUT 10

Value group	PLC	Related FW	1.1.0
Units	[-]		
Comm object	21257	Related applications	MCB
Description			
State of analog output of PLC.			

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PLC-AOUT 11

Value group	PLC	Related FW	1.1.0
Units	[-]		
Comm object	21258	Related applications	MCB
Description			
State of analog output of PLC.			

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PLC-AOUT 12

Value group	PLC	Related FW	1.1.0
Units	[-]		
Comm object	21259	Related applications	MCB
Description			
State of analog output of PLC.			

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PLC-AOUT 13

Value group	PLC	Related FW	1.1.0
Units	[-]		
Comm object	21260	Related applications	MCB
Description			
State of analog output of PLC.			

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PLC-AOUT 14

Value group	PLC	Related FW	1.1.0
Units	[-]		
Comm object	21261	Related applications	MCB
Description			
State of analog output of PLC.			

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PLC-AOUT 15

Value group	PLC	Related FW	1.1.0
Units	[-]		
Comm object	21262	Related applications	MCB
Description			
State of analog output of PLC.			

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PLC-AOUT 16

Value group	PLC	Related FW	1.1.0
Units	[-]		
Comm object	21263	Related applications	MCB
Description			
State of analog output of PLC.			

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PLC-AOUT 17

Value group	PLC	Related FW	1.1.0
Units	[-]		
Comm object	21264	Related applications	MCB
Description			
State of analog output of PLC.			

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PLC-AOUT 18

Value group	PLC	Related FW	1.1.0
Units	[-]		
Comm object	21265	Related applications	MCB
Description			
State of analog output of PLC.			

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PLC-AOUT 19

Value group	PLC	Related FW	1.1.0
Units	[-]		
Comm object	21266	Related applications	MCB
Description			
State of analog output of PLC.			

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PLC-AOUT 20

Value group	PLC	Related FW	1.1.0
Units	[-]		
Comm object	21267	Related applications	MCB
Description			
State of analog output of PLC.			

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PLC-AOUT 21

Value group	PLC	Related FW	1.1.0
Units	[-]		
Comm object	21268	Related applications	MCB
Description			
State of analog output of PLC.			

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PLC-AOUT 22

Value group	PLC	Related FW	1.1.0
Units	[-]		
Comm object	21269	Related applications	MCB
Description			
State of analog output of PLC.			

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PLC-AOUT 23

Value group	PLC	Related FW	1.1.0
Units	[-]		
Comm object	21270	Related applications	MCB
Description			
State of analog output of PLC.			

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PLC-AOUT 24

Value group	PLC	Related FW	1.1.0
Units	[-]		
Comm object	21271	Related applications	MCB
Description			
State of analog output of PLC.			

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PLC-AOUT 25

Value group	PLC	Related FW	1.1.0
Units	[-]		
Comm object	21272	Related applications	MCB
Description			
State of analog output of PLC.			

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PLC-AOUT 26

Value group	PLC	Related FW	1.1.0
Units	[-]		
Comm object	21273	Related applications	MCB
Description			
State of analog output of PLC.			

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PLC-AOUT 27

Value group	PLC	Related FW	1.1.0
Units	[-]		
Comm object	21274	Related applications	MCB
Description			
State of analog output of PLC.			

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PLC-AOUT 28

Value group	PLC	Related FW	1.1.0
Units	[-]		
Comm object	21275	Related applications	MCB
Description			
State of analog output of PLC.			

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PLC-AOUT 29

Value group	PLC	Related FW	1.1.0
Units	[-]		
Comm object	21276	Related applications	MCB
Description			
State of analog output of PLC.			

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PLC-AOUT 30

Value group	PLC	Related FW	1.1.0
Units	[-]		
Comm object	21277	Related applications	MCB
Description			
State of analog output of PLC.			

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PLC-AOUT 31

Value group	PLC	Related FW	1.1.0
Units	[-]		
Comm object	21278	Related applications	MCB
Description			
State of analog output of PLC.			

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PLC-AOUT 32

Value group	PLC	Related FW	1.1.0
Units	[-]		
Comm object	21279	Related applications	MCB
Description			
State of analog output of PLC.			

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PLC-AOUT 33

Value group	PLC	Related FW	1.1.0
Units	[-]		
Comm object	21280	Related applications	MCB
Description			
State of analog output of PLC.			

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PLC-AOUT 34

Value group	PLC	Related FW	1.1.0
Units	[-]		
Comm object	21281	Related applications	MCB
Description			
State of analog output of PLC.			

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PLC-AOUT 35

Value group	PLC	Related FW	1.1.0
Units	[-]		
Comm object	21282	Related applications	MCB
Description			
State of analog output of PLC.			

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PLC-AOUT 36

Value group	PLC	Related FW	1.1.0
Units	[-]		
Comm object	21283	Related applications	MCB
Description			
State of analog output of PLC.			

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PLC-AOUT 37

Value group	PLC	Related FW	1.1.0
Units	[-]		
Comm object	21284	Related applications	MCB
Description			
State of analog output of PLC.			

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PLC-AOUT 38

Value group	PLC	Related FW	1.1.0
Units	[-]		
Comm object	21285	Related applications	MCB
Description			
State of analog output of PLC.			

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PLC-AOUT 39

Value group	PLC	Related FW	1.1.0
Units	[-]		
Comm object	21286	Related applications	MCB
Description			
State of analog output of PLC.			

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PLC-AOUT 4

Value group	PLC	Related FW	1.1.0
Units	[-]		
Comm object	21287	Related applications	MCB
Description			
State of analog output of PLC.			

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PLC-AOUT 41

Value group	PLC	Related FW	1.1.0
Units	[-]		
Comm object	21288	Related applications	MCB
Description			
State of analog output of PLC.			

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PLC-AOUT 42

Value group	PLC	Related FW	1.1.0
Units	[-]		
Comm object	21289	Related applications	MCB
Description			
State of analog output of PLC.			

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PLC-AOUT 43

Value group	PLC	Related FW	1.1.0
Units	[-]		
Comm object	21290	Related applications	MCB
Description			
State of analog output of PLC.			

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PLC-AOUT 44

Value group	PLC	Related FW	1.1.0
Units	[-]		
Comm object	21291	Related applications	MCB
Description			
State of analog output of PLC.			

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PLC-AOUT 45

Value group	PLC	Related FW	1.1.0
Units	[-]		
Comm object	21292	Related applications	MCB
Description			
State of analog output of PLC.			

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PLC-AOUT 46

Value group	PLC	Related FW	1.1.0
Units	[-]		
Comm object	21293	Related applications	MCB
Description			
State of analog output of PLC.			

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PLC-AOUT 47

Value group	PLC	Related FW	1.1.0
Units	[-]		
Comm object	21294	Related applications	MCB
Description			
State of analog output of PLC.			

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PLC-AOUT 48

Value group	PLC	Related FW	1.1.0
Units	[-]		
Comm object	21295	Related applications	MCB
Description			
State of analog output of PLC.			

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PLC-AOUT 49

Value group	PLC	Related FW	1.1.0
Units	[-]		
Comm object	21296	Related applications	MCB
Description			
State of analog output of PLC.			

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PLC-AOUT 50

Value group	PLC	Related FW	1.1.0
Units	[-]		
Comm object	21297	Related applications	MCB
Description			
State of analog output of PLC.			

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PLC-AOUT 51

Value group	PLC	Related FW	1.1.0
Units	[-]		
Comm object	21298	Related applications	MCB
Description			
State of analog output of PLC.			

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PLC-AOUT 52

Value group	PLC	Related FW	1.1.0
Units	[-]		
Comm object	21299	Related applications	MCB
Description			
State of analog output of PLC.			

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PLC-AOUT 53

Value group	PLC	Related FW	1.1.0
Units	[-]		
Comm object	21300	Related applications	MCB
Description			
State of analog output of PLC.			

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PLC-AOUT 54

Value group	PLC	Related FW	1.1.0
Units	[-]		
Comm object	21301	Related applications	MCB
Description			
State of analog output of PLC.			

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PLC-AOUT 55

Value group	PLC	Related FW	1.1.0
Units	[-]		
Comm object	21302	Related applications	MCB
Description			
State of analog output of PLC.			

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PLC-AOUT 56

Value group	PLC	Related FW	1.1.0
Units	[-]		
Comm object	21303	Related applications	MCB
Description			
State of analog output of PLC.			

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PLC-AOUT 57

Value group	PLC	Related FW	1.1.0
Units	[-]		
Comm object	21304	Related applications	MCB
Description			
State of analog output of PLC.			

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PLC-AOUT 58

Value group	PLC	Related FW	1.1.0
Units	[-]		
Comm object	21305	Related applications	MCB
Description			
State of analog output of PLC.			

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PLC-AOUT 59

Value group	PLC	Related FW	1.1.0
Units	[-]		
Comm object	21306	Related applications	MCB
Description			
State of analog output of PLC.			

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PLC-AOUT 60

Value group	PLC	Related FW	1.1.0
Units	[-]		
Comm object	21307	Related applications	MCB
Description			
State of analog output of PLC.			

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PLC-AOUT 61

Value group	PLC	Related FW	1.1.0
Units	[-]		
Comm object	21308	Related applications	MCB
Description			
State of analog output of PLC.			

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PLC-AOUT 62

Value group	PLC	Related FW	1.1.0
Units	[-]		
Comm object	21309	Related applications	MCB
Description			
State of analog output of PLC.			

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PLC-AOUT 63

Value group	PLC	Related FW	1.1.0
Units	[-]		
Comm object	21310	Related applications	MCB
Description			
State of analog output of PLC.			

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PLC-AOUT 64

Value group	PLC	Related FW	1.1.0
Units	[-]		
Comm object	21311	Related applications	MCB
Description			
State of analog output of PLC.			

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PLC-BOUT 1

Value group	PLC	Related FW	1.1.0
Units	[-]		
Comm object	10424	Related applications	MCB
Description			
State of binary outputs of PLC.			

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PLC-BOUT 2

Value group	PLC	Related FW	1.1.0
Units	[-]		
Comm object	10425	Related applications	MCB
Description			
State of binary outputs of PLC.			

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PLC-BOUT 3

Value group	PLC	Related FW	1.1.0
Units	[-]		
Comm object	10426	Related applications	MCB
Description			
State of binary outputs of PLC.			

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PLC-BOUT 4

Value group	PLC	Related FW	1.1.0
Units	[-]		
Comm object	10427	Related applications	MCB
Description			
State of binary outputs of PLC.			

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PLC-BOUT 5

Value group	PLC	Related FW	1.1.0
Units	[-]		
Comm object	10428	Related applications	MCB
Description			
State of binary outputs of PLC.			

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PLC-BOUT 6

Value group	PLC	Related FW	1.1.0
Units	[-]		
Comm object	10429	Related applications	MCB
Description			
State of binary outputs of PLC.			

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PLC-BOUT 7

Value group	PLC	Related FW	1.1.0
Units	[-]		
Comm object	10430	Related applications	MCB
Description			
State of binary outputs of PLC.			

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PLC-BOUT 8

Value group	PLC	Related FW	1.1.0
Units	[-]		
Comm object	10431	Related applications	MCB
Description			
State of binary outputs of PLC.			

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PLC-BOUT 9

Value group	PLC	Related FW	1.1.0
Units	[-]		
Comm object	10432	Related applications	MCB
Description			
State of binary outputs of PLC.			

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PLC-BOUT 10

Value group	PLC	Related FW	1.1.0
Units	[-]		
Comm object	10433	Related applications	MCB
Description			
State of binary outputs of PLC.			

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PLC-BOUT 11

Value group	PLC	Related FW	1.1.0
Units	[-]		
Comm object	10434	Related applications	MCB
Description			
State of binary outputs of PLC.			

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PLC-BOUT 12

Value group	PLC	Related FW	1.1.0
Units	[-]		
Comm object	10435	Related applications	MCB
Description			
State of binary outputs of PLC.			

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PLC-BOUT 13

Value group	PLC	Related FW	1.1.0
Units	[-]		
Comm object	10436	Related applications	MCB
Description			
State of binary outputs of PLC.			

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PLC-BOUT 14

Value group	PLC	Related FW	1.1.0
Units	[-]		
Comm object	10437	Related applications	MCB
Description			
State of binary outputs of PLC.			

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PLC-BOUT 15

Value group	PLC	Related FW	1.1.0
Units	[-]		
Comm object	10438	Related applications	MCB
Description			
State of binary outputs of PLC.			

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PLC-BOUT 16

Value group	PLC	Related FW	1.1.0
Units	[-]		
Comm object	10439	Related applications	MCB
Description			
State of binary outputs of PLC.			

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PLC-BOUT 17

Value group	PLC	Related FW	1.1.0
Units	[-]		
Comm object	14570	Related applications	MCB
Description			
State of binary outputs of PLC.			

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PLC-BOUT 18

Value group	PLC	Related FW	1.1.0
Units	[-]		
Comm object	14571	Related applications	MCB
Description			
State of binary outputs of PLC.			

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PLC-BOUT 19

Value group	PLC	Related FW	1.1.0
Units	[-]		
Comm object	14572	Related applications	MCB
Description			
State of binary outputs of PLC.			

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PLC-BOUT 20

Value group	PLC	Related FW	1.1.0
Units	[-]		
Comm object	14573	Related applications	MCB
Description			
State of binary outputs of PLC.			

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PLC-BOUT 21

Value group	PLC	Related FW	1.1.0
Units	[-]		
Comm object	14574	Related applications	MCB
Description			
State of binary outputs of PLC.			

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PLC-BOUT 22

Value group	PLC	Related FW	1.1.0
Units	[-]		
Comm object	14575	Related applications	MCB
Description			
State of binary outputs of PLC.			

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PLC-BOUT 23

Value group	PLC	Related FW	1.1.0
Units	[-]		
Comm object	14576	Related applications	MCB
Description			
State of binary outputs of PLC.			

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PLC-BOUT 24

Value group	PLC	Related FW	1.1.0
Units	[-]		
Comm object	14577	Related applications	MCB
Description			
State of binary outputs of PLC.			

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PLC-BOUT 25

Value group	PLC	Related FW	1.1.0
Units	[-]		
Comm object	14578	Related applications	MCB
Description			
State of binary outputs of PLC.			

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PLC-BOUT 26

Value group	PLC	Related FW	1.1.0
Units	[-]		
Comm object	14579	Related applications	MCB
Description			
State of binary outputs of PLC.			

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PLC-BOUT 27

Value group	PLC	Related FW	1.1.0
Units	[-]		
Comm object	14580	Related applications	MCB
Description			
State of binary outputs of PLC.			

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PLC-BOUT 28

Value group	PLC	Related FW	1.1.0
Units	[-]		
Comm object	14581	Related applications	MCB
Description			
State of binary outputs of PLC.			

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PLC-BOUT 29

Value group	PLC	Related FW	1.1.0
Units	[-]		
Comm object	14582	Related applications	MCB
Description			
State of binary outputs of PLC.			

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PLC-BOUT 30

Value group	PLC	Related FW	1.1.0
Units	[-]		
Comm object	14583	Related applications	MCB
Description			
State of binary outputs of PLC.			

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PLC-BOUT 31

Value group	PLC	Related FW	1.1.0
Units	[-]		
Comm object	14584	Related applications	MCB
Description			
State of binary outputs of PLC.			

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PLC-BOUT 32

Value group	PLC	Related FW	1.1.0
Units	[-]		
Comm object	14585	Related applications	MCB
Description			
State of binary outputs of PLC.			

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PLC-BOUT 33

Value group	PLC	Related FW	1.1.0
Units	[-]		
Comm object	16914	Related applications	MCB
Description			
State of binary outputs of PLC.			

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PLC-BOUT 34

Value group	PLC	Related FW	1.1.0
Units	[-]		
Comm object	16915	Related applications	MCB
Description			
State of binary outputs of PLC.			

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PLC-BOUT 35

Value group	PLC	Related FW	1.1.0
Units	[-]		
Comm object	16916	Related applications	MCB
Description			
State of binary outputs of PLC.			

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PLC-BOUT 36

Value group	PLC	Related FW	1.1.0
Units	[-]		
Comm object	16917	Related applications	MCB
Description			
State of binary outputs of PLC.			

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PLC-BOUT 37

Value group	PLC	Related FW	1.1.0
Units	[-]		
Comm object	16918	Related applications	MCB
Description			
State of binary outputs of PLC.			

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PLC-BOUT 38

Value group	PLC	Related FW	1.1.0
Units	[-]		
Comm object	16919	Related applications	MCB
Description			
State of binary outputs of PLC.			

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PLC-BOUT 39

Value group	PLC	Related FW	1.1.0
Units	[-]		
Comm object	16920	Related applications	MCB
Description			
State of binary outputs of PLC.			

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PLC-BOUT 40

Value group	PLC	Related FW	1.1.0
Units	[-]		
Comm object	16921	Related applications	MCB
Description			
State of binary outputs of PLC.			

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PLC-BOUT 41

Value group	PLC	Related FW	1.1.0
Units	[-]		
Comm object	16922	Related applications	MCB
Description			
State of binary outputs of PLC.			

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PLC-BOUT 42

Value group	PLC	Related FW	1.1.0
Units	[-]		
Comm object	16923	Related applications	MCB
Description			
State of binary outputs of PLC.			

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PLC-BOUT 43

Value group	PLC	Related FW	1.1.0
Units	[-]		
Comm object	16924	Related applications	MCB
Description			
State of binary outputs of PLC.			

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PLC-BOUT 44

Value group	PLC	Related FW	1.1.0
Units	[-]		
Comm object	16925	Related applications	MCB
Description			
State of binary outputs of PLC.			

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PLC-BOUT 45

Value group	PLC	Related FW	1.1.0
Units	[-]		
Comm object	16926	Related applications	MCB
Description			
State of binary outputs of PLC.			

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PLC-BOUT 46

Value group	PLC	Related FW	1.1.0
Units	[-]		
Comm object	16927	Related applications	MCB
Description			
State of binary outputs of PLC.			

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PLC-BOUT 47

Value group	PLC	Related FW	1.1.0
Units	[-]		
Comm object	16928	Related applications	MCB
Description			
State of binary outputs of PLC.			

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PLC-BOUT 48

Value group	PLC	Related FW	1.1.0
Units	[-]		
Comm object	16929	Related applications	MCB
Description			
State of binary outputs of PLC.			

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PLC-BOUT 49

Value group	PLC	Related FW	1.1.0
Units	[-]		
Comm object	16930	Related applications	MCB
Description			
State of binary outputs of PLC.			

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PLC-BOUT 50

Value group	PLC	Related FW	1.1.0
Units	[-]		
Comm object	16931	Related applications	MCB
Description			
State of binary outputs of PLC.			

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PLC-BOUT 51

Value group	PLC	Related FW	1.1.0
Units	[-]		
Comm object	16932	Related applications	MCB
Description			
State of binary outputs of PLC.			

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PLC-BOUT 52

Value group	PLC	Related FW	1.1.0
Units	[-]		
Comm object	16933	Related applications	MCB
Description			
State of binary outputs of PLC.			

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PLC-BOUT 53

Value group	PLC	Related FW	1.1.0
Units	[-]		
Comm object	16934	Related applications	MCB
Description			
State of binary outputs of PLC.			

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PLC-BOUT 54

Value group	PLC	Related FW	1.1.0
Units	[-]		
Comm object	16935	Related applications	MCB
Description			
State of binary outputs of PLC.			

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PLC-BOUT 55

Value group	PLC	Related FW	1.1.0
Units	[-]		
Comm object	16936	Related applications	MCB
Description			
State of binary outputs of PLC.			

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PLC-BOUT 56

Value group	PLC	Related FW	1.1.0
Units	[-]		
Comm object	16937	Related applications	MCB
Description			
State of binary outputs of PLC.			

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PLC-BOUT 57

Value group	PLC	Related FW	1.1.0
Units	[-]		
Comm object	16938	Related applications	MCB
Description			
State of binary outputs of PLC.			

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PLC-BOUT 58

Value group	PLC	Related FW	1.1.0
Units	[-]		
Comm object	16939	Related applications	MCB
Description			
State of binary outputs of PLC.			

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PLC-BOUT 59

Value group	PLC	Related FW	1.1.0
Units	[-]		
Comm object	16940	Related applications	MCB
Description			
State of binary outputs of PLC.			

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PLC-BOUT 60

Value group	PLC	Related FW	1.1.0
Units	[-]		
Comm object	16941	Related applications	MCB
Description			
State of binary outputs of PLC.			

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PLC-BOUT 61

Value group	PLC	Related FW	1.1.0
Units	[-]		
Comm object	16942	Related applications	MCB
Description			
State of binary outputs of PLC.			

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PLC-BOUT 62

Value group	PLC	Related FW	1.1.0
Units	[-]		
Comm object	16943	Related applications	MCB
Description			
State of binary outputs of PLC.			

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PLC-BOUT 63

Value group	PLC	Related FW	1.1.0
Units	[-]		
Comm object	16944	Related applications	MCB
Description			
State of binary outputs of PLC.			

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PLC-BOUT 64

Value group	PLC	Related FW	1.1.0
Units	[-]		
Comm object	16945	Related applications	MCB
Description			
State of binary outputs of PLC.			

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PLC Resource 1

Value group	PLC	Related FW	1.1.0
Units	[-]		
Comm object	21216	Related applications	MCB
Description			
Internal value of PLC block.			

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PLC Resource 2

Value group	PLC	Related FW	1.1.0
Units	[-]		
Comm object	21217	Related applications	MCB
Description			
Internal value of PLC block.			

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PLC Resource 3

Value group	PLC	Related FW	1.1.0
Units	[-]		
Comm object	21218	Related applications	MCB
Description			
Internal value of PLC block.			

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PLC Resource 4

Value group	PLC	Related FW	1.1.0
Units	[-]		
Comm object	21219	Related applications	MCB
Description			
Internal value of PLC block.			

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PLC Resource 5

Value group	PLC	Related FW	1.1.0
Units	[-]		
Comm object	21220	Related applications	MCB
Description			
Internal value of PLC block.			

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PLC Resource 6

Value group	PLC	Related FW	1.1.0
Units	[-]		
Comm object	21221	Related applications	MCB
Description			
Internal value of PLC block.			

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PLC Resource 7

Value group	PLC	Related FW	1.1.0
Units	[-]		
Comm object	21222	Related applications	MCB
Description			
Internal value of PLC block.			

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PLC Resource 8

Value group	PLC	Related FW	1.1.0
Units	[-]		
Comm object	21223	Related applications	MCB
Description			
Internal value of PLC block.			

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PLC Resource 9

Value group	PLC	Related FW	1.1.0
Units	[-]		
Comm object	21224	Related applications	MCB
Description			
Internal value of PLC block.			

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PLC Resource 10

Value group	PLC	Related FW	1.1.0
Units	[-]		
Comm object	21225	Related applications	MCB
Description			
Internal value of PLC block.			

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PLC Resource 11

Value group	PLC	Related FW	1.1.0
Units	[-]		
Comm object	21226	Related applications	MCB
Description			
Internal value of PLC block.			

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PLC Resource 12

Value group	PLC	Related FW	1.1.0
Units	[-]		
Comm object	21227	Related applications	MCB
Description			
Internal value of PLC block.			

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PLC Resource 13

Value group	PLC	Related FW	1.1.0
Units	[-]		
Comm object	21228	Related applications	MCB
Description			
Internal value of PLC block.			

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PLC Resource 14

Value group	PLC	Related FW	1.1.0
Units	[-]		
Comm object	21229	Related applications	MCB
Description			
Internal value of PLC block.			

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PLC Resource 15

Value group	PLC	Related FW	1.1.0
Units	[-]		
Comm object	21230	Related applications	MCB
Description			
Internal value of PLC block.			

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PLC Resource 16

Value group	PLC	Related FW	1.1.0
Units	[-]		
Comm object	21231	Related applications	MCB
Description			
Internal value of PLC block.			

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PLC Resource 17

Value group	PLC	Related FW	1.1.0
Units	[-]		
Comm object	21232	Related applications	MCB
Description			
Internal value of PLC block.			

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PLC Resource 18

Value group	PLC	Related FW	1.1.0
Units	[-]		
Comm object	21233	Related applications	MCB
Description			
Internal value of PLC block.			

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PLC Resource 19

Value group	PLC	Related FW	1.1.0
Units	[-]		
Comm object	21234	Related applications	MCB
Description			
Internal value of PLC block.			

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PLC Resource 20

Value group	PLC	Related FW	1.1.0
Units	[-]		
Comm object	21235	Related applications	MCB
Description			
Internal value of PLC block.			

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Group: DIST-IN 1-32

Binary inputs 1 1-8

Value group	DIST-IN 1-32	Related FW	1.1.0
Units	[-]		
Comm object	13301	Related applications	MCB
Description			
This value contains first 8 Binary Inputs of distributed binary inputs from DIST-IN (page 31) module 1. Received data are from Controller Unit with CAN Controller Address (page 362) = 1 . <ol style="list-style-type: none">1. DISTBIN-1 12. DISTBIN-1 23. DISTBIN-1 34. DISTBIN-1 45. DISTBIN-1 56. DISTBIN-1 67. DISTBIN-1 78. DISTBIN-1 8			

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Binary inputs 1 9-16

Value group	DIST-IN 1-32	Related FW	1.1.0
Units	[-]		
Comm object	20890	Related applications	MCB
Description			
This value contains second 8 Binary Inputs of distributed binary inputs from DIST-IN (page 31) module 1. <div>IMPORTANT: This value is supported only when CAN Intercontroller Comm Mode (page 366) = 64C CAN FD or 32C CAN FD or 8C CAN FD!</div> Received data are from Controller Unit with CAN Controller Address (page 362) = 1 . <ol style="list-style-type: none">1. DISTBIN-1 92. DISTBIN-1 103. DISTBIN-1 114. DISTBIN-1 125. DISTBIN-1 136. DISTBIN-1 147. DISTBIN-1 158. DISTBIN-1 16			

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Binary inputs 1 17-24

Value group	DIST-IN 1-32	Related FW	1.1.0
Units	[-]		
Comm object	16741	Related applications	MCB
Description			
This value contains third 8 Binary Inputs of distributed binary inputs from DIST-IN (page 31) module 1.			
IMPORTANT: This value is supported only when CAN Intercontroller Comm Mode (page 366) = 64C CAN FD or 32C CAN FD or 8C CAN FD!			
Received data are from Controller Unit with CAN Controller Address (page 362) = 1.			
<ol style="list-style-type: none"> 1. DISTBIN-1 17 2. DISTBIN-1 18 3. DISTBIN-1 19 4. DISTBIN-1 20 5. DISTBIN-1 21 6. DISTBIN-1 22 7. DISTBIN-1 23 8. DISTBIN-1 24 			

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Binary inputs 1 25-32

Value group	DIST-IN 1-32	Related FW	1.1.0
Units	[-]		
Comm object	16805	Related applications	MCB
Description			
This value contains fourth 8 Binary Inputs of distributed binary inputs from DIST-IN (page 31) module 1.			
IMPORTANT: This value is supported only when CAN Intercontroller Comm Mode (page 366) = 64C CAN FD or 32C CAN FD or 8C CAN FD!			
Received data are from Controller Unit with CAN Controller Address (page 362) = 1.			
<ol style="list-style-type: none"> 1. DISTBIN-1 25 2. DISTBIN-1 26 3. DISTBIN-1 27 4. DISTBIN-1 28 5. DISTBIN-1 29 6. DISTBIN-1 30 7. DISTBIN-1 31 8. DISTBIN-1 32 			

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DISTAIN-1 1

Value group	DIST-IN 1-32	Related FW	1.1.0
Units	Based on configuration		
Comm object	20955	Related applications	MCB
Description			
This value contains data of first distributed analog input from DIST-IN (page 31) module which are received from Controller Unit with CAN Controller Address (page 362) = 1 .			
IMPORTANT: This value is received (and visible) only when it is configured with sensor type "Electronic".			
IMPORTANT: This value is supported only when CAN Intercontroller Comm Mode (page 366) = 64C CAN FD or 32C CAN FD or 8C CAN FD!			

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DISTAIN-1 2

Value group	DIST-IN 1-32	Related FW	1.1.0
Units	Based on configuration		
Comm object	20956	Related applications	MCB
Description			
This value contains data of second distributed analog input from DIST-IN (page 31) module which are received from Controller Unit with CAN Controller Address (page 362) = 1 .			
IMPORTANT: This value is received (and visible) only when it is configured with sensor type "Electronic".			
IMPORTANT: This value is supported only when CAN Intercontroller Comm Mode (page 366) = 64C CAN FD or 32C CAN FD or 8C CAN FD!			

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DISTAIN-1 3

Value group	DIST-IN 1-32	Related FW	1.1.0
Units	Based on configuration		
Comm object	20957	Related applications	MCB
Description			
This value contains data of third distributed analog input from DIST-IN (page 31) module which are received from Controller Unit with CAN Controller Address (page 362) = 1 .			
IMPORTANT: This value is received (and visible) only when it is configured with sensor type "Electronic".			
IMPORTANT: This value is supported only when CAN Intercontroller Comm Mode (page 366) = 64C CAN FD or 32C CAN FD or 8C CAN FD!			

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DISTAIN-1 4

Value group	DIST-IN 1-32	Related FW	1.1.0
Units	Based on configuration		
Comm object	20958	Related applications	MCB
Description			
This value contains data of fourth distributed analog input from DIST-IN (page 31) module which are received from Controller Unit with CAN Controller Address (page 362) = 1 .			
IMPORTANT: This value is received (and visible) only when it is configured with sensor type "Electronic".			
IMPORTANT: This value is supported only when CAN Intercontroller Comm Mode (page 366) = 64C CAN FD or 32C CAN FD or 8C CAN FD!			

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Binary inputs 2 1-8

Value group	DIST-IN 1-32	Related FW	1.1.0
Units	[-]		
Comm object	13302	Related applications	MCB
Description			
This value contains first 8 Binary Inputs of distributed binary inputs from DIST-IN (page 31) module 2. Received data are from Controller Unit with CAN Controller Address (page 362) = 2 .			
1. DISTBIN-2 1			
2. DISTBIN-2 2			
3. DISTBIN-2 3			
4. DISTBIN-2 4			
5. DISTBIN-2 5			
6. DISTBIN-2 6			
7. DISTBIN-2 7			
8. DISTBIN-2 8			

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Binary inputs 2 9-16

Value group	DIST-IN 1-32	Related FW	1.1.0
Units	[-]		
Comm object	20891	Related applications	MCB
Description			
This value contains second 8 Binary Inputs of distributed binary inputs from DIST-IN (page 31) module 2.			
IMPORTANT: This value is supported only when CAN Intercontroller Comm Mode (page 366) = 64C CAN FD or 32C CAN FD or 8C CAN FD!			
Received data are from Controller Unit with CAN Controller Address (page 362) = 2.			
<ol style="list-style-type: none"> 1. DISTBIN-2 9 2. DISTBIN-2 10 3. DISTBIN-2 11 4. DISTBIN-2 12 5. DISTBIN-2 13 6. DISTBIN-2 14 7. DISTBIN-2 15 8. DISTBIN-2 16 			

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Binary inputs 2 17-24

Value group	DIST-IN 1-32	Related FW	1.1.0
Units	[-]		
Comm object	16742	Related applications	MCB
Description			
This value contains third 8 Binary Inputs of distributed binary inputs from DIST-IN (page 31) module 2.			
IMPORTANT: This value is supported only when CAN Intercontroller Comm Mode (page 366) = 64C CAN FD or 32C CAN FD or 8C CAN FD!			
Received data are from Controller Unit with CAN Controller Address (page 362) = 2.			
<ol style="list-style-type: none"> 1. DISTBIN-2 17 2. DISTBIN-2 18 3. DISTBIN-2 19 4. DISTBIN-2 20 5. DISTBIN-2 21 6. DISTBIN-2 22 7. DISTBIN-2 23 8. DISTBIN-2 24 			

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Binary inputs 2 25-32

Value group	DIST-IN 1-32	Related FW	1.1.0
Units	[-]		
Comm object	16806	Related applications	MCB
Description			
This value contains fourth 8 Binary Inputs of distributed binary inputs from DIST-IN (page 31) module 2.			
IMPORTANT: This value is supported only when CAN Intercontroller Comm Mode (page 366) = 64C CAN FD or 32C CAN FD or 8C CAN FD!			
Received data are from Controller Unit with CAN Controller Address (page 362) = 2 .			
<ol style="list-style-type: none"> 1. DISTBIN-2 25 2. DISTBIN-2 26 3. DISTBIN-2 27 4. DISTBIN-2 28 5. DISTBIN-2 29 6. DISTBIN-2 30 7. DISTBIN-2 31 8. DISTBIN-2 32 			

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DISTAIN-2 1

Value group	DIST-IN 1-32	Related FW	1.1.0
Units	Based on configuration		
Comm object	20959	Related applications	MCB
Description			
This value contains data of first distributed analog input from DIST-IN (page 31) module which are received from Controller Unit with CAN Controller Address (page 362) = 2 .			
IMPORTANT: This value is received (and visible) only when it is configured with sensor type "Electronic".			
IMPORTANT: This value is supported only when CAN Intercontroller Comm Mode (page 366) = 64C CAN FD or 32C CAN FD or 8C CAN FD!			

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DISTAIN-2 2

Value group	DIST-IN 1-32	Related FW	1.1.0
Units	Based on configuration		
Comm object	20960	Related applications	MCB
Description			
This value contains data of second distributed analog input from DIST-IN (page 31) module which are received from Controller Unit with CAN Controller Address (page 362) = 2 .			
IMPORTANT: This value is received (and visible) only when it is configured with sensor type "Electronic".			
IMPORTANT: This value is supported only when CAN Intercontroller Comm Mode (page 366) = 64C CAN FD or 32C CAN FD or 8C CAN FD!			

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DISTAIN-2 3

Value group	DIST-IN 1-32	Related FW	1.1.0
Units	Based on configuration		
Comm object	20961	Related applications	MCB
Description			
This value contains data of third distributed analog input from DIST-IN (page 31) module which are received from Controller Unit with CAN Controller Address (page 362) = 2 .			
IMPORTANT: This value is received (and visible) only when it is configured with sensor type "Electronic".			
IMPORTANT: This value is supported only when CAN Intercontroller Comm Mode (page 366) = 64C CAN FD or 32C CAN FD or 8C CAN FD!			

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DISTAIN-2 4

Value group	DIST-IN 1-32	Related FW	1.1.0
Units	Based on configuration		
Comm object	20962	Related applications	MCB
Description			
This value contains data of fourth distributed analog input from DIST-IN (page 31) module which are received from Controller Unit with CAN Controller Address (page 362) = 1 .			
IMPORTANT: This value is received (and visible) only when it is configured with sensor type "Electronic".			
IMPORTANT: This value is supported only when CAN Intercontroller Comm Mode (page 366) = 64C CAN FD or 32C CAN FD or 8C CAN FD!			

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Group: DIST-IN 33-64

Binary inputs 33 1-8

Value group	DIST-IN 33-64	Related FW	1.1.0
Units	[-]		
Comm object	25858	Related applications	MCB
Description			
This value contains first 8 Binary Inputs of distributed binary inputs from DIST-IN (page 31) module 33. Received data are from Controller Unit with CAN Controller Address (page 362) = 33 .			
<ol style="list-style-type: none">1. DISTBIN-33 12. DISTBIN-33 23. DISTBIN-33 34. DISTBIN-33 45. DISTBIN-33 56. DISTBIN-33 67. DISTBIN-33 78. DISTBIN-33 8			

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Binary inputs 33 9-16

Value group	DIST-IN 33-64	Related FW	1.1.0
Units	[-]		
Comm object	20922	Related applications	MCB
Description			
This value contains last 8 Binary Inputs of distributed binary inputs from DIST-IN (page 31) module 33.			
IMPORTANT: This value is supported only when CAN Intercontroller Comm Mode (page 366) = 64C CAN FD or 8C CAN FD!			
Received data are from Controller Unit with CAN Controller Address (page 362) = 33 .			
<ol style="list-style-type: none">1. DISTBIN-33 92. DISTBIN-33 103. DISTBIN-33 114. DISTBIN-33 125. DISTBIN-33 136. DISTBIN-33 147. DISTBIN-33 158. DISTBIN-33 16			

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Binary inputs 33 17-24

Value group	DIST-IN 33-64	Related FW	1.1.0
Units	[-]		
Comm object	16773	Related applications	MCB
Description			
This value contains first 8 Binary Inputs of distributed binary inputs from DIST-IN (page 31) module 33.			
IMPORTANT: This value is supported only when CAN Intercontroller Comm Mode (page 366) = 64C CAN FD or 8C CAN FD!			
Received data are from Controller Unit with CAN Controller Address (page 362) = 33 .			
<ol style="list-style-type: none"> 1. DISTBIN-33 17 2. DISTBIN-33 18 3. DISTBIN-33 19 4. DISTBIN-33 20 5. DISTBIN-33 21 6. DISTBIN-33 22 7. DISTBIN-33 23 8. DISTBIN-33 24 			

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Binary inputs 33 25-32

Value group	DIST-IN 33-64	Related FW	1.1.0
Units	[-]		
Comm object	16837	Related applications	MCB
Description			
This value contains first 8 Binary Inputs of distributed binary inputs from DIST-IN (page 31) module 33.			
IMPORTANT: This value is supported only when CAN Intercontroller Comm Mode (page 366) = 64C CAN FD or 8C CAN FD!			
Received data are from Controller Unit with CAN Controller Address (page 362) = 33 .			
<ol style="list-style-type: none"> 1. DISTBIN-33 25 2. DISTBIN-33 26 3. DISTBIN-33 27 4. DISTBIN-33 28 5. DISTBIN-33 29 6. DISTBIN-33 30 7. DISTBIN-33 31 8. DISTBIN-33 32 			

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DISTAIN-33 1

Value group	DIST-IN 33-64	Related FW	1.1.0
Units	Based on configuration		
Comm object	21083	Related applications	MCB
Description			
This value contains data of first distributed analog input from DIST-IN (page 31) module which are received from Controller Unit with CAN Controller Address (page 362) = 33 .			
IMPORTANT: This value is received (and visible) only when it is configured with sensor type "Electronic".			
IMPORTANT: This value is supported only when CAN Intercontroller Comm Mode (page 366) = 64C CAN FD or 8C CAN FD!			

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DISTAIN-33 2

Value group	DIST-IN 33-64	Related FW	1.1.0
Units	Based on configuration		
Comm object	21084	Related applications	MCB
Description			
This value contains data of second distributed analog input from DIST-IN (page 31) module which are received from Controller Unit with CAN Controller Address (page 362) = 33 .			
IMPORTANT: This value is received (and visible) only when it is configured with sensor type "Electronic".			
IMPORTANT: This value is supported only when CAN Intercontroller Comm Mode (page 366) = 64C CAN FD or 8C CAN FD!			

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DISTAIN-33 3

Value group	DIST-IN 33-64	Related FW	1.1.0
Units	Based on configuration		
Comm object	21085	Related applications	MCB
Description			
This value contains data of third distributed analog input from DIST-IN (page 31) module which are received from Controller Unit with CAN Controller Address (page 362) = 33 .			
IMPORTANT: This value is received (and visible) only when it is configured with sensor type "Electronic".			
IMPORTANT: This value is supported only when CAN Intercontroller Comm Mode (page 366) = 64C CAN FD or 8C CAN FD!			

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DISTAIN-33 4

Value group	DIST-IN 33-64	Related FW	1.1.0
Units	Based on configuration		
Comm object	21086	Related applications	MCB
Description			
This value contains data of fourth distributed analog input from DIST-IN (page 31) module which are received from Controller Unit with CAN Controller Address (page 362) = 33 .			
IMPORTANT: This value is received (and visible) only when it is configured with sensor type "Electronic".			
IMPORTANT: This value is supported only when CAN Intercontroller Comm Mode (page 366) = 64C CAN FD or 8C CAN FD!			

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Binary inputs 34 1-8

Value group	DIST-IN 33-64	Related FW	1.1.0
Units	[-]		
Comm object	20859	Related applications	MCB
Description			
This value contains first 8 Binary Inputs of distributed binary inputs from DIST-IN (page 31) module 34. Received data are from Controller Unit with CAN Controller Address (page 362) = 34 .			
1. DISTBIN-34 1			
2. DISTBIN-34 2			
3. DISTBIN-34 3			
4. DISTBIN-34 4			
5. DISTBIN-34 5			
6. DISTBIN-34 6			
7. DISTBIN-34 7			
8. DISTBIN-34 8			

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Binary inputs 34 9-16

Value group	DIST-IN 33-64	Related FW	1.1.0
Units	[-]		
Comm object	20923	Related applications	MCB
Description			
This value contains last 8 Binary Inputs of distributed binary inputs from DIST-IN (page 31) module 34.			
IMPORTANT: This value is supported only when CAN Intercontroller Comm Mode (page 366) = 64C CAN FD or 8C CAN FD!			
Received data are from Controller Unit with CAN Controller Address (page 362) = 34 .			
<ol style="list-style-type: none"> 1. DISTBIN-34 9 2. DISTBIN-34 10 3. DISTBIN-34 11 4. DISTBIN-34 12 5. DISTBIN-34 13 6. DISTBIN-34 14 7. DISTBIN-34 15 8. DISTBIN-34 16 			

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Binary inputs 34 17-24

Value group	DIST-IN 33-64	Related FW	1.1.0
Units	[-]		
Comm object	16774	Related applications	MCB
Description			
This value contains first 8 Binary Inputs of distributed binary inputs from DIST-IN (page 31) module 34.			
IMPORTANT: This value is supported only when CAN Intercontroller Comm Mode (page 366) = 64C CAN FD or 8C CAN FD!			
Received data are from Controller Unit with CAN Controller Address (page 362) = 34 .			
<ol style="list-style-type: none"> 1. DISTBIN-34 17 2. DISTBIN-34 18 3. DISTBIN-34 19 4. DISTBIN-34 20 5. DISTBIN-34 21 6. DISTBIN-34 22 7. DISTBIN-34 23 8. DISTBIN-34 24 			

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Binary inputs 34 25-32

Value group	DIST-IN 33-64	Related FW	1.1.0
Units	[-]		
Comm object	16838	Related applications	MCB
Description			
This value contains first 8 Binary Inputs of distributed binary inputs from DIST-IN (page 31) module 34.			
IMPORTANT: This value is supported only when CAN Intercontroller Comm Mode (page 366) = 64C CAN FD or 8C CAN FD!			
Received data are from Controller Unit with CAN Controller Address (page 362) = 34 .			
<ol style="list-style-type: none"> 1. DISTBIN-34 25 2. DISTBIN-34 26 3. DISTBIN-34 27 4. DISTBIN-34 28 5. DISTBIN-34 29 6. DISTBIN-34 30 7. DISTBIN-34 31 8. DISTBIN-34 32 			

[back to List of values](#)

DISTAIN-34 1

Value group	DIST-IN 33-64	Related FW	1.1.0
Units	Based on configuration		
Comm object	21087	Related applications	MCB
Description			
This value contains data of first distributed analog input from DIST-IN (page 31) module which are received from Controller Unit with CAN Controller Address (page 362) = 34 .			
IMPORTANT: This value is received (and visible) only when it is configured with sensor type "Electronic".			
IMPORTANT: This value is supported only when CAN Intercontroller Comm Mode (page 366) = 64C CAN FD or 8C CAN FD!			

[back to List of values](#)

DISTAIN-34 2

Value group	DIST-IN 33-64	Related FW	1.1.0
Units	Based on configuration		
Comm object	21088	Related applications	MCB
Description			
This value contains data of second distributed analog input from DIST-IN (page 31) module which are received from Controller Unit with CAN Controller Address (page 362) = 34 .			
IMPORTANT: This value is received (and visible) only when it is configured with sensor type "Electronic".			
IMPORTANT: This value is supported only when CAN Intercontroller Comm Mode (page 366) = 64C CAN FD or 8C CAN FD!			

🔍 back to List of values

DISTAIN-34 3

Value group	DIST-IN 33-64	Related FW	1.1.0
Units	Based on configuration		
Comm object	21089	Related applications	MCB
Description			
This value contains data of third distributed analog input from DIST-IN (page 31) module which are received from Controller Unit with CAN Controller Address (page 362) = 34 .			
IMPORTANT: This value is received (and visible) only when it is configured with sensor type "Electronic".			
IMPORTANT: This value is supported only when CAN Intercontroller Comm Mode (page 366) = 64C CAN FD or 8C CAN FD!			

🔍 back to List of values

DISTAIN-34 4

Value group	DIST-IN 33-64	Related FW	1.1.0
Units	Based on configuration		
Comm object	21090	Related applications	MCB
Description			
This value contains data of fourth distributed analog input from DIST-IN (page 31) module which are received from Controller Unit with CAN Controller Address (page 362) = 34 .			
IMPORTANT: This value is received (and visible) only when it is configured with sensor type "Electronic".			
IMPORTANT: This value is supported only when CAN Intercontroller Comm Mode (page 366) = 64C CAN FD or 8C CAN FD!			

🔍 back to List of values

Group: SH Modules

SHBIN-1

Value group	SH Modules	Related FW	1.1.0
Units	[-]		
Comm object	10572	Related applications	MCB
Description			
This value contains Binary Inputs of shared binary inputs from SHBIN module 1. <ol style="list-style-type: none">1. SHBIN-1 12. SHBIN-1 23. SHBIN-1 34. SHBIN-1 45. SHBIN-1 56. SHBIN-1 67. SHBIN-1 78. SHBIN-1 8			

[back to List of values](#)

SHBIN-2

Value group	SH Modules	Related FW	1.1.0
Units	[-]		
Comm object	10573	Related applications	MCB
Description			
This value contains Binary Inputs of shared binary inputs from SHBIN module 2. <ol style="list-style-type: none">1. SHBIN-2 12. SHBIN-2 23. SHBIN-2 34. SHBIN-2 45. SHBIN-2 56. SHBIN-2 67. SHBIN-2 78. SHBIN-2 8			

[back to List of values](#)

SHBIN-3

Value group	SH Modules	Related FW	1.1.0
Units	[-]		
Comm object	10574	Related applications	MCB
Description			
This value contains Binary Inputs of shared binary inputs from SHBIN module 3. 1. SHBIN-3 1 2. SHBIN-3 2 3. SHBIN-3 3 4. SHBIN-3 4 5. SHBIN-3 5 6. SHBIN-3 6 7. SHBIN-3 7 8. SHBIN-3 8			

[◀ back to List of values](#)

SHBIN-4

Value group	SH Modules	Related FW	1.1.0
Units	[-]		
Comm object	10575	Related applications	MCB
Description			
This value contains Binary Inputs of shared binary inputs from SHBIN module 4. 1. SHBIN-4 1 2. SHBIN-4 2 3. SHBIN-4 3 4. SHBIN-4 4 5. SHBIN-4 5 6. SHBIN-4 6 7. SHBIN-4 7 8. SHBIN-4 8			

[◀ back to List of values](#)

SHBIN-5

Value group	SH Modules	Related FW	1.1.0
Units	[-]		
Comm object	11341	Related applications	MCB
Description			
This value contains Binary Inputs of shared binary inputs from SHBIN module 5. 1. SHBIN-5 1 2. SHBIN-5 2 3. SHBIN-5 3 4. SHBIN-5 4 5. SHBIN-5 5 6. SHBIN-5 6 7. SHBIN-5 7 8. SHBIN-5 8			

[◀ back to List of values](#)

SHBIN-6

Value group	SH Modules	Related FW	1.1.0
Units	[-]		
Comm object	11342	Related applications	MCB
Description			
This value contains Binary Inputs of shared binary inputs from SHBIN module 6. 1. SHBIN-6 1 2. SHBIN-6 2 3. SHBIN-6 3 4. SHBIN-6 4 5. SHBIN-6 5 6. SHBIN-6 6 7. SHBIN-6 7 8. SHBIN-6 8			

[◀ back to List of values](#)

SHBOUT-1

Value group	SH Modules	Related FW	1.1.0
Units	[-]		
Comm object	10576	Related applications	MCB
Description			
This value contains Binary Inputs of shared binary outputs from SHBOUT module 1.			
1. SHBOUT-1 1			
2. SHBOUT-1 2			
3. SHBOUT-1 3			
4. SHBOUT-1 4			
5. SHBOUT-1 5			
6. SHBOUT-1 6			
7. SHBOUT-1 7			
8. SHBOUT-1 8			

[◀ back to List of values](#)

SHBOUT-2

Value group	SH Modules	Related FW	1.1.0
Units	[-]		
Comm object	10577	Related applications	MCB
Description			
This value contains Binary Inputs of shared binary outputs from SHBOUT module 2.			
1. SHBOUT-2 1			
2. SHBOUT-2 2			
3. SHBOUT-2 3			
4. SHBOUT-2 4			
5. SHBOUT-2 5			
6. SHBOUT-2 6			
7. SHBOUT-2 7			
8. SHBOUT-2 8			

[◀ back to List of values](#)

SHBOUT-3

Value group	SH Modules	Related FW	1.1.0
Units	[-]		
Comm object	10578	Related applications	MCB
Description			
This value contains Binary Inputs of shared binary outputs from SHBOUT module 3. 1. SHBOUT-3 1 2. SHBOUT-3 2 3. SHBOUT-3 3 4. SHBOUT-3 4 5. SHBOUT-3 5 6. SHBOUT-3 6 7. SHBOUT-3 7 8. SHBOUT-3 8			

[◀ back to List of values](#)

SHBOUT-4

Value group	SH Modules	Related FW	1.1.0
Units	[-]		
Comm object	10579	Related applications	MCB
Description			
This value contains Binary Inputs of shared binary outputs from SHBOUT module 4. 1. SHBOUT-4 1 2. SHBOUT-4 2 3. SHBOUT-4 3 4. SHBOUT-4 4 5. SHBOUT-4 5 6. SHBOUT-4 6 7. SHBOUT-4 7 8. SHBOUT-4 8			

[◀ back to List of values](#)

SHBOUT-5

Value group	SH Modules	Related FW	1.1.0
Units	[-]		
Comm object	11343	Related applications	MCB
Description			
This value contains Binary Inputs of shared binary outputs from SHBOUT module 5. <ol style="list-style-type: none">1. SHBOUT-5 12. SHBOUT-5 23. SHBOUT-5 34. SHBOUT-5 45. SHBOUT-5 56. SHBOUT-5 67. SHBOUT-5 78. SHBOUT-5 8			

[◀ back to List of values](#)

SHBOUT-6

Value group	SH Modules	Related FW	1.1.0
Units	[-]		
Comm object	11344	Related applications	MCB
Description			
This value contains Binary Inputs of shared binary outputs from SHBOUT module 6. <ol style="list-style-type: none">1. SHBOUT-6 12. SHBOUT-6 23. SHBOUT-6 34. SHBOUT-6 45. SHBOUT-6 56. SHBOUT-6 67. SHBOUT-6 78. SHBOUT-6 8			

[◀ back to List of values](#)

SHAIN-1 1

Value group	SH Modules	Related FW	1.1.0
Units	[-]		
Comm object	10584	Related applications	MCB
Description			
This value contains data of first shared analog input from SHAOUT module 1.			
IMPORTANT: This value is received (and visible) only when it is configured with sensor type "Electronic".			

[back to List of values](#)

SHAIN-1 2

Value group	SH Modules	Related FW	1.1.0
Units	[-]		
Comm object	10585	Related applications	MCB
Description			
This value contains data of second shared analog input from SHAOUT module 1.			
IMPORTANT: This value is received (and visible) only when it is configured with sensor type "Electronic".			

[back to List of values](#)

SHAIN-1 3

Value group	SH Modules	Related FW	1.1.0
Units	[-]		
Comm object	10586	Related applications	MCB
Description			
This value contains data of third shared analog input from SHAOUT module 1.			
IMPORTANT: This value is received (and visible) only when it is configured with sensor type "Electronic".			

[back to List of values](#)

SHAIN-1 4

Value group	SH Modules	Related FW	1.1.0
Units	[-]		
Comm object	10587	Related applications	MCB
Description			
This value contains data of fourth shared analog input from SHAOUT module 1.			
IMPORTANT: This value is received (and visible) only when it is configured with sensor type "Electronic".			

[back to List of values](#)

SHAIN-2 1

Value group	SH Modules	Related FW	1.1.0
Units	[-]		
Comm object	11390	Related applications	MCB
Description			
This value contains data of first shared analog input from SHAOUT module 2.			
IMPORTANT: This value is received (and visible) only when it is configured with sensor type "Electronic".			

[back to List of values](#)

SHAIN-2 2

Value group	SH Modules	Related FW	1.1.0
Units	[-]		
Comm object	11391	Related applications	MCB
Description			
This value contains data of second shared analog input from SHAOUT module 2.			
IMPORTANT: This value is received (and visible) only when it is configured with sensor type "Electronic".			

[back to List of values](#)

SHAIN-2 3

Value group	SH Modules	Related FW	1.1.0
Units	[-]		
Comm object	11392	Related applications	MCB
Description			
This value contains data of third shared analog input from SHAOUT module 2.			
IMPORTANT: This value is received (and visible) only when it is configured with sensor type "Electronic".			

[back to List of values](#)

SHAIN-2 4

Value group	SH Modules	Related FW	1.1.0
Units	[-]		
Comm object	11393	Related applications	MCB
Description			
This value contains data of fourth shared analog input from SHAOUT module 2.			
IMPORTANT: This value is received (and visible) only when it is configured with sensor type "Electronic".			

[back to List of values](#)

Group: Virtual Shared OUT

Binary outputs 1-8

Value group	Virtual Shared OUT	Related FW	1.1.0
Units	[-]		
Comm object	13333	Related applications	MCB
Description			
This value contains first 8 Binary Outputs of distributed binary outputs from DIST-OUT (page 32) module.			
<ol style="list-style-type: none">1. DISTBOUT 12. DISTBOUT 23. DISTBOUT 34. DISTBOUT 45. DISTBOUT 56. DISTBOUT 67. DISTBOUT 78. DISTBOUT 8			

[back to List of values](#)

Binary outputs 9-16

Value group	Virtual Shared OUT	Related FW	1.1.0
Units	[-]		
Comm object	20954	Related applications	MCB
Description			
This value contains second 8 Binary Outputs of distributed binary outputs from DIST-OUT (page 32) module.			
IMPORTANT: This value is supported only when CAN Intercontroller Comm Mode (page 366) = 64C CAN FD or 32C CAN FD or 8C CAN FD!			
<ol style="list-style-type: none">1. DISTBOUT 92. DISTBOUT 103. DISTBOUT 114. DISTBOUT 125. DISTBOUT 136. DISTBOUT 147. DISTBOUT 158. DISTBOUT 16			

[back to List of values](#)

Binary outputs 17-24

Value group	Virtual Shared OUT	Related FW	1.1.0
Units	[-]		
Comm object	16870	Related applications	MCB
Description			
This value contains third 8 Binary Outputs of distributed binary outputs from DIST-OUT (page 32) module.			
IMPORTANT: This value is supported only when CAN Intercontroller Comm Mode (page 366) = 64C CAN FD or 32C CAN FD or 8C CAN FD!			
<ol style="list-style-type: none">1. DISTBOUT 172. DISTBOUT 183. DISTBOUT 194. DISTBOUT 205. DISTBOUT 216. DISTBOUT 227. DISTBOUT 238. DISTBOUT 24			

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Binary outputs 25-32

Value group	Virtual Shared OUT	Related FW	1.1.0
Units	[-]		
Comm object	16871	Related applications	MCB
Description			
This value contains fourth 8 Binary Outputs of distributed binary outputs from DIST-OUT (page 32) module.			
IMPORTANT: This value is supported only when CAN Intercontroller Comm Mode (page 366) = 64C CAN FD or 32C CAN FD or 8C CAN FD!			
<ol style="list-style-type: none">1. DISTBOUT 252. DISTBOUT 263. DISTBOUT 274. DISTBOUT 285. DISTBOUT 296. DISTBOUT 307. DISTBOUT 318. DISTBOUT 32			

[back to List of values](#)

8.1.5 Application Curves

List of Application Curves

Capability L	596
Capability C	597

 back to Controller objects

Capability L

Related FW	1.1.0	Related applications	MCB
App Curve ID	4		

Description

This curve defines **System Operation Area** (page 184) within which it can deliver reactive power continuously without overheating while **Total Running Load Character** (page 484) = L.

X-axis is relative value of **Total Running P** (page 482) to **Running Nominal Power Of All** (page 481).

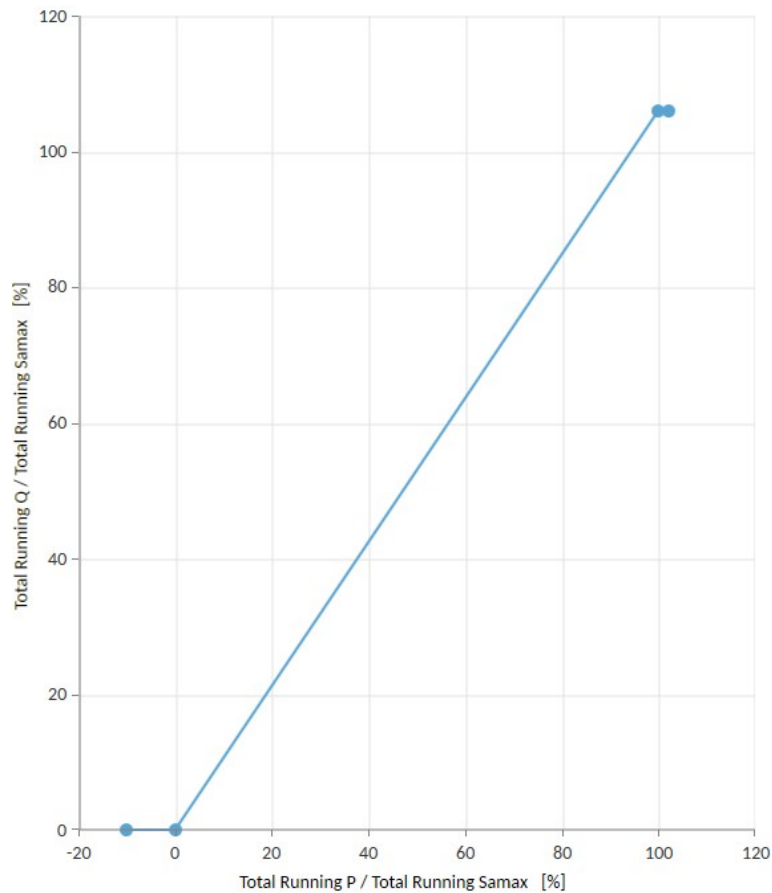
Y-axis is relative value of **Total Running Q** (page 483) to **Total Running Samax** (page 482).

IMPORTANT: The Capability L curve have to be setup according to the Capability curve of the worst (weakest) Gen-set in order to ensure right functionality of the whole system.

Default values

X-axis [%]	Y-axis [%]
-10	0
0	0
100	106
102	106

Default appearance



[back to Application Curves](#)

Capability C

Related FW	1.1.0	Related applications	MCB								
App Curve ID	5										
Description											
This curve defines System Operation Area (page 184) within which it can deliver reactive power continuously without overheating while Total Running Load Character (page 484) = C.											
X-axis is relative value of Total Running P (page 482) to Running Nominal Power Of All (page 481).											
Y-axis is relative value of Total Running Q (page 483) to Total Running Samax (page 482).											
Default values											
X-axis [%]		Y-axis [%]									
-10		0									
0		0									
100		-60									
102		-60									
Default appearance											
<p>The graph displays the relationship between the relative total running power (X-axis) and the relative total running reactive power (Y-axis) for Capability C. The X-axis, labeled 'Total Running P / Total Running Samax [%]', ranges from -20 to 120. The Y-axis, labeled 'Total Running Q / Total Running Samax [%]', ranges from -70 to 0. The curve is defined by three points: (-10, 0), (0, 0), and (100, -60). The line segment from (-10, 0) to (0, 0) is horizontal, and the segment from (0, 0) to (100, -60) is a straight line with a negative slope.</p> <table><tr><th>Total Running P / Total Running Samax [%]</th><th>Total Running Q / Total Running Samax [%]</th></tr><tr><td>-10</td><td>0</td></tr><tr><td>0</td><td>0</td></tr><tr><td>100</td><td>-60</td></tr></table>				Total Running P / Total Running Samax [%]	Total Running Q / Total Running Samax [%]	-10	0	0	0	100	-60
Total Running P / Total Running Samax [%]	Total Running Q / Total Running Samax [%]										
-10	0										
0	0										
100	-60										



back to Application Curves

8.1.6 Logical binary inputs

What Logical binary inputs are:

Logical binary inputs are inputs for binary values and functions.

Alphabetical groups of Logical binary inputs

LBI: E	601
LBI: F	604
LBI: G	612
LBI: H	612
LBI: I	613
LBI: L	614
LBI: M	614
LBI: N	618
LBI: P	618
LBI: R	620
LBI: S	621
LBI: T	622
LBI: U	622
LBI: V	622

For full list of Logical binary inputs go to the chapter **Logical binary inputs alphabetically (page 599)**.

Logical binary inputs alphabetically

LBI: E 601	Forced Value Input 02 605	Hot Swap Recovery 613
ECU Communication Fail	Forced Value Input 03 605	Horn Reset Button 613
Block 601	Forced Value Input 04 606	LBI: I 613
ECU Communication Fail	Forced Value Input 05 606	Imp/Exp Control 613
Block 1 601	Forced Value Input 06 606	LBI: L 614
ECU Communication Fail	Forced Value Input 07 606	Load Lower 614
Block 2 601	Forced Value Input 08 606	Load Raise 614
ECU Communication Fail	Forced Value Input 09 607	LBI: M 614
Block 3 601	Forced Value Input 10 607	Mains Fail Block 614
ECU Communication Fail	Forced Value Input 11 607	MCB Disable 615
Block 4 601	Forced Value Input 12 607	MCB Feedback 616
ECU Communication Fail	Forced Value Input 13 607	MCB Feedback Negative 617
Block 5 602	Forced Value Input 14 608	MCB Isolated 617
ECU Communication Fail	Forced Value Input 15 608	LBI: N 618
Block 6 602	Forced Value Input 16 608	Not Used 618
ECU Communication Fail	Forced Value Input 17 608	LBI: P 618
Block 7 602	Forced Value Input 18 608	Process Control 618
ECU Communication Fail	Forced Value Input 19 609	Protection Force Disable 1 618
Block 8 602	Forced Value Input 20 609	Protection Force Disable 2 619
ECU Communication Fail	Forced Value Input 21 609	Protection Force Disable 3 619
Block 9 602	Forced Value Input 22 609	Pulse Counter 1 620
ECU Communication Fail	Forced Value Input 23 609	Pulse Counter 2 620
Block 10 603	Forced Value Input 24 610	LBI: R 620
ECU Communication Fail	Forced Value Input 25 610	Ramp Pause 620
Block 11 603	Forced Value Input 26 610	Remote RUN MODE 620
ECU Communication Fail	Forced Value Input 27 610	Remote PRG MODE 621
Block 12 603	Forced Value Input 28 610	LBI: S 621
ECU Communication Fail	Forced Value Input 29 611	Synchronization Check 621
Block 13 603	Forced Value Input 30 611	Synchronization
ECU Communication Fail	Forced Value Input 31 611	Permissive 621
Block 14 603	Forced Value Input 32 611	Synchronization Run 621
ECU Communication Fail	LBI: G 612	LBI: T 622
Block 15 604	Group link 612	Time Stamp Act 622
ECU Communication Fail	LBI: H 612	LBI: U 622
Block 16 604	Hot Swap Ctrl Block 612	Utility Unload 622
Emergency MAN 604	Hot Swap Heartbeat	LBI: V 622
LBI: F 604	Detect 613	Voltage Raise 622
Fault Reset Button 604		Voltage Lower 622
Force Protection Disable 605		
Forced Value Input 01 605		

 **back to Controller objects**

LBID: E

ECU Communication Fail Block

Related FW	1.1.0	Related applications	MCB
LBID ID	141		
Description			
Activation of this binary input blocks all protections (including user protections) for every single configured ECU.			

⬅ back to Logical binary inputs alphabetically

ECU Communication Fail Block 1

Related FW	1.1.0	Related applications	MCB
LBID ID	1020		
Description			
Activation of this binary input blocks all protections (including user protections) for ECU configured in ECU slot 1. Alarm Wrn ECU 1 Comm Fail (page 729) is deactivated while this LBI is active.			

⬅ back to Logical binary inputs alphabetically

ECU Communication Fail Block 2

Related FW	1.1.0	Related applications	MCB
LBID ID	1021		
Description			
Activation of this binary input blocks all protections (including user protections) for ECU configured in ECU slot 2. Alarm Wrn ECU 2 Comm Fail (page 729) is deactivated while this LBI is active.			

⬅ back to Logical binary inputs alphabetically

ECU Communication Fail Block 3

Related FW	1.1.0	Related applications	MCB
LBID ID	1022		
Description			
Activation of this binary input blocks all protections (including user protections) for ECU configured in ECU slot 3. Alarm Wrn ECU 3 Comm Fail (page 729) is deactivated while this LBI is active.			

⬅ back to Logical binary inputs alphabetically

ECU Communication Fail Block 4

Related FW	1.1.0	Related applications	MCB
LBID ID	1023		
Description			
Activation of this binary input blocks all protections (including user protections) for ECU configured in ECU slot 4. Alarm Wrn ECU 4 Comm Fail (page 729) is deactivated while this LBI is active.			

⬅ back to Logical binary inputs alphabetically

ECU Communication Fail Block 5

Related FW	1.1.0	Related applications	MCB
LBI ID	1024		
Description			
Activation of this binary input blocks all protections (including user protections) for ECU configured in ECU slot 5. Alarm Wrn ECU 5 Comm Fail (page 730) is deactivated while this LBI is active.			

⬅ back to Logical binary inputs alphabetically

ECU Communication Fail Block 6

Related FW	1.1.0	Related applications	MCB
LBI ID	1025		
Description			
Activation of this binary input blocks all protections (including user protections) for ECU configured in ECU slot 6. Alarm Wrn ECU 6 Comm Fail (page 730) is deactivated while this LBI is active.			

⬅ back to Logical binary inputs alphabetically

ECU Communication Fail Block 7

Related FW	1.1.0	Related applications	MCB
LBI ID	1026		
Description			
Activation of this binary input blocks all protections (including user protections) for ECU configured in ECU slot 7. Alarm Wrn ECU 7 Comm Fail (page 730) is deactivated while this LBI is active.			

⬅ back to Logical binary inputs alphabetically

ECU Communication Fail Block 8

Related FW	1.1.0	Related applications	MCB
LBI ID	1027		
Description			
Activation of this binary input blocks all protections (including user protections) for ECU configured in ECU slot 8. Alarm Wrn ECU 8 Comm Fail (page 731) is deactivated while this LBI is active.			

⬅ back to Logical binary inputs alphabetically

ECU Communication Fail Block 9

Related FW	1.1.0	Related applications	MCB
LBI ID	1028		
Description			
Activation of this binary input blocks all protections (including user protections) for ECU configured in ECU slot 9. Alarm Wrn ECU 9 Comm Fail (page 731) is deactivated while this LBI is active.			

⬅ back to Logical binary inputs alphabetically

ECU Communication Fail Block 10

Related FW	1.1.0	Related applications	MCB
LBI ID	1029		
Description			
Activation of this binary input blocks all protections (including user protections) for ECU configured in ECU slot 10. Alarm Wrn ECU 10 Comm Fail (page 731) is deactivated while this LBI is active.			

⬅ back to Logical binary inputs alphabetically

ECU Communication Fail Block 11

Related FW	1.1.0	Related applications	MCB
LBI ID	1030		
Description			
Activation of this binary input blocks all protections (including user protections) for ECU configured in ECU slot 11. Alarm Wrn ECU 11 Comm Fail (page 731) is deactivated while this LBI is active.			

⬅ back to Logical binary inputs alphabetically

ECU Communication Fail Block 12

Related FW	1.1.0	Related applications	MCB
LBI ID	1031		
Description			
Activation of this binary input blocks all protections (including user protections) for ECU configured in ECU slot 12. Alarm Wrn ECU 12 Comm Fail (page 732) is deactivated while this LBI is active.			

⬅ back to Logical binary inputs alphabetically

ECU Communication Fail Block 13

Related FW	1.1.0	Related applications	MCB
LBI ID	1032		
Description			
Activation of this binary input blocks all protections (including user protections) for ECU configured in ECU slot 13. Alarm Wrn ECU 13 Comm Fail (page 732) is deactivated while this LBI is active.			

⬅ back to Logical binary inputs alphabetically

ECU Communication Fail Block 14

Related FW	1.1.0	Related applications	MCB
LBI ID	1033		
Description			
Activation of this binary input blocks all protections (including user protections) for ECU configured in ECU slot 14. Alarm Wrn ECU 14 Comm Fail (page 732) is deactivated while this LBI is active.			

⬅ back to Logical binary inputs alphabetically

ECU Communication Fail Block 15

Related FW	1.1.0	Related applications	MCB
LBI ID	1034		
Description			
Activation of this binary input blocks all protections (including user protections) for ECU configured in ECU slot 15. Alarm Wrn ECU 15 Comm Fail (page 733) is deactivated while this LBI is active.			

⬆ back to Logical binary inputs alphabetically

ECU Communication Fail Block 16

Related FW	1.1.0	Related applications	MCB
LBI ID	1035		
Description			
Activation of this binary input blocks all protections (including user protections) for ECU configured in ECU slot 16. Alarm Wrn ECU 16 Comm Fail (page 733) is deactivated while this LBI is active.			

⬆ back to Logical binary inputs alphabetically


Emergency MAN

Related FW	1.1.0	Related applications	MCB
LBI ID	45		
Description			
This input is designed to allow the breakers to be controlled externally (not by the controller). This feature can be useful in case of some failure, which disables the breakers to be controlled by the controller.			
The controller behaves in the following way:			
<ul style="list-style-type: none">➤ Stops all functions regarding the breaker control, deactivates all outputs related to it.➤ When the input is deactivated, the controller takes control according to the situation in the moment of deactivation.			

⬆ back to Logical binary inputs alphabetically

LBI: F

Fault Reset Button

Related FW	1.1.0	Related applications	MCB
LBI ID	191		
Description			
Binary input has the same function as Fault Reset button  on an External display (page 77) .			

⬆ back to Logical binary inputs alphabetically

Force Protection Disable

Related FW	1.1.0	Related applications	MCB
LBI ID	16		
Description			
Selected protections are disabled if LBI: Force Protection Disable is active..			
Activation and deactivation of this binary input will create history record:			
<div><div>></div>Force Protection Disable active</div>			
<div><div>></div>Force Protection Disable inactive</div>			
Behavior depends on configuration of LBI - normally close or normally open.			

⬅ back to Logical binary inputs alphabetically

Forced Value Input 01

Related FW	1.1.0	Related applications	MCB
LBI ID	19		
Description			
This LBI is used for activation of preconfigured Forced Value (page 140) to setpoint.			
<i>Note: This LBI can be renamed during configuration.</i>			

⬅ back to Logical binary inputs alphabetically

Forced Value Input 02

Related FW	1.1.0	Related applications	MCB
LBI ID	20		
Description			
This LBI is used for activation of preconfigured Forced Value (page 140) to setpoint.			
<i>Note: This LBI can be renamed during configuration.</i>			

⬅ back to Logical binary inputs alphabetically

Forced Value Input 03

Related FW	1.1.0	Related applications	MCB
LBI ID	21		
Description			
This LBI is used for activation of preconfigured Forced Value (page 140) to setpoint.			
<i>Note: This LBI can be renamed during configuration.</i>			

⬅ back to Logical binary inputs alphabetically

Forced Value Input 04

Related FW	1.1.0	Related applications	MCB
LBI ID	22		
Description			
This LBI is used for activation of preconfigured Forced Value (page 140) to setpoint.			
Note: This LBI can be renamed during configuration.			

⬅ back to Logical binary inputs alphabetically

Forced Value Input 05

Related FW	1.1.0	Related applications	MCB
LBI ID	23		
Description			
This LBI is used for activation of preconfigured Forced Value (page 140) to setpoint.			
Note: This LBI can be renamed during configuration.			

⬅ back to Logical binary inputs alphabetically

Forced Value Input 06

Related FW	1.1.0	Related applications	MCB
LBI ID	24		
Description			
This LBI is used for activation of preconfigured Forced Value (page 140) to setpoint.			
Note: This LBI can be renamed during configuration.			

⬅ back to Logical binary inputs alphabetically

Forced Value Input 07

Related FW	1.1.0	Related applications	MCB
LBI ID	25		
Description			
This LBI is used for activation of preconfigured Forced Value (page 140) to setpoint.			
Note: This LBI can be renamed during configuration.			

⬅ back to Logical binary inputs alphabetically

Forced Value Input 08

Related FW	1.1.0	Related applications	MCB
LBI ID	26		
Description			
This LBI is used for activation of preconfigured Forced Value (page 140) to setpoint.			
Note: This LBI can be renamed during configuration.			

⬅ back to Logical binary inputs alphabetically

Forced Value Input 09

Related FW	1.1.0	Related applications	MCB
LBI ID	27		
Description			
This LBI is used for activation of preconfigured Forced Value (page 140) to setpoint.			
Note: This LBI can be renamed during configuration.			

⬅ back to Logical binary inputs alphabetically

Forced Value Input 10

Related FW	1.1.0	Related applications	MCB
LBI ID	28		
Description			
This LBI is used for activation of preconfigured Forced Value (page 140) to setpoint.			
Note: This LBI can be renamed during configuration.			

⬅ back to Logical binary inputs alphabetically

Forced Value Input 11

Related FW	1.1.0	Related applications	MCB
LBI ID	29		
Description			
This LBI is used for activation of preconfigured Forced Value (page 140) to setpoint.			
Note: This LBI can be renamed during configuration.			

⬅ back to Logical binary inputs alphabetically

Forced Value Input 12

Related FW	1.1.0	Related applications	MCB
LBI ID	30		
Description			
This LBI is used for activation of preconfigured Forced Value (page 140) to setpoint.			
Note: This LBI can be renamed during configuration.			

⬅ back to Logical binary inputs alphabetically

Forced Value Input 13

Related FW	1.1.0	Related applications	MCB
LBI ID	31		
Description			
This LBI is used for activation of preconfigured Forced Value (page 140) to setpoint.			
Note: This LBI can be renamed during configuration.			

⬅ back to Logical binary inputs alphabetically

Forced Value Input 14

Related FW	1.1.0	Related applications	MCB
LBI ID	32		
Description			
This LBI is used for activation of preconfigured Forced Value (page 140) to setpoint.			
<i>Note: This LBI can be renamed during configuration.</i>			

⬅ back to Logical binary inputs alphabetically

Forced Value Input 15

Related FW	1.1.0	Related applications	MCB
LBI ID	33		
Description			
This LBI is used for activation of preconfigured Forced Value (page 140) to setpoint.			
<i>Note: This LBI can be renamed during configuration.</i>			

⬅ back to Logical binary inputs alphabetically

Forced Value Input 16

Related FW	1.1.0	Related applications	MCB
LBI ID	34		
Description			
This LBI is used for activation of preconfigured Forced Value (page 140) to setpoint.			
<i>Note: This LBI can be renamed during configuration.</i>			

⬅ back to Logical binary inputs alphabetically

Forced Value Input 17

Related FW	1.1.0	Related applications	MCB
LBI ID	839		
Description			
This LBI is used for activation of preconfigured Forced Value (page 140) to setpoint.			
<i>Note: This LBI can be renamed during configuration.</i>			

⬅ back to Logical binary inputs alphabetically

Forced Value Input 18

Related FW	1.1.0	Related applications	MCB
LBI ID	840		
Description			
This LBI is used for activation of preconfigured Forced Value (page 140) to setpoint.			
<i>Note: This LBI can be renamed during configuration.</i>			

⬅ back to Logical binary inputs alphabetically

Forced Value Input 19

Related FW	1.1.0	Related applications	MCB
LBI ID	841		
Description			
This LBI is used for activation of preconfigured Forced Value (page 140) to setpoint.			
Note: This LBI can be renamed during configuration.			

⬅ back to Logical binary inputs alphabetically

Forced Value Input 20

Related FW	1.1.0	Related applications	MCB
LBI ID	842		
Description			
This LBI is used for activation of preconfigured Forced Value (page 140) to setpoint.			
Note: This LBI can be renamed during configuration.			

⬅ back to Logical binary inputs alphabetically

Forced Value Input 21

Related FW	1.1.0	Related applications	MCB
LBI ID	843		
Description			
This LBI is used for activation of preconfigured Forced Value (page 140) to setpoint.			
Note: This LBI can be renamed during configuration.			

⬅ back to Logical binary inputs alphabetically

Forced Value Input 22

Related FW	1.1.0	Related applications	MCB
LBI ID	844		
Description			
This LBI is used for activation of preconfigured Forced Value (page 140) to setpoint.			
Note: This LBI can be renamed during configuration.			

⬅ back to Logical binary inputs alphabetically

Forced Value Input 23

Related FW	1.1.0	Related applications	MCB
LBI ID	845		
Description			
This LBI is used for activation of preconfigured Forced Value (page 140) to setpoint.			
Note: This LBI can be renamed during configuration.			

⬅ back to Logical binary inputs alphabetically

Forced Value Input 24

Related FW	1.1.0	Related applications	MCB
LBI ID	846		
Description			
This LBI is used for activation of preconfigured Forced Value (page 140) to setpoint.			
Note: This LBI can be renamed during configuration.			

⬅ back to Logical binary inputs alphabetically

Forced Value Input 25

Related FW	1.1.0	Related applications	MCB
LBI ID	847		
Description			
This LBI is used for activation of preconfigured Forced Value (page 140) to setpoint.			
Note: This LBI can be renamed during configuration.			

⬅ back to Logical binary inputs alphabetically

Forced Value Input 26

Related FW	1.1.0	Related applications	MCB
LBI ID	848		
Description			
This LBI is used for activation of preconfigured Forced Value (page 140) to setpoint.			
Note: This LBI can be renamed during configuration.			

⬅ back to Logical binary inputs alphabetically

Forced Value Input 27

Related FW	1.1.0	Related applications	MCB
LBI ID	849		
Description			
This LBI is used for activation of preconfigured Forced Value (page 140) to setpoint.			
Note: This LBI can be renamed during configuration.			

⬅ back to Logical binary inputs alphabetically

Forced Value Input 28

Related FW	1.1.0	Related applications	MCB
LBI ID	850		
Description			
This LBI is used for activation of preconfigured Forced Value (page 140) to setpoint.			
Note: This LBI can be renamed during configuration.			

⬅ back to Logical binary inputs alphabetically

Forced Value Input 29

Related FW	1.1.0	Related applications	MCB
LBI ID	851		
Description			
This LBI is used for activation of preconfigured Forced Value (page 140) to setpoint.			
Note: This LBI can be renamed during configuration.			

⬅ back to Logical binary inputs alphabetically

Forced Value Input 30

Related FW	1.1.0	Related applications	MCB
LBI ID	852		
Description			
This LBI is used for activation of preconfigured Forced Value (page 140) to setpoint.			
Note: This LBI can be renamed during configuration.			

⬅ back to Logical binary inputs alphabetically

Forced Value Input 31

Related FW	1.1.0	Related applications	MCB
LBI ID	853		
Description			
This LBI is used for activation of preconfigured Forced Value (page 140) to setpoint.			
Note: This LBI can be renamed during configuration.			

⬅ back to Logical binary inputs alphabetically

Forced Value Input 32

Related FW	1.1.0	Related applications	MCB
LBI ID	854		
Description			
This LBI is used for activation of preconfigured Forced Value (page 140) to setpoint.			
Note: This LBI can be renamed during configuration.			

⬅ back to Logical binary inputs alphabetically

LBI: G

Group link

Related FW	1.1.0	Related applications	MCB
LBI ID	59		
Description			
<p>This input is used for logical connection and disconnection of two gen-set groups selected with setpoints Group Link L (page 276) and Group Link R (page 277). If the input is active, then the two selected groups will perform load sharing and Var sharing together as one large group.</p> <p>Note: This function is independent on the group which the particular controller belongs to, i.e. the controller can provide linking function e.g. for groups 3,4 although it belongs to group 2.</p>			

⬅ back to Logical binary inputs alphabetically

LBI: H

Hot Swap Ctrl Block

Related FW	1.1.0	Related applications	MCB
LBI ID	1047		
Description			
<p>This LBI is used to detect if this controller is considered to be dead by the second Hot Swap Redundancy (page 141) controller.</p> <p>If the LBI is activated this controller is considered to be dead and it is forced to the listening mode. The controller in listening mode does not send any messages to other controllers but only reads what is being transmitted. This LBI has to be physically wired to the LBO HOT SWAP SWITCH (PAGE 639) of the second Hot Swap Redundancy (page 141) controller.</p> <p><i>Note: If both Master and Backup controllers are alive, the Master is in control and the Backup is automatically in the listening mode. This LBI is used only to force the listening mode on controller which is considered to be dead by the second controller.</i></p> <p>IMPORTANT: This input has to be configured to physical input of the controller.</p> <p>IMPORTANT: This input has to be configured on both Master and Backup controllers.</p>			

⬅ back to Logical binary inputs alphabetically

Hot Swap Heartbeat Detect

Related FW	1.1.0	Related applications	MCB
LBI ID	1037		
Description			
<p>This LBI is used for detection that the second Hot Swap Redundancy (page 141) is alive.</p> <p>This LBI has to be physically wired to the LBO HOT SWAP HEARTBEAT (PAGE 638) of the second Hot Swap Redundancy (page 141) controller. If the Heartbeat signal is not received, this controller activates LBO Hot Swap Switch (page 639).</p>			
IMPORTANT: This input has to be configured to physical input of the controller.			
IMPORTANT: This input has to be configured on both Master and Backup controllers.			


⬅ back to Logical binary inputs alphabetically

Hot Swap Recovery

Related FW	1.1.0	Related applications	MCB
LBI ID	1048		
Description			
<p>This binary input is used to recover the Hot Swap Redundancy (page 141) system in case of Wrn Master Controller Failed or Wrn Backup Controller Failed alarm is present in the Alarm list.The necessary condition to recovery the system to the default state is that both controllers are in the OFF mode.</p>			
Note: <i>If warnings remains after the recovery, the wiring and configuration should be checked.</i>			

⬅ back to Logical binary inputs alphabetically

Horn Reset Button

Related FW	1.1.0	Related applications	MCB
LBI ID	192		
Description			
Binary input has the same function as Horn reset  button on an External display (page 77) .			

⬅ back to Logical binary inputs alphabetically

LBI: I

Imp/Exp Control

Related FW	1.1.0	Related applications	MCB
LBI ID	1187		
Description			
This logical input is used to activate Import/Export operation if MCB is closed and any Gen-set is in Load Sharing. If Import/Export is not active, System Baseload operation is used instead.			

⬅ back to Logical binary inputs alphabetically

LBI: L

Load Lower

Related FW	1.1.0	Related applications	MCB
LBI ID	1183		
Description			
This is multipurpose binary input which activates Load/Frequency lower rated change. If it is activated together with LOAD RAISE (PAGE 614) the request for Load control will be switched from setpoint input to the analog input LOAD CONTROL: SYSTEM BASELOAD (PAGE 654) or LOAD CONTROL: IMPORT/EXPORT (PAGE 654) .			

⬅ back to Logical binary inputs alphabetically

Load Raise

Related FW	1.1.0	Related applications	MCB
LBI ID	1182		
Description			
This is multipurpose binary input which activates Load/Frequency raise rated change. If it is activated together with LOAD LOWER (PAGE 614) the request for Load control will be switched from the setpoint input to the analog input LOAD CONTROL: SYSTEM BASELOAD (PAGE 654) or LOAD CONTROL: IMPORT/EXPORT (PAGE 654) .			

⬅ back to Logical binary inputs alphabetically

LBI: M

Mains Fail Block

Related FW	1.1.0	Related applications	MCB
LBI ID	622		
Description			
This logical input simulates healthy Mains even if the Mains parameters are not OK.			

⬅ back to Logical binary inputs alphabetically

MCB Disable

Related FW	1.1.0	Related applications	MCB
LBI ID	124		
Description			
<p>This binary input is used to prevent MCB closing and opening.</p> <ul style="list-style-type: none">➤ If the input is active during synchronizing, the controller will continue synchronizing without issuing the MCB closing command until the input is deactivated or Sync timeout is elapsed.➤ If the input is active and the MCB Button is pressed in MAN mode to close the MCB to dead bus, the MCB will not be closed until this input is deactivated and the MCB Button is pressed again.➤ If the input is active and the MCB is to be closed to dead bus automatically, the MCB will not be closed until this input is deactivated.➤ If the input is active and MCB is already closed, the breaker will not open.			

 [back to Logical binary inputs alphabetically](#)

MCB Feedback

Related FW	1.1.0	Related applications	MCB
LBI ID	65		

Description

Use this input to indicate whether the mains circuit breaker is opened or closed.

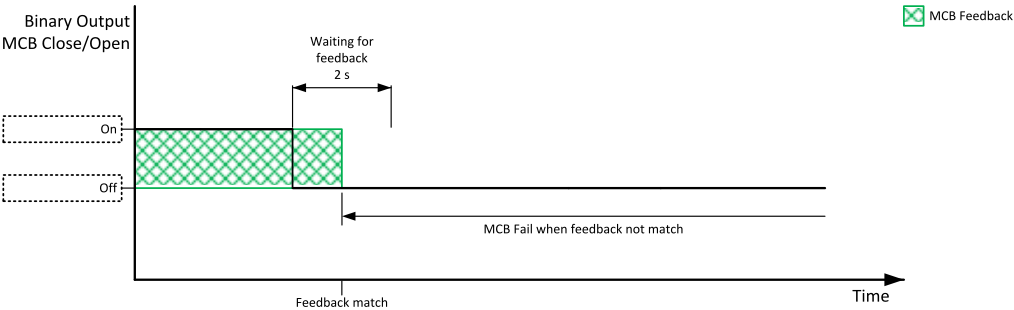


Image 7.4 MCB Feedback 1

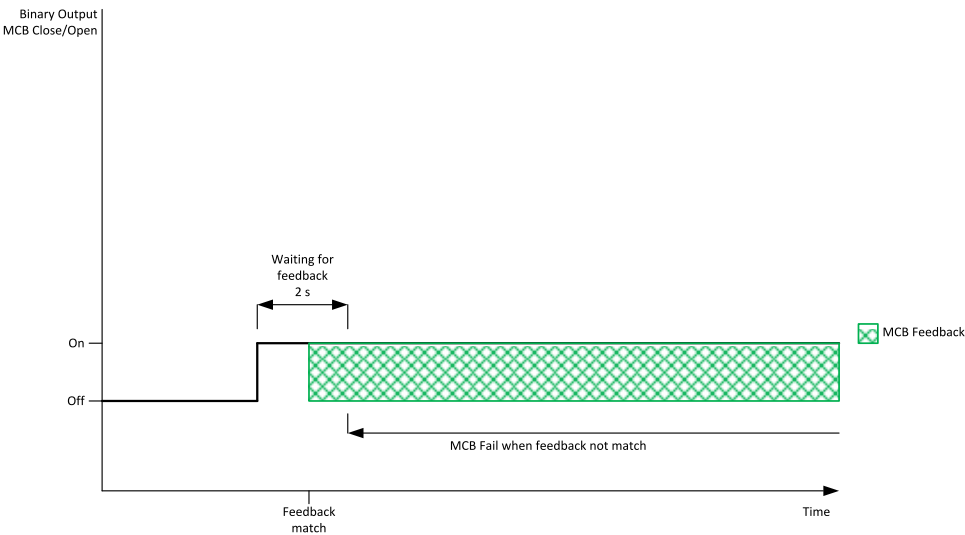


Image 7.5 MCB Feedback 2

[back to Logical binary inputs alphabetically](#)

MCB Feedback Negative

Related FW	1.1.0	Related applications	MCB
LBI ID	66		
Description			
<p>Use this input to indicate whether the mains circuit breaker is opened or closed.</p> <p>This input is logically inverted against LBI MCB FEEDBACK (PAGE 616).</p>			

Image 7.6 MCB Feedback 1

Image 7.7 MCB Feedback 2

⬅ back to Logical binary inputs alphabetically

MCB Isolated

Related FW	1.1.0	Related applications	MCB
LBI ID	601		
Description			
<p>This binary input is used as signalization to the CU that Load is cut off from the MCB by the external isolator. That can be useful in case the MCB fails to open, and it is required to run the Systems in Island/Multiple Island operation.</p>			
<p>Note: The alarm AHI MCB Isolated (page 748) is turned on when the MCB Isolated is active and the MCB is disabled.</p>			

⬅ back to Logical binary inputs alphabetically

LBI: N

Not Used

Related FW	1.1.0	Related applications	MCB
LBI ID	184		
Description			
Binary input has no function. Use this configuration when binary input is not used.			

⬅ back to Logical binary inputs alphabetically

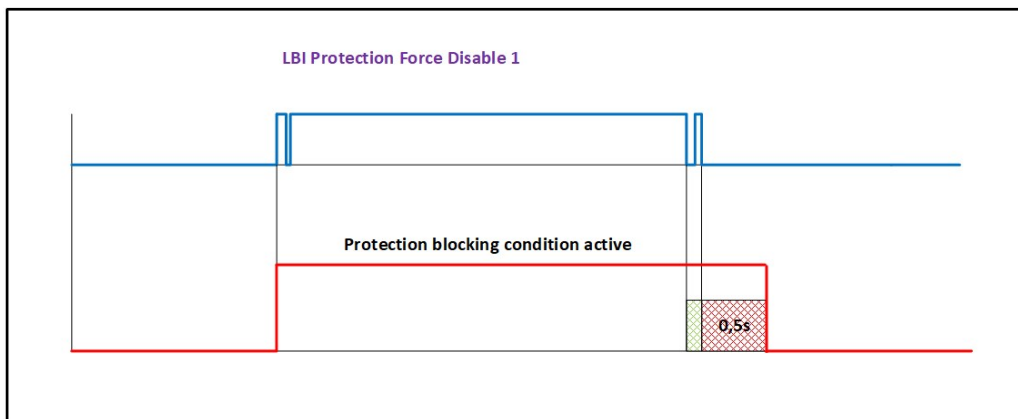
LBI: P

Process Control

Related FW	1.1.0	Related applications	MCB
LBI ID	1184		
Description			
This logical input is used to switch from the Load Control to the Process Control. The LAI PROCESS CONTROL: P REQUEST (PAGE 656) will be used as direct source for P Request.			
Note: The Process Control has higher priority than Import/Export.			

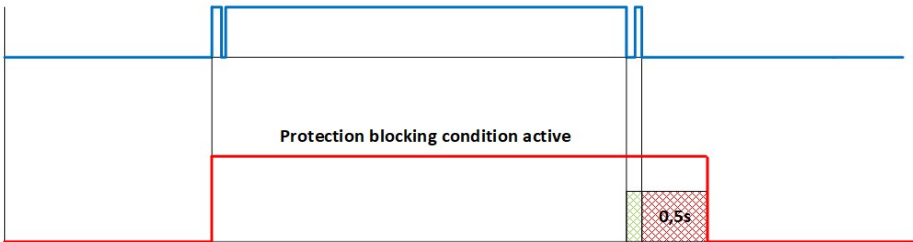
⬅ back to Logical binary inputs alphabetically

Protection Force Disable 1

Related FW	1.1.0	Related applications	MCB
LBI ID	16		
Description			
Activation of this LBI disables selected protections.			
Proper history record is written to the history log.			
<ul style="list-style-type: none">➤ Protection Force Disable 1 active➤ Protection Force Disable 1 inactive			
			

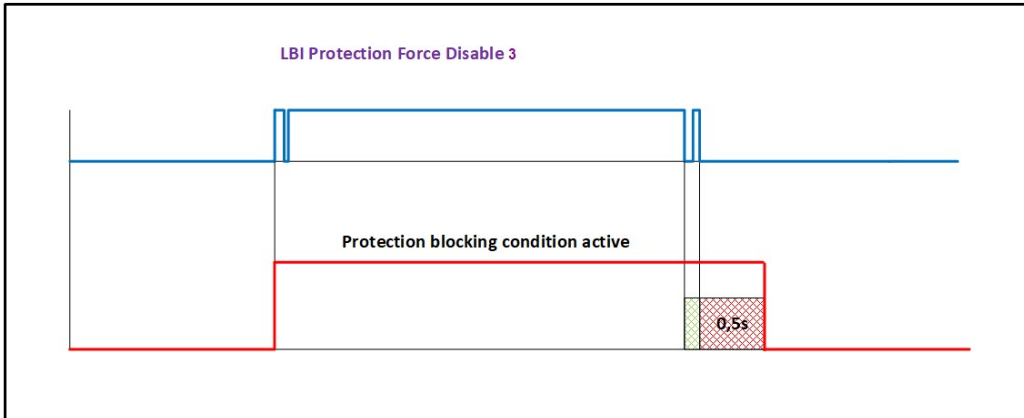
⬅ back to Logical binary inputs alphabetically

Protection Force Disable 2

Related FW	1.1.0	Related applications	MCB
LBI ID	17		
Description			
Activation of this LBI disables selected protections.			
Proper history record is written to the history log.			
<div>> Protection Force Disable 2 active</div> <div>> Protection Force Disable 2 inactive</div>			
<div><div><div>LBI Protection Force Disable 2</div></div></div>			

[back to Logical binary inputs alphabetically](#)

Protection Force Disable 3

Related FW	1.1.0	Related applications	MCB
LBI ID	18		
Description			
Activation of this LBI disables selected protections.			
Proper history record is written to the history log.			
<div>> Protection Force Disable 3 active</div> <div>> Protection Force Disable 3 inactive</div>			
<div><div>LBI Protection Force Disable 3</div></div>			

[back to Logical binary inputs alphabetically](#)

Pulse Counter 1

Related FW	1.1.0	Related applications	MCB
LBI ID	87		
Description			
This is the input of the "slow" Pulse Counters (page 169) function which is connected with LBI PULSE COUNTER 1 (PAGE 620) .			

⬆ back to Logical binary inputs alphabetically

Pulse Counter 2

Related FW	1.1.0	Related applications	MCB
LBI ID	88		
Description			
This is the input of the "slow" Pulse Counters (page 169) function which is connected with LBI PULSE COUNTER 2 (PAGE 620) .			

⬆ back to Logical binary inputs alphabetically

LBI: R

Ramp Pause

Related FW	1.1.0	Related applications	MCB
LBI ID	1173		
Description			
This LBI is used to freeze actual Load request (Required P).			
Note: The Ramp Pause has higher priority than Process Control and Import/Export.			

⬆ back to Logical binary inputs alphabetically

Remote RUN MODE

Related FW	1.1.0	Related applications	MCB
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 TEST			
➤ Remote MAN			
➤ Remote AUTO (Lowest Priority)			

⬆ back to Logical binary inputs alphabetically

Remote PRG MODE

Related FW	1.1.0	Related applications	MCB
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 TEST			
➤ Remote MAN			
➤ Remote AUTO (Lowest Priority)			

⬅ back to Logical binary inputs alphabetically

LBI: S

Synchronization Check

Related FW	1.1.0	Related applications	MCB
LBI ID	1166		
Description			
This logical input activates synchronization without breaker closing. Breaker will not be closed after synchronization windows is reached.			

⬅ back to Logical binary inputs alphabetically

Synchronization Permissive

Related FW	1.1.0	Related applications	MCB
LBI ID	1167		
Description			
This logical input is used to activate passive synchronization. It only allows to automatically close the breaker when synchronization windows is reached.			
Note: Passive synchronization can be used together with rated change.			

⬅ back to Logical binary inputs alphabetically

Synchronization Run

Related FW	1.1.0	Related applications	MCB
LBI ID	1168		
Description			
This logical input activates synchronization with automatic breaker closing when synchronization windows is reached.			

⬅ back to Logical binary inputs alphabetically

LBI: T

Time Stamp Act

Related FW	1.1.0	Related applications	MCB
LBI ID	125		
Description			
This binary input is used as activation condition for periodic history records if setpoint Time Stamp Act (page 278) is set to Condition.			

⬅ back to Logical binary inputs alphabetically

LBI: U

Utility Unload

Related FW	1.1.0	Related applications	MCB
LBI ID	120		
Description			
This logical input is used to unload Utility/Mains and transfer all load to Gen-sets in Load Sharing. If all Gen-sets in Load Sharing run on their nominal power and Mains Unload MCB Open Window (page 296) is not reached the unloading is stopped.			

⬅ back to Logical binary inputs alphabetically

LBI: V

Voltage Raise

Related FW	1.1.0	Related applications	MCB
LBI ID	1180		
Description			
This is multipurpose binary input which activates Var/Voltage raise rated change. If it is activated together with VOLTAGE LOWER (PAGE 622) the request for PF/Q control will be switched from the constant (manual) excitation to the automatic control defined by setpoints in Subgroup: PF/Q Control (page 302).			

⬅ back to Logical binary inputs alphabetically

Voltage Lower

Related FW	1.1.0	Related applications	MCB
LBI ID	1181		
Description			
This is multipurpose binary input which activates Var/Voltage lower rated change. If it is activated together with VOLTAGE RAISE (PAGE 622) the request for PF/Q control will be switched from the constant (manual) excitation to the automatic control defined by setpoints in Subgroup: PF/Q Control (page 302).			

⬅ back to Logical binary inputs alphabetically

8.1.7 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	625
LBO: B	627
LBO: C	627
LBO: D	630
LBO: E	630
LBO: F	637
LBO: G	637
LBO: H	638
LBO: I	640
LBO: M	641
LBO: N	645
LBO: O	645
LBO: P	645
LBO: S	647

For full list of Logical binary outputs go to the chapter **Logical binary outputs alphabetically (page 624)**.

Logical binary outputs alphabetically

LBO: A	625	ECU 6 Comm Fail	631	HornRes Button Echo	639
Access Locked	625	ECU 7 Comm Fail	631	HW AC Voltage	
Alarm	625	ECU 8 Comm Fail	631	Measurement Error	639
Alarm Flashing	625	ECU 9 Comm Fail	631	LBO: I	640
Alarm Bus Frequency	625	ECU 10 Comm Fail	632	In Synchronism	640
Alarm Overcurrent	625	ECU 11 Comm Fail	632	In Mains Parallel	640
Alarm Bus Voltage	626	ECU 12 Comm Fail	632	Initialized	640
Alarm Bus	626	ECU 13 Comm Fail	632	LBO: M	641
Alarm Bus Frequency	626	ECU 14 Comm Fail	632	Mains Healthy	641
Alarm Bus Voltage	626	ECU 15 Comm Fail	632	Mains P High Limit	641
Any GCB Closed	627	ECU 16 Comm Fail	633	Mains P Low Limit	641
Any Gen-set In Load Shar	627	ECU Comm OK	633	MCB Close/Open	641
LBO: B	627	Exercise Timer 1	633	MCB OFF Coil	642
Bus Healthy	627	Exercise Timer 2	633	MCB ON Coil	643
LBO: C	627	Exercise Timer 3	634	MCB Status	643
Common Alarm Active		Exercise Timer 4	634	MCB UV Coil	644
Level 1	627	Exercise Timer 5	634	Minimal Power PTM	
Common Alarm Active		Exercise Timer 6	635	Limitation	644
Level 2	628	Exercise Timer 7	635	Mode RUN	644
Common Alarm Level 1	628	Exercise Timer 8	635	Mode PRG	645
Common Alarm Level 2	628	Exercise Timer 9	636	LBO: N	645
Common Alarm Only	628	Exercise Timer 10	636	Not Used	645
Common History Record	628	Exercise Timer 11	636	LBO: O	645
Common Mains Protection	629	Exercise Timer 12	637	Open GCB In Load Shar	645
Common Mains Protection		LBO: F	637	LBO: P	645
+ FltRes	629	FltRes Button Echo	637	Peripheral Module Comm	
Common System		LBO: G	637	Fail	645
StopProtection	629	Generator Capability C		Power Switch 1	646
Common Warning	629	Limit	637	Power Switch 2	647
LBO: D	630	Generator Capability L		System Power Limitation	647
Deadbus	630	Limit	637	LBO: S	647
LBO: E	630	LBO: H	638	Still Log 0	647
ECU Comm Fail	630	Heartbeat	638	Still Log 1	648
ECU 1 Comm Fail	630	Horn	638	Sync To Mains Allowed	648
ECU 2 Comm Fail	630	Horn Flashing	638	Synchronization	648
ECU 3 Comm Fail	630	Hot Swap Heartbeat	638	System P High Limit	648
ECU 4 Comm Fail	631	Hot Swap Switch	639	System P Low Limit	648
ECU 5 Comm Fail	631				

🔍 back to Controller objects

LBO: A

Access Locked

Related FW	1.1.0	Related applications	MCB
LBO ID	2480		
Description			
This output is closed when the function Access lock (page 119) is activated and it can be used to block any LBOs which are required to be locked.			

⬅ back to Logical binary outputs alphabetically

Alarm

Related FW	1.1.0	Related applications	MCB
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 Flashing

Related FW	1.1.0	Related applications	MCB
LBO ID	28		
Description			
This is the flashing alternative of the output ALARM (PAGE 625) , i.e. the output flashes with 1 Hz period while the output Alarm is closed.			

⬅ back to Logical binary outputs alphabetically

Alarm Bus Frequency

Related FW	1.1.0	Related applications	MCB
LBO ID	1266		
Description			
This output is active when at least 1 protection caused by Bus >f Protection (page 353) or Bus <f Protection (page 354) is active.			

⬅ back to Logical binary outputs alphabetically

Alarm Overcurrent

Related FW	1.1.0	Related applications	MCB
LBO ID	109		
Description			
This output is active while at least one of the following overcurrent protection is active Short Circuit Protection (page 337) or IDMT Overcurrent Protection (page 337) .			

⬅ back to Logical binary outputs alphabetically

Alarm Bus Voltage

Related FW	1.1.0	Related applications	MCB
LBO ID	1263		
Description			
This output is active when at least 1 alarm caused by Bus >V Protection (page 346) or Bus <V Protection (page 347) is present in the alarmlist.			

⬅ back to Logical binary outputs alphabetically

Alarm Bus

Related FW	1.1.0	Related applications	MCB
LBO ID	197		
Description			
This output is active when at least 1 protection caused by Mains >>V Protection (page 341) , Mains >V Protection (page 339) or Mains <V Protection (page 343) , Mains <<V Protection (page 344) , Mains >>f Protection (page 350) , Mains >f Protection (page 349) , Mains <f Protection (page 351) , Mains <<f Protection (page 352) is active.			

⬅ back to Logical binary outputs alphabetically

Alarm Bus Frequency

Related FW	1.1.0	Related applications	MCB
LBO ID	1271		
Description			
This output is closed when at least 1 protection caused by Mains >>f Protection (page 350) Mains >f Protection (page 349) , Mains <f Protection (page 351) or Mains <<f Protection (page 352) is active.			

⬅ back to Logical binary outputs alphabetically

Alarm Bus Voltage

Related FW	1.1.0	Related applications	MCB
LBO ID	1270		
Description			
This output is closed when at least 1 protection caused by Mains >>V Protection (page 341) Mains >V Protection (page 339) , Mains <V Protection (page 343) or Mains <<V Protection (page 344) is active.			

⬅ back to Logical binary outputs alphabetically

Any GCB Closed

Related FW	1.1.0	Related applications	MCB
LBO ID	222		
Description			
This output is active when a GCB of any controller connected via ⑩ CAN2A (page 43) and/or ⑪ CAN2B (page 43) is closed.			
Note: This function works on CAN16 (page 501) - CAN64 (page 502) values, therefore it ignores Control Groups (page 193).			

⬆ back to Logical binary outputs alphabetically

Any Gen-set In Load Shar

Related FW	1.1.0	Related applications	MCB
LBO ID	5598		
Description			
This output is activated when there is at least one Gen-set with closed GCB and active Load/Unload (in Load Sharing) in the same group as IM controller.			

⬆ back to Logical binary outputs alphabetically

LBO: B

Bus Healthy

Related FW	1.1.0	Related applications	MCB
LBO ID	77		
Description			
This output is closed while Bus parameters (voltage & frequency) are considered as healthy, i.e. within limits.			

⬆ back to Logical binary outputs alphabetically

LBO: C

Common Alarm Active Level 1

Related FW	1.1.0	Related applications	MCB
LBO ID	13		
Description			
This output is closed when there is at least one Alarms level 1 (page 706) in the alarmlist.			

⬆ back to Logical binary outputs alphabetically

Common Alarm Active Level 2

Related FW	1.1.0	Related applications	MCB
LBO ID	15		
Description			
This output is closed when there is at least one Alarms level 2 (page 757) in the alarmlist.			

⬅ back to Logical binary outputs alphabetically

Common Alarm Level 1

Related FW	1.1.0	Related applications	MCB
LBO ID	14		
Description			
This output is closed when there is at least one unconfirmed Alarms level 1 (page 706) in the alarmlist.			

⬅ back to Logical binary outputs alphabetically

Common Alarm Level 2

Related FW	1.1.0	Related applications	MCB
LBO ID	16		
Description			
This output is closed when there is at least one unconfirmed Alarms level 2 (page 757) in the alarmlist.			

⬅ back to Logical binary outputs alphabetically

Common Alarm Only

Related FW	1.1.0	Related applications	MCB
LBO ID	11		
Description			
This output is closed when there is at least one alarm of type Alarm Only (page 743) present in the alarmlist.			

⬅ back to Logical binary outputs alphabetically

Common History Record

Related FW	1.1.0	Related applications	MCB
LBO ID	12		
Description			
This output is closed for 1 second every time alarm of type History Record Only (page 748) occurs.			
Note: When any History Record alarm is activated the history record is logged into history.			

⬅ back to Logical binary outputs alphabetically

Common Mains Protection

Related FW	1.1.0	Related applications	MCB
LBO ID	10		
Description			
This output is closed when there is at least one active alarm of type Mains Protection* (page 212).			
Note: When any Mains Protection alarm is activated the Mains fail is signaled and AMF Function (page 184) is started if it is enabled.			

⬅ back to Logical binary outputs alphabetically

Common Mains Protection + FltRes

Related FW	1.1.0	Related applications	MCB
LBO ID	4		
Description			
This output is closed when there is at least one active alarm of type Mains Protection + FltRes (page 212) present in the alarmlist.			
Note: When any Mains Protection + FltRes alarm is activated the MCB opens immediately.			

⬅ back to Logical binary outputs alphabetically

Common System StopProtection

Related FW	1.1.0	Related applications	MCB
LBO ID	5		
Description			
This output is closed when there is at least one alarm of type System Protection (page 771) present in the alarmlist.			
Note: When any SP alarm is activated the IM sends command to all Gen-sets in Load Shar in the same group or connected via BTB to do soft unload and open their GCBs.			

⬅ back to Logical binary outputs alphabetically

Common Warning

Related FW	1.1.0	Related applications	MCB
LBO ID	3		
Description			
This output is closed when there is at least one alarm of type Warning (page 709) present in the alarmlist.			

⬅ back to Logical binary outputs alphabetically

LBO: D

Deadbus

Related FW	1.1.0	Related applications	MCB
LBO ID	2675		
Description			
This output is active when the Bus is considered to be dead (Bus voltage is below relative value set by the setpoint Bus Dead Level (page 269)).			

🔍 back to Logical binary outputs alphabetically

LBO: E

ECU Comm Fail

Related FW	1.1.0	Related applications	MCB
LBO ID	114		
Description			
This output is closed when there is no communication with at least one configured ECU.			

🔍 back to Logical binary outputs alphabetically

ECU 1 Comm Fail

Related FW	1.1.0	Related applications	MCB
LBO ID	1998		
Description			
This output is closed when there is no communication with ECU configured in ECU slot 1.			

🔍 back to Logical binary outputs alphabetically

ECU 2 Comm Fail

Related FW	1.1.0	Related applications	MCB
LBO ID	1999		
Description			
This output is closed when there is no communication with ECU configured in ECU slot 2.			

🔍 back to Logical binary outputs alphabetically

ECU 3 Comm Fail

Related FW	1.1.0	Related applications	MCB
LBO ID	2000		
Description			
This output is closed when there is no communication with ECU configured in ECU slot 3.			

🔍 back to Logical binary outputs alphabetically

ECU 4 Comm Fail

Related FW	1.1.0	Related applications	MCB
LBO ID	2001		
Description			
This output is closed when there is no communication with ECU configured in ECU slot 4.			

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ECU 5 Comm Fail

Related FW	1.1.0	Related applications	MCB
LBO ID	2002		
Description			
This output is closed when there is no communication with ECU configured in ECU slot 5.			

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ECU 6 Comm Fail

Related FW	1.1.0	Related applications	MCB
LBO ID	2003		
Description			
This output is closed when there is no communication with ECU configured in ECU slot 6.			

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ECU 7 Comm Fail

Related FW	1.1.0	Related applications	MCB
LBO ID	2004		
Description			
This output is closed when there is no communication with ECU configured in ECU slot 7.			

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ECU 8 Comm Fail

Related FW	1.1.0	Related applications	MCB
LBO ID	2005		
Description			
This output is closed when there is no communication with ECU configured in ECU slot 8.			

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ECU 9 Comm Fail

Related FW	1.1.0	Related applications	MCB
LBO ID	2006		
Description			
This output is closed when there is no communication with ECU configured in ECU slot 9.			

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ECU 10 Comm Fail

Related FW	1.1.0	Related applications	MCB
LBO ID	2007		
Description			
This output is closed when there is no communication with ECU configured in ECU slot 10.			

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ECU 11 Comm Fail

Related FW	1.1.0	Related applications	MCB
LBO ID	2008		
Description			
This output is closed when there is no communication with ECU configured in ECU slot 11.			

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ECU 12 Comm Fail

Related FW	1.1.0	Related applications	MCB
LBO ID	2009		
Description			
This output is closed when there is no communication with ECU configured in ECU slot 12.			

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ECU 13 Comm Fail

Related FW	1.1.0	Related applications	MCB
LBO ID	2010		
Description			
This output is closed when there is no communication with ECU configured in ECU slot 13.			

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ECU 14 Comm Fail

Related FW	1.1.0	Related applications	MCB
LBO ID	2011		
Description			
This output is closed when there is no communication with ECU configured in ECU slot 14.			

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ECU 15 Comm Fail

Related FW	1.1.0	Related applications	MCB
LBO ID	2012		
Description			
This output is closed when there is no communication with ECU configured in ECU slot 15.			

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ECU 16 Comm Fail

Related FW	1.1.0	Related applications	MCB
LBO ID	2013		
Description			
This output is closed when there is no communication with ECU configured in ECU slot 16.			

⬅ back to Logical binary outputs alphabetically

ECU Comm OK

Related FW	1.1.0	Related applications	MCB
LBO ID	347		
Description			
This output is closed when all configured ECUs are communicating without any issue.			

⬅ back to Logical binary outputs alphabetically

Exercise Timer 1

Related FW	1.1.0	Related applications	MCB
LBO ID	1250		
Description			
This output is closed when the Exercise timer 1 is activated. The output can be used to make periodic tests of the System, breakers, any external logic etc. and its activation depends on the setpoints in the Subgroup: Timer 1 (page 417) subgroup.			
Note: If more than one timer is active at the same time, timer with selected higher priority function is applied.			

⬅ back to Logical binary outputs alphabetically

Exercise Timer 2

Related FW	1.1.0	Related applications	MCB
LBO ID	1251		
Description			
This output is closed when the Exercise timer 2 is activated. The output can be used to make periodic tests of the System, breakers, any external logic etc. and its activation depends on the setpoints in the Subgroup: Timer 2 (page 419) subgroup.			
Note: If more than one timer is active at the same time, timer with selected higher priority function is applied.			

⬅ back to Logical binary outputs alphabetically

Exercise Timer 3

Related FW	1.1.0	Related applications	MCB
LBO ID	1946		
Description			
This output is closed when the Exercise timer 3 is activated. The output can be used to make periodic tests of the System, breakers, any external logic etc. and its activation depends on the setpoints in the Subgroup: Timer 3 (page 421) subgroup.			
Note: <i>If more than one timer is active at the same time, timer with selected higher priority function is applied.</i>			

⬅ back to Logical binary outputs alphabetically

Exercise Timer 4

Related FW	1.1.0	Related applications	MCB
LBO ID	1947		
Description			
This output is closed when the Exercise timer 4 is activated. The output can be used to make periodic tests of the System, breakers, any external logic etc. and its activation depends on the setpoints in the Subgroup: Timer 4 (page 423) subgroup.			
Note: <i>If more than one timer is active at the same time, timer with selected higher priority function is applied.</i>			

⬅ back to Logical binary outputs alphabetically

Exercise Timer 5

Related FW	1.1.0	Related applications	MCB
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 System, breakers, any external logic etc. and its activation depends on the setpoints in the Subgroup: Timer 5 (page 425) subgroup.			
Note: <i>If more than one timer is active at the same time, timer with selected higher priority function is applied.</i>			

⬅ back to Logical binary outputs alphabetically

Exercise Timer 6

Related FW	1.1.0	Related applications	MCB
LBO ID	1949		
Description			
This output is closed when the Exercise timer 6 is activated. The output can be used to make periodic tests of the System, breakers, any external logic etc. and its activation depends on the setpoints in the Subgroup: Timer 6 (page 427) subgroup.			
Note: <i>If more than one timer is active at the same time, timer with selected higher priority function is applied.</i>			

⬅ back to Logical binary outputs alphabetically

Exercise Timer 7

Related FW	1.1.0	Related applications	MCB
LBO ID	1950		
Description			
This output is closed when the Exercise timer 7 is activated. The output can be used to make periodic tests of the System, breakers, any external logic etc. and its activation depends on the setpoints in the Subgroup: Timer 7 (page 429) subgroup.			
Note: <i>If more than one timer is active at the same time, timer with selected higher priority function is applied.</i>			

⬅ back to Logical binary outputs alphabetically

Exercise Timer 8

Related FW	1.1.0	Related applications	MCB
LBO ID	1951		
Description			
This output is closed when the Exercise timer 8 is activated. The output can be used to make periodic tests of the System, breakers, any external logic etc. and its activation depends on the setpoints in the Subgroup: Timer 8 (page 431) subgroup.			
Note: <i>If more than one timer is active at the same time, timer with selected higher priority function is applied.</i>			

⬅ back to Logical binary outputs alphabetically

Exercise Timer 9

Related FW	1.1.0	Related applications	MCB
LBO ID	2630		
Description			
<p>This output is closed when the Exercise timer 9 is activated. The output can be used to make periodic tests of the System, breakers, any external logic etc. and its activation depends on the setpoints in the Subgroup: Timer 9 (page 433) subgroup.</p>			
<p>Note: <i>If more than one timer is active at the same time, timer with selected higher priority function is applied.</i></p>			

⬅ back to Logical binary outputs alphabetically

Exercise Timer 10

Related FW	1.1.0	Related applications	MCB
LBO ID	2631		
Description			
<p>This output is closed when the Exercise timer 10 is activated. The output can be used to make periodic tests of the System, breakers, any external logic etc. and its activation depends on the setpoints in the Subgroup: Timer 10 (page 435) subgroup.</p>			
<p>Note: <i>If more than one timer is active at the same time, timer with selected higher priority function is applied.</i></p>			

⬅ back to Logical binary outputs alphabetically

Exercise Timer 11

Related FW	1.1.0	Related applications	MCB
LBO ID	2632		
Description			
<p>This output is closed when the Exercise timer 11 is activated. The output can be used to make periodic tests of the System, breakers, any external logic etc. and its activation depends on the setpoints in the Subgroup: Timer 11 (page 437) subgroup.</p>			
<p>Note: <i>If more than one timer is active at the same time, timer with selected higher priority function is applied.</i></p>			

⬅ back to Logical binary outputs alphabetically


Exercise Timer 12

Related FW	1.1.0	Related applications	MCB
LBO ID	2633		
Description			
This output is closed when the Exercise timer 12 is activated. The output can be used to make periodic tests of the System, breakers, any external logic etc. and its activation depends on the setpoints in the Subgroup: Timer 12 (page 439) subgroup.			
<i>Note: If more than one timer is active at the same time, timer with selected higher priority function is applied.</i>			

⬅ back to Logical binary outputs alphabetically

LBO: F

FltRes Button Echo

Related FW	1.1.0	Related applications	MCB
LBO ID	30		
Description			
This output provides 1 s pulse when:			
<ul style="list-style-type: none">➤ Fault Reset button  is pressed on an External display (page 77).➤ Fault Reset command is received via communication line➤ LBI FAULT RESET BUTTON (PAGE 604) is activated.			

⬅ back to Logical binary outputs alphabetically

LBO: G

Generator Capability C Limit

Related FW	1.1.0	Related applications	MCB
LBO ID	1427		
Description			
This output is closed when the Required PF (page 486) (while Required PF Character (page 486) = C) or Required Q (page 486) is out of capacitive limits in which is the System allowed to run.			
Limits are given by adjusting the CAPABILITY C (PAGE 597) .			

⬅ back to Logical binary outputs alphabetically

Generator Capability L Limit

Related FW	1.1.0	Related applications	MCB
LBO ID	1428		
Description			
This output is closed when the Required PF (page 486) (while Required PF Character (page 486) = L) or Required Q (page 486) is out of inductive limits in which is the System allowed to run.			
Limits are given by adjusting the CAPABILITY L (PAGE 596) .			

⬅ back to Logical binary outputs alphabetically



LBO: H

Heartbeat

Related FW	1.1.0	Related applications	MCB
LBO ID	81		
Description			
This output toggles on/off in a period of 500 ms whenever the controller is switched on and functional.			

🔍 back to Logical binary outputs alphabetically

Horn

Related FW	1.1.0	Related applications	MCB
LBO ID	1		
Description			
This output is closed when any Alarms (page 706) is activated and stays closed until: <ul style="list-style-type: none">> Fault reset  is pressed> Horn reset  is pressed> Horn Timeout (page 272) elapses			

🔍 back to Logical binary outputs alphabetically

Horn Flashing

Related FW	1.1.0	Related applications	MCB
LBO ID	29		
Description			
This is the flashing alternative of the output HORN (PAGE 638) , i.e. the output flashes with 1 Hz period while the output Horn is closed.			

🔍 back to Logical binary outputs alphabetically

Hot Swap Heartbeat

Related FW	1.1.0	Related applications	MCB
LBO ID	2447		
Description			
This output is used to inform the second Hot Swap Redundancy (page 141) controller about the fact that this controller is alive.			
This LBO has to be physically wired to the LBI HOT SWAP HEARTBEAT DETECT (PAGE 613) of the second Hot Swap Redundancy (page 141) controller. If the signal is not sent, the second controller activates LBO HOT SWAP SWITCH (PAGE 639) .			
IMPORTANT: This output has to be configured to physical output of the controller.			
IMPORTANT: This output has to be configured on both Master and Backup controllers.			

🔍 back to Logical binary outputs alphabetically

Hot Swap Switch

Related FW	1.1.0	Related applications	MCB
LBO ID	2469		
Description			
<p>This output is activated when the LBI HOT SWAP HEARTBEAT DETECT (PAGE 613) of this controller do not receive the LBO HOT SWAP HEARTBEAT (PAGE 638) signal from the second Hot Swap Redundancy (page 141) controller.</p> <p>This output is used as control signal for switches / switch disconnectors that are used to disconnect specific terminals of the second Hot Swap Redundancy (page 141) controller. It is also used as physical input for LBI HOT SWAP CTRL BLOCK (PAGE 612) of the second controller.</p> <p>IMPORTANT: This output has to be configured to physical output of the controller.</p> <p>IMPORTANT: This output has to be configured on both Master and Backup controllers.</p>			

🔍 back to Logical binary outputs alphabetically

HornRes Button Echo

Related FW	1.1.0	Related applications	MCB
LBO ID	31		
Description			
This output is closed for 1 s every time Horn Reset Button is pressed.			

🔍 back to Logical binary outputs alphabetically

HW AC Voltage Measurement Error

Related FW	1.1.0	Related applications	MCB
LBO ID	2560		
Description			
<p>This logical binary output is activated once the wrong 3V3 reference voltage is detected.</p> <p>It is recommended to use it to activate user protection which will open MCB and turn off the System to prevent any damage to the System, load or mains.</p> <p>IMPORTANT: This LBO only works on HW revision D and higher.</p>			

🔍 back to Logical binary outputs alphabetically

LBO: I

In Synchronism

Related FW	1.1.0	Related applications	MCB
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">➤ Slip Angle (page 457) between Mains and Bus Voltage is within range given by Phase Window (page 284) for time longer than Dwell Time (page 284). Required if Synchronization Type (page 281) = PhaseMatch.➤ Slip Frequency (page 457) between between Mains and Bus Frequency is withing range given by Slip Frequency Window (page 285) for time longer than Dwell Time (page 284). Required if Synchronization Type (page 281) = SlipSynchr.➤ Voltage difference between Mains and Bus voltage in all phases must be lower or equal to Voltage Window (page 283) for time longer than Dwell Time (page 284). Required always.			

⬅ back to Logical binary outputs alphabetically

In Mains Parallel

Related FW	1.1.0	Related applications	MCB
LBO ID	2132		
Description			
This output is closed when the parallel bus voltage and Mains voltage is present and breakers are closed.			

⬅ back to Logical binary outputs alphabetically

Initialized

Related FW	1.1.0	Related applications	MCB
LBO ID	1222		
Description			
This output is activated after the controller is initialized. It can be used to block some PLC logic blocks while controller initialization is being proceeded.			

⬅ back to Logical binary outputs alphabetically

LBO: M

Mains Healthy

Related FW	1.1.0	Related applications	MCB
LBO ID	78		
Description			
This output is closed while Mains parameters (voltage & frequency) are considered as healthy, i. e. within limits.			

⬅ back to Logical binary outputs alphabetically

Mains P High Limit

Related FW	1.1.0	Related applications	MCB
LBO ID	5594		
Description			
This output is closed when Mains power raise above setpoint Mains P High Limit On (page 298) (high limit is activated).			

⬅ back to Logical binary outputs alphabetically

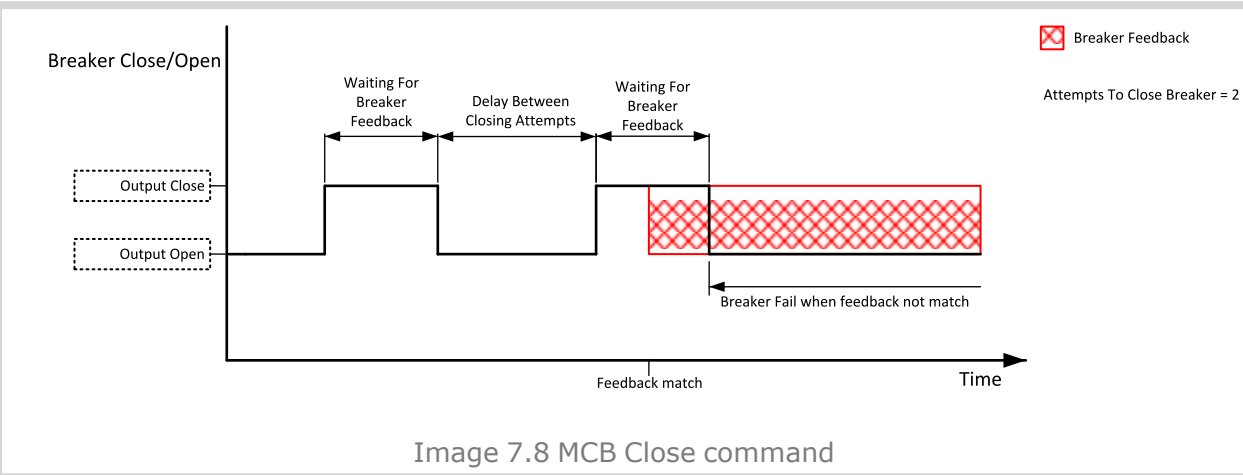
Mains P Low Limit

Related FW	1.1.0	Related applications	MCB
LBO ID	5595		
Description			
This output is closed when Mains power drop below setpoint Mains P Low Limit On (page 299) (low limit is activated).			

⬅ back to Logical binary outputs alphabetically

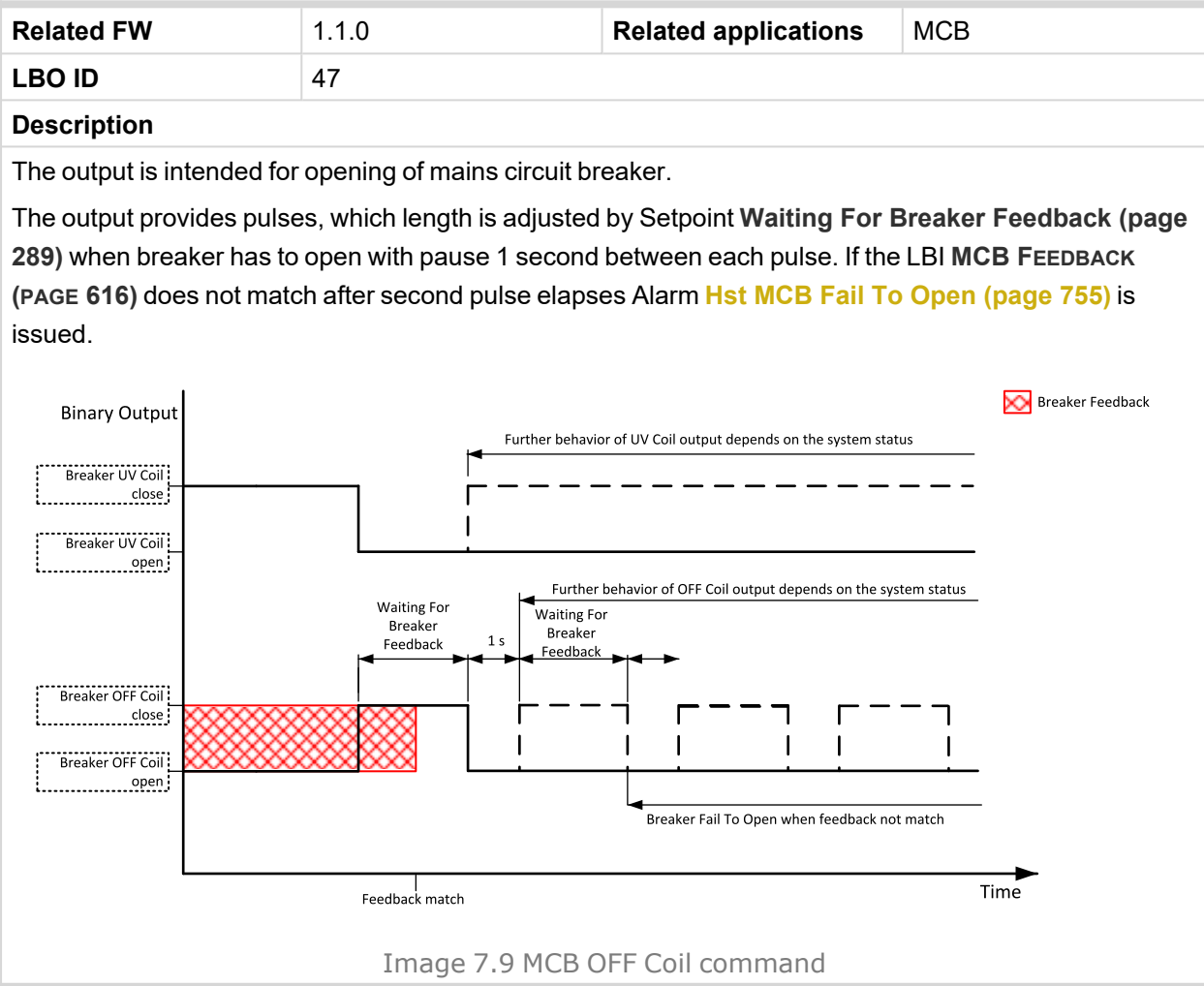
MCB Close/Open

Related FW	1.1.0	Related applications	MCB
LBO ID	45		
Description			
The output controls the mains 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 Setpoint Waiting For Breaker Feedback (page 289) and it was already the last attempt the specific alarm based on the current breaker position is issued.			



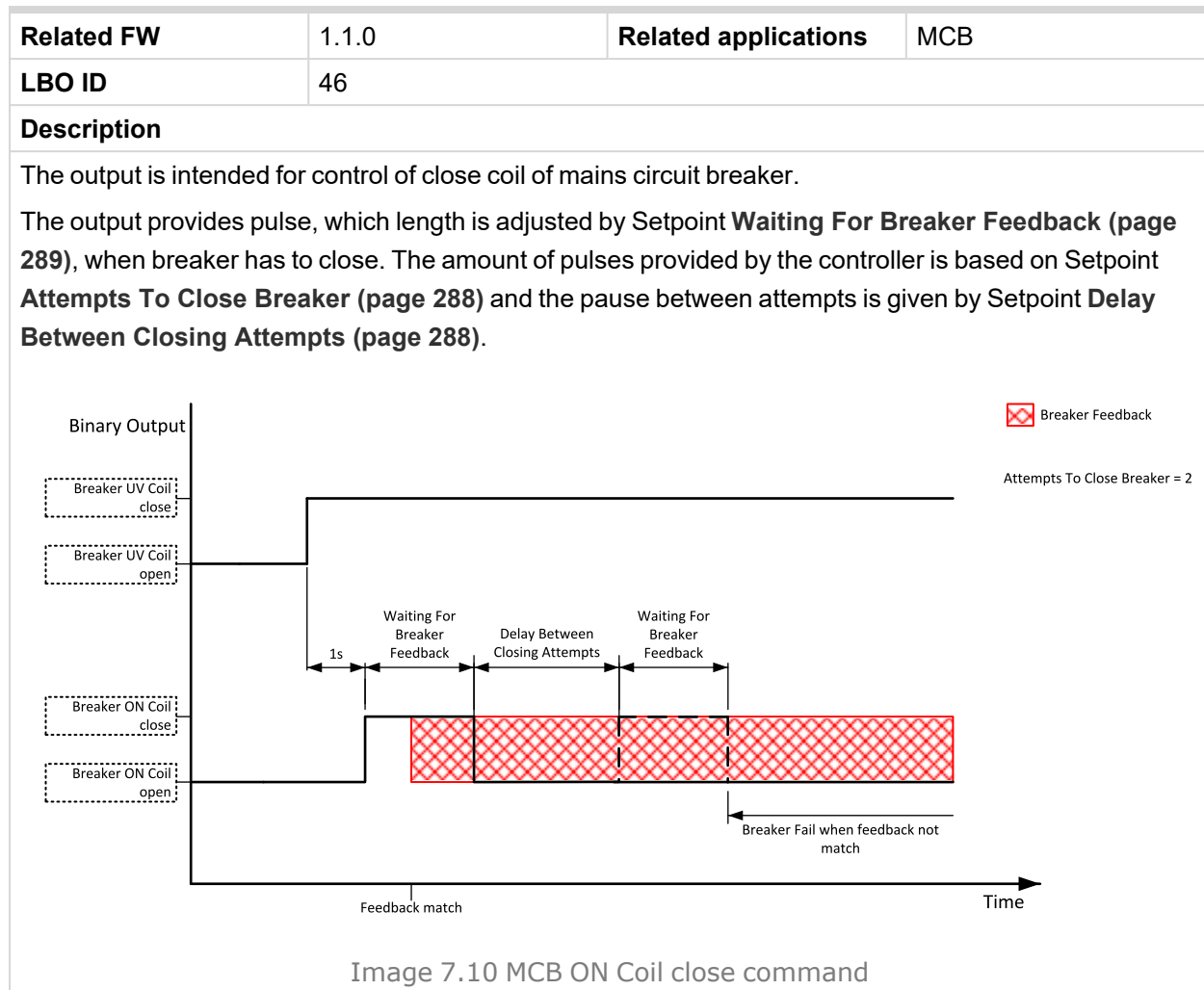
⬅ back to Logical binary outputs alphabetically

MCB OFF Coil



⬅ back to Logical binary outputs alphabetically

MCB ON Coil



🔍 back to Logical binary outputs alphabetically

MCB Status

Related FW	1.1.0	Related applications	MCB
LBO ID	85		

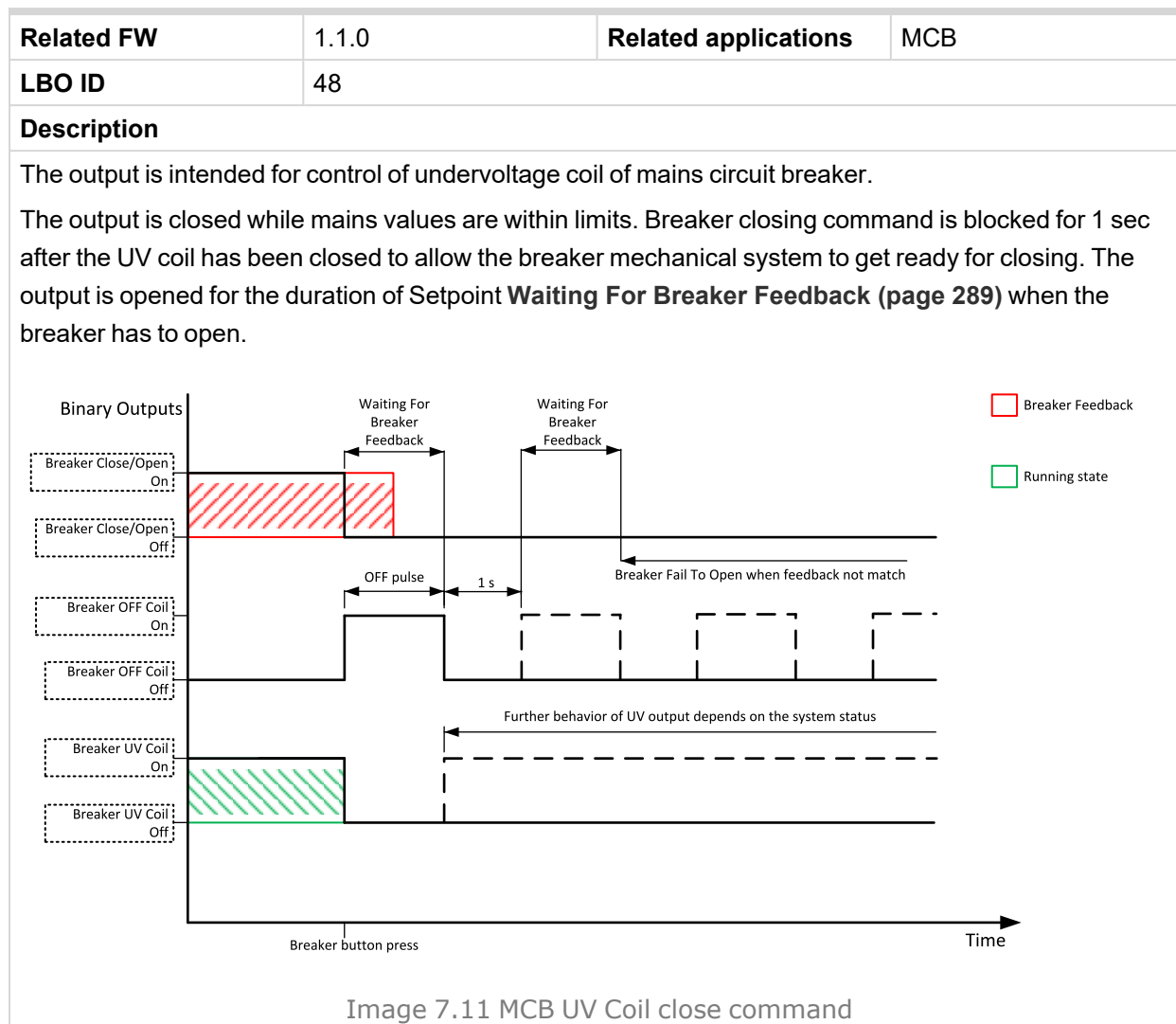
Description

This output indicates the MCB position as it is internally considered by the controller. The position is based on **MCB FEEDBACK** (PAGE 616) and **MCB FEEDBACK NEGATIVE** (PAGE 617).

- In case that only **MCB FEEDBACK** (PAGE 616) is used, this output mirrors the input.
- In case that both **MCB FEEDBACK** (PAGE 616) and **MCB FEEDBACK NEGATIVE** (PAGE 617) are used and
 - Feedback match - output indicates MCB position according to feedbacks.
 - Feedback do not match - output indicates last position when feedbacks matched.

🔍 back to Logical binary outputs alphabetically

MCB UV Coil



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Minimal Power PTM Limitation

Related FW	1.1.0	Related applications	MCB
LBO ID	2638		
Description			
This output is closed always when the controller detects that the System go below Minimal Power PTM (page 334) . It does not matter if the Minimal Power PTM Protection (page 355) is Enabled or not.			

 **back to Logical binary outputs alphabetically**

Mode RUN

Related FW	1.1.0	Related applications	MCB
LBO ID	18		
Description			
This output is active whenever Controller Mode (page 494) = MAN.			

⬆ back to Logical binary outputs alphabetically

Mode PRG

Related FW	1.1.0	Related applications	MCB
LBO ID	17		
Description			
This output is active whenever Controller Mode (page 494) = OFF.			

⬆ back to Logical binary outputs alphabetically

LBO: N

Not Used

Related FW	1.1.0	Related applications	MCB
LBO ID	286		
Description			
Output has no function.			

⬆ back to Logical binary outputs alphabetically

LBO: O

Open GCB In Load Shar

Related FW	1.1.0	Related applications	MCB
LBO ID	5601		
Description			
This output is activated for 1 second when Total Running P In Load Shar (page 482) drops below the setpoint Generator Unload GCB Open Window (page 295) and LBI LOAD LOWER (PAGE 614) is active. When this output is activated the request to open all GCBs in Load Shar is sent to all Gen-set in the same group via Intercontroller CAN.			

⬆ back to Logical binary outputs alphabetically

LBO: P

Peripheral Module Comm Fail

Related FW	1.1.0	Related applications	MCB
LBO ID	115		
Description			
This output is closed when there is no communication with at least one configured peripheral module.			

⬆ back to Logical binary outputs alphabetically

Power Switch 1

Related FW	1.1.0	Related applications	MCB
LBO ID	290		

Description

This is an output from the Power switch function. The behavior of the switch depends on the adjustment of the setpoints **System Power Switch 1 On (page 297)** and **System Power Switch 1 Off (page 297)**

When the dummy load function is used the switching ON of Power switch is blocked while no Gen-set is connected to the bus.

The Power Switch is activated when **Total Running P (page 482)** reach relative On Level which is related to the **Running Nominal Power Of All (page 481)**

The graph plots 'Power Switch Output' (On/Off) against power in 'kW'. Two hysteresis cases are shown:

- Level On > Level Off:** The switch turns On at a higher power level than it turns Off.
- Level On < Level Off:** The switch turns On at a lower power level than it turns Off.

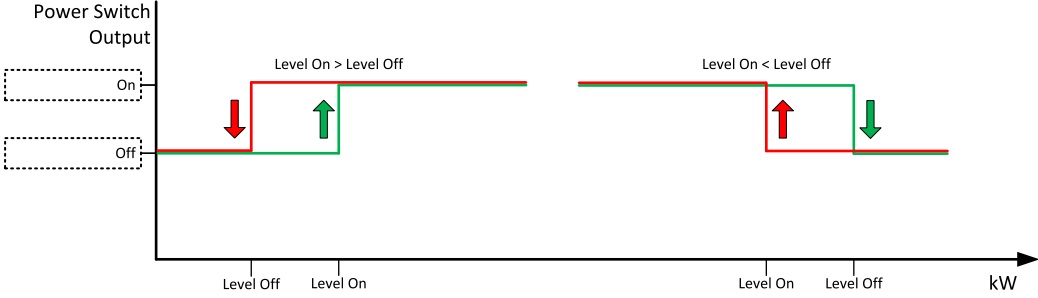
Red arrows indicate the transition from Off to On, and green arrows indicate the transition from On to Off.

Image 7.12 Power Switch Example

Note: Power Switch can work in both directions high limit with hysteresis: On > Off or low limit with hysteresis On < Off.

⬅ back to Logical binary outputs alphabetically

Power Switch 2

Related FW	1.1.0	Related applications	MCB
LBO ID	5593		
Description <p>This is an output from the Power switch function. The behavior of the switch depends on the adjustment of the setpoints System Power Switch 2 On (page 297) and System Power Switch 2 Off (page 298). When the dummy load function is used the switching ON of Power switch is blocked while no Gen-set is connected to the bus.</p> <p>The Power Switch is activated when Total Running P (page 482) reach relative On Level which is related to the Running Nominal Power Of All (page 481)</p>			
 <p style="text-align: center;">Image 7.13 Power Switch Example</p> <p>Note: Power Switch can work in both directions high limit with hysteresis: On > Off or low limit with hysteresis On < Off.</p>			

⬅ back to Logical binary outputs alphabetically

System Power Limitation

Related FW	1.1.0	Related applications	MCB
LBO ID	2241		
Description <p>This output is closed while Total Running P (page 482) is being reduced due to: Import/Export Limitation (page 291) = Enabled.</p>			

⬅ back to Logical binary outputs alphabetically

LBO: S

Still Log 0

Related FW	1.1.0	Related applications	MCB
LBO ID	26		
Description <p>Logical binary output which is still in logical 0.</p>			

⬅ back to Logical binary outputs alphabetically

Still Log 1

Related FW	1.1.0	Related applications	MCB
LBO ID	27		
Description			
Logical binary output which is still in logical 1.			

⬅ back to Logical binary outputs alphabetically

Sync To Mains Allowed

Related FW	1.1.0	Related applications	MCB
LBO ID	1057		
Description			
This output is closed when synchronization to the mains is allowed or Breaker state (page 494) = ParalOper.			

⬅ back to Logical binary outputs alphabetically

Synchronization

Related FW	1.1.0	Related applications	MCB
LBO ID	69		
Description			
The output is closed when synchronization is active (synchronization via MCB breaker) and opens when LBO MCB STATUS (PAGE 643) closes.			

⬅ back to Logical binary outputs alphabetically

System P High Limit

Related FW	1.1.0	Related applications	MCB
LBO ID	5596		
Description			
This output is closed when System power raise above setpoint System P High Limit On (page 300) (high limit is activated).			

⬅ back to Logical binary outputs alphabetically

System P Low Limit

Related FW	1.1.0	Related applications	MCB
LBO ID	5597		
Description			
This output is closed when System power drop below setpoint System P Low Limit On (page 301) (low limit is activated).			

⬅ back to Logical binary outputs alphabetically

8.1.8 Logical analog inputs

What Logical analog inputs are:

Logical analog inputs are inputs for analog values.

Alphabetical groups of Logical analog inputs

LAI: C	651
LAI: L	654
LAI: M	654
LAI: N	655
LAI: P	655
LAI: Q	656

For full list of Logical analog inputs go to the chapter **Logical analog inputs alphabetically (page 650)**.

Logical analog inputs alphabetically

LAI: C	651
Cold Temp 1	651
Cold Temp 2	651
Cold Temp 3	651
Cold Temp 4	652
Cold Temp 5	652
Cold Temp 6	652
Cold Temp 7	653
Cold Temp 8	653
Cold Temp 9	653
Cold Temp 10	654
LAI: L	654
Load Control: System Baseload	654
Load Control: Import/Export	654
LAI: M	654
Mains Measurement P	654
Mains Measurement Q	655
LAI: N	655
Not Used	655
LAI: P	655
PF Control: System Base PF	655
PF Control: Imp/Exp PF ...	656
Process Control: P Request	656
LAI: Q	656
Q Control: System Base Q	656
Q Control: Imp/Exp Q	656

 **back to Controller objects**

LAI: C

Cold Temp 1

Related FW	1.1.0	Related applications	MCB
LAI ID	56		
Description			
<p>This LAI is used for compensation of thermocouple temperature measurement. It is used when there is a significant temperature difference between on-board terminal and a module terminal (such as Intel AIN8TC). This input compensate the CAN module configured with address (index) 1.</p> <p>Note: <i>The compensation is only for thermocouples without internal compensation "Thermo (nc) ..." (not cold junction compensation).</i></p>			

⬅ back to Logical analog inputs alphabetically

Cold Temp 2

Related FW	1.1.0	Related applications	MCB
LAI ID	57		
Description			
<p>This LAI is used for compensation of thermocouple temperature measurement. It is used when there is a significant temperature difference between on-board terminal and a module terminal (such as Intel AIN8TC). This input compensate the CAN module configured with address (index) 2.</p> <p>Note: <i>The compensation is only for thermocouples without internal compensation "Thermo (nc) ..." (not cold junction compensation).</i></p>			

⬅ back to Logical analog inputs alphabetically

Cold Temp 3

Related FW	1.1.0	Related applications	MCB
LAI ID	58		
Description			
<p>This LAI is used for compensation of thermocouple temperature measurement. It is used when there is a significant temperature difference between on-board terminal and a module terminal (such as Intel AIN8TC). This input compensate the CAN module configured with address (index) 3.</p> <p>Note: <i>The compensation is only for thermocouples without internal compensation "Thermo (nc) ..." (not cold junction compensation).</i></p>			

⬅ back to Logical analog inputs alphabetically

Cold Temp 4

Related FW	1.1.0	Related applications	MCB
LAI ID	59		
Description			
This LAI is used for compensation of thermocouple temperature measurement. It is used when there is a significant temperature difference between on-board terminal and a module terminal (such as Intel® AIN8TC). This input compensates the CAN module configured with address (index) 4.			
Note: The compensation is only for thermocouples without internal compensation "Thermo (nc) ..." (not cold junction compensation).			

⬆ back to Logical analog inputs alphabetically

Cold Temp 5

Related FW	1.1.0	Related applications	MCB
LAI ID	341		
Description			
This LAI is used for compensation of thermocouple temperature measurement. It is used when there is a significant temperature difference between on-board terminal and a module terminal (such as Intel® AIN8TC). This input compensates the CAN module configured with address (index) 5.			
Note: The compensation is only for thermocouples without internal compensation "Thermo (nc) ..." (not cold junction compensation).			

⬆ back to Logical analog inputs alphabetically

Cold Temp 6

Related FW	1.1.0	Related applications	MCB
LAI ID	342		
Description			
This LAI is used for compensation of thermocouple temperature measurement. It is used when there is a significant temperature difference between on-board terminal and a module terminal (such as Intel® AIN8TC). This input compensates the CAN module configured with address (index) 6.			
Note: The compensation is only for thermocouples without internal compensation "Thermo (nc) ..." (not cold junction compensation).			

⬆ back to Logical analog inputs alphabetically

Cold Temp 7

Related FW	1.1.0	Related applications	MCB
LAI ID	343		
Description			
This LAI is used for compensation of thermocouple temperature measurement. It is used when there is a significant temperature difference between on-board terminal and a module terminal (such as Intel® AIN8TC). This input compensates the CAN module configured with address (index) 7.			
Note: The compensation is only for thermocouples without internal compensation "Thermo (nc) ..." (not cold junction compensation).			

◀ back to Logical analog inputs alphabetically

Cold Temp 8

Related FW	1.1.0	Related applications	MCB
LAI ID	344		
Description			
This LAI is used for compensation of thermocouple temperature measurement. It is used when there is a significant temperature difference between on-board terminal and a module terminal (such as Intel® AIN8TC). This input compensates the CAN module configured with address (index) 8.			
Note: The compensation is only for thermocouples without internal compensation "Thermo (nc) ..." (not cold junction compensation).			

◀ back to Logical analog inputs alphabetically

Cold Temp 9

Related FW	1.1.0	Related applications	MCB
LAI ID	418		
Description			
This LAI is used for compensation of thermocouple temperature measurement. It is used when there is a significant temperature difference between on-board terminal and a module terminal (such as Intel® AIN8TC). This input compensates the CAN module configured with address (index) 9.			
Note: The compensation is only for thermocouples without internal compensation "Thermo (nc) ..." (not cold junction compensation).			

◀ back to Logical analog inputs alphabetically

Cold Temp 10

Related FW	1.1.0	Related applications	MCB
LAI ID	419		
Description			
<p>This LAI is used for compensation of thermocouple temperature measurement. It is used when there is a significant temperature difference between on-board terminal and a module terminal (such as Intel AIN8TC). This input compensate the CAN module configured with address (index) 10.</p>			
<p>Note: The compensation is only for thermocouples without internal compensation "Thermo (nc) ..." (not cold junction compensation).</p>			

⬅ back to Logical analog inputs alphabetically

LAI: L

Load Control: System Baseload

Related FW	1.1.0	Related applications	MCB
LAI ID	538		
Description			
This input is used as analog source request for System Baseload if both LBIs LOAD RAISE (PAGE 614) and LOAD LOWER (PAGE 614) are activated and LBI IMP/EXP CONTROL (PAGE 613) is NOT activated.			

⬅ back to Logical analog inputs alphabetically

Load Control: Import/Export

Related FW	1.1.0	Related applications	MCB
LAI ID	539		
Description			
This input is used as analog source request for Import/Export if both LBIs LOAD RAISE (PAGE 614) and LOAD LOWER (PAGE 614) are activated and LBI IMP/EXP CONTROL (PAGE 613) is activated too.			

⬅ back to Logical analog inputs alphabetically

LAI: M

Mains Measurement P

Related FW	1.1.0	Related applications	MCB
LAI ID	5		
Description			
<p>This LAI is designed for Mains Import Measurement (page 200), when Mains Measurement P (page 308) = Analog Input. Value from this input is used in load transfer from Mains to System.</p> <p>Load transfer is considered to be finished when this value is lower than Mains Unload MCB Open Window (page 296)</p>			

⬅ back to Logical analog inputs alphabetically

Mains Measurement Q

Related FW	1.1.0	Related applications	MCB
LAI ID	6		
Description			
This LAI is designed for Mains Import Measurement (page 200) , when Mains Measurement Q (page 308) = Analog Input. Value from this input is used in load transfer from mains to System. Load transfer is considered to be finished when this value is lower than Mains Unload MCB Open Window (page 296)			

⬅ back to Logical analog inputs alphabetically

LAI: N

Not Used

Related FW	1.1.0	Related applications	MCB
LAI ID	230		
Description			
Input has no function.			

⬅ back to Logical analog inputs alphabetically

LAI: P

PF Control: System Base PF

Related FW	1.1.0	Related applications	MCB								
LAI ID	3										
Description											
This LAI is a source value for control of the Power Factor if PF/Q Request Source (page 302) = Analog External Value, PF/Q Control Mode (page 302) = PF Control, and LBI IMP/EXP CONTROL (PAGE 613) is not active.											
<table><tr><th>Analog value</th><th>Cos phi factor</th></tr><tr><td><60</td><td>0.6L</td></tr><tr><td>60 .. 100</td><td>0.6L .. 1.00</td></tr><tr><td>101 .. 120</td><td>0.99C .. 0.80C</td></tr></table>				Analog value	Cos phi factor	<60	0.6L	60 .. 100	0.6L .. 1.00	101 .. 120	0.99C .. 0.80C
Analog value	Cos phi factor										
<60	0.6L										
60 .. 100	0.6L .. 1.00										
101 .. 120	0.99C .. 0.80C										

⬅ back to Logical analog inputs alphabetically

PF Control: Imp/Exp PF

Related FW	1.1.0	Related applications	MCB
LAI ID	4		
Description			
This LAI is a source value for control of the Power Factor if PF/Q Request Source (page 302) = Analog External Value, PF/Q Control Mode (page 302) = PF Control, and LBI IMP/EXP CONTROL (PAGE 613) is active.			
Analog value		Cos phi factor	
<60		0.6L	
60 .. 100		0.6L .. 1.00	
101 .. 120		0.99C .. 0.80C	

⬅ back to Logical analog inputs alphabetically

Process Control: P Request

Related FW	1.1.0	Related applications	MCB
LAI ID	540		
Description			
This logical input is used as source request for Process Control if LBI PROCESS CONTROL (PAGE 618) is activated.			

⬅ back to Logical analog inputs alphabetically

LAI: Q

Q Control: System Base Q

Related FW	1.1.0	Related applications	MCB
LAI ID	171		
Description			
This LAI is a source value for control of the Power Factor if PF/Q Request Source (page 302) = Analog External Value, PF/Q Control Mode (page 302) = Q Control, and LBI IMP/EXP CONTROL (PAGE 613) is not active.			

⬅ back to Logical analog inputs alphabetically

Q Control: Imp/Exp Q

Related FW	1.1.0	Related applications	MCB
LAI ID	195		
Description			
This LAI is a source value for control of the Power Factor if PF/Q Request Source (page 302) = Analog External Value, PF/Q Control Mode (page 302) = Q Control, and LBI IMP/EXP CONTROL (PAGE 613) is active.			

⬅ back to Logical analog inputs alphabetically

8.1.9 Fixed Protection States

List of Fixed Protection States

Fixed Protections States 1	658
Fixed Protections States 2	659
Fixed Protections States 3	660
Fixed Protections States 4	661

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Fixed Protections States 1

Related FW	1.1.0	Related applications	MCB
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">1. Wrn Brute Force Protection Active (page 710)2. Wrn Redundant CAN inconsistency (page 738)3. Wrn CAN2 Empty (page 711)4. Wrn SHBIN Collision (page 741)5. Wrn SHAIN Collision (page 739)6. Not Used7. Not Used8. Not Used9. ALI SD Card Formatting/Mounting (page 746)10. Wrn SD Card File System Failed (page 738)11. AHI Battery Undervoltage (page 748)12. AHI Battery Overvoltage (page 748)13. Wrn SD Card Failed (page 738)14. Wrn Long Term History Fail (page 735)15. Wrn Load IMP/EXP Fail (page 735)16. Wrn PF/Q IMP/EXP Fail (page 737)17. Wrn PF Control Fail (page 736)18. Wrn Q Control Fail (page 737)19. Not Used20. Not Used21. Not Used22. Not Used23. Not Used24. Not Used25. Not Used26. Not Used27. Not Used28. Not Used29. Not Used30. Not Used			

 [back to Fixed Protection States](#)

Fixed Protections States 2

Related FW	1.1.0	Related applications	MCB
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">1. MP Mains >V L1-N (page 759)2. MP Mains >V L2-N (page 759)3. MP Mains >V L3-N (page 759)4. MP Mains >V L1-L2 (page 759)5. MP Mains >V L2-L3 (page 760)6. MP Mains >V L3-L1 (page 760)7. MP Mains >>V L1-N (page 760)8. MP Mains >>V L2-N (page 761)9. MP Mains >>V L3-N (page 761)10. MP Mains >>V L1-L2 (page 761)11. MP Mains >>V L2-L3 (page 761)12. MP Mains >>V L3-L1 (page 762)13. MP Mains Avg >V L1-N (page 762)14. MP Mains Avg >V L2-N (page 762)15. MP Mains Avg >V L3-N (page 762)16. MP Mains Avg >V L1-L2 (page 763)17. MP Mains Avg >V L2-L3 (page 763)18. MP Mains Avg >V L3-L1 (page 763)19. MP Mains <V L1-N (page 763)20. MP Mains <V L2-N (page 764)21. MP Mains <V L3-N (page 764)22. MP Mains <V L1-L2 (page 764)23. MP Mains <V L2-L3 (page 765)24. MP Mains <V L3-L1 (page 765)25. MP Mains <<V L1-N (page 765)26. MP Mains <<V L2-N (page 766)27. MP Mains <<V L3-N (page 766)28. MP Mains <<V L1-L2 (page 766)29. MP Mains <<V L2-L3 (page 766)30. MP Mains <<V L3-L1 (page 767)31. MP Mains V Unbalance Ph-N (page 767)32. MP Mains V Unbalance Ph-Ph (page 767)			

 [back to Fixed Protection States](#)

Fixed Protections States 3

Related FW	1.1.0	Related applications	MCB
Comm object	20746		
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">1. MP Mains >f (page 768)2. MP Mains >>f (page 768)3. MP Mains <f (page 768)4. MP Mains <<f (page 769)5. IDMT Overload (page 770)6. MPR Short Circuit (page 770)7. MPR IDMT Mains >A (page 770)8. MPR Current Unbalance (page 770)9. ALI Mains Ph Rotation Opposite (page 744)10. Hst MCB Fail (page 753)11. Hst Synchronization Fail (page 755)12. Hst Synchronization Fail (page 757)13. Hst Bus >V L1-N (page 748)14. Hst Bus >V L2-N (page 749)15. Hst Bus >V L3-N (page 749)16. Hst Bus >V L1-L2 (page 749)17. Hst Bus >V L2-L3 (page 749)18. Hst Bus >V L3-L1 (page 750)19. Hst Bus <V L1-N (page 750)20. Hst Bus <V L2-N (page 750)21. Hst Bus <V L3-N (page 750)22. Hst Bus <V L1-L2 (page 751)23. Hst Bus <V L2-L3 (page 751)24. Hst Bus <V L3-L1 (page 751)25. Hst Bus V Unbalance Ph-N (page 752)26. Hst Bus V Unbalance Ph-Ph (page 752)27. Hst Bus >f (page 751)28. Hst Bus <f (page 752)29. Bus Meas Error (page 752)30. Reserved31. Reserved			

 [back to Fixed Protection States](#)

Fixed Protections States 4

Related FW	1.1.0	Related applications	MCB
Comm object	20747		
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">1. Wrn Alarm e-mail 1 Fail (page 709)2. Wrn Alarm e-mail 2 Fail (page 709)3. Wrn Alarm e-mail 3 Fail (page 709)4. Wrn Alarm e-mail 4 Fail (page 709)5. Wrn SNMP TRAP 1 Fail (page 741)6. Wrn SNMP TRAP 2 Fail (page 742)7. Not Used8. Not Used9. Not Used10. Not Used11. Not Used12. Not Used13. Not Used14. Not Used15. Wrn Total Running PQS Value Overflow (page 742)16. Hst MCB Fail To Open (page 755)17. Hst MCB Fail To Close (page 754)18. Reserved19. Reserved20. Reserved21. Reserved22. ALI SD Card Not Compatible (page 745)23. ALI SD Card In Slot (page 746)24. ALI SD Card Full (page 746)			

 [back to Fixed Protection States](#)

8.1.10 User Protection States

List of User Protection States

User Protections States 1	663
User Protections States 2	663
User Protections States 3	663
User Protections States 4	663
User Protections States 5	663
User Protections States 6	664
User Protections States 7	664
User Protections States 8	664
User Protections States 9	664
User Protections States 10	664

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User Protections States 1

Related FW	1.1.0	Related applications	MCB
Comm object	20759		
Description			
This is a group of user protection states.			

[back to User Protection States](#)

User Protections States 2

Related FW	1.1.0	Related applications	MCB
Comm object	20760		
Description			
This is a group of user protection states.			

[back to User Protection States](#)

User Protections States 3

Related FW	1.1.0	5Related applications	MCB
Comm object	20761		
Description			
This is a group of user protection states.			

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User Protections States 4

Related FW	1.1.0	Related applications	MCB
Comm object	20762		
Description			
This is a group of user protection states.			

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User Protections States 5

Related FW	1.1.0	Related applications	MCB
Comm object	20763		
Description			
This is a group of user protection states.			

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User Protections States 6

Related FW	1.1.0	Related applications	MCB
Comm object	20764		
Description			
This is a group of user protection states.			

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User Protections States 7

Related FW	1.1.0	Related applications	MCB
Comm object	20765		
Description			
This is a group of user protection states.			

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User Protections States 8

Related FW	1.1.0	Related applications	MCB
Comm object	20766		
Description			
This is a group of user protection states.			

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User Protections States 9

Related FW	1.1.0	Related applications	MCB
Comm object	20767		
Description			
This is a group of user protection states.			

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User Protections States 10

Related FW	1.1.0	Related applications	MCB
Comm object	20768		
Description			
This is a group of user protection states.			

[◀ back to User Protection States](#)

8.1.11 PLC

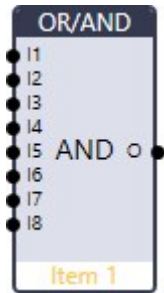
List of PLC blocks

Group: Logical functions	666
OR/AND	666
XOR/RS	668
Group: Comparators	669
Comp Delay	669
Comp Hyst	670
Comp Win	671
Group: Time functions	672
Delay	672
Timer	674
Group: Math operations	676
Interpolation	676
AxB/C±D	677
Math Fc.	678
Group: Regulators	680
PID	680
Up/Down Ctrl Block	685
Group: Ramp functions	687
Inc/Dec	687
Mov Avg	688
Ramp	689
Up/Down	690
Group: Other functions	692
Analog Switch	692
Analog Switch 8	693
Circuit Breaker	695
Comp. 4	697
Convert	698
Counter	700
Decomp. 4	701
Differ	702
Hold	703
Validator	704

🔍 back to Controller objects

Group: Logical functions

OR/AND

PLC group	Basic logical functions	
Related FW	1.1.0	
Related applications	MCB	
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

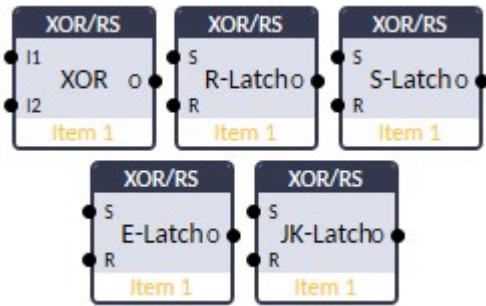
OK

Cancel

Image 7.14 Configuration of OR/AND block

⬆ back to List of PLC blocks

XOR/RS

PLC group	Basic logical functions				
Related FW	1.1.0				
Related applications	MCB				
PLC Block ID	39				
Inputs					
Input	Type	Negation	Range	Function	
Input 1..2	Binary	Yes	0/1	Inputs 1..2	
Outputs					
Output	Type	Negation	Range	Function	
Output	Binary	Yes	0/1	Result of the logical operation	
Description					
The block performs logical (boolean) XOR operation of two binary operands or several variants of the RS flipflop function. Both Inputs and Output can be inverted.					
Function type XOR					
Input 1	Input 2	Output			
0	0	0			
0	1	1			
1	0	1			
1	1	0			
The result of XOR operation between two binary inputs (Input 1 and Input 2) is defined by table below.					
Function type RS					
Input 2 (R)	Input 1 (S)	R-latch	S-latch	E-latch	JK-latch
Q					
0	0	Q ⁻¹	Q ⁻¹	Q ⁻¹	Q ⁻¹
0	1	1	1	1	1
1	0	0	0	0	0
1	1	0	1	Q ⁻¹	NOT(Q ⁻¹)
The Q ⁻¹ denotes the state of the RS block output in the last evaluation cycle.					
The block Output value is given by the selected RS flip-flop variant evaluation:					
➤ R-latch: When both inputs (R, S) are set the Reset input is dominant.					
➤ S-latch: When both inputs (R, S) are set the Set input is dominant.					
➤ E-latch: When both inputs (R, S) are set the previous output is preserved.					
➤ JK-latch: When both inputs (R, S) are set the block output is negated.					
The block has the setting for the variant functions of the RS flip-flop circuit. This setting is					

available in the block configuration dialog (i.e. it is done in the configuration and cannot be changed dynamically while the PLC is running).

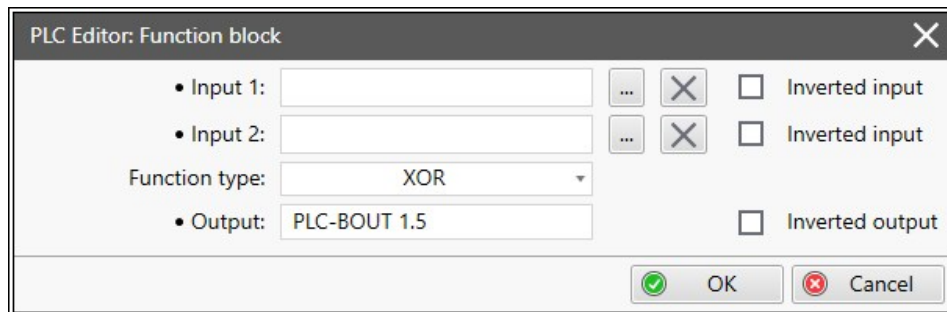


Image 7.15 Configuration of XOR/RS block

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Group: Comparators

Comp Delay


PLC group	Comparison of analog inputs			
Related FW	1.1.0			
Related applications	MCB			
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>				
Shortcut	Name		Relation	
LT	less than		Input "<" Reference	
LE	less than equal		Input "<=" Reference	
EQ	equal		Input "==" Reference	
GT	greater than		Input ">" Reference (default)	
GE	greater than equal		Input ">=" Reference	



Image 7.16 Configuration of Comp Delay block

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Comp Hyst

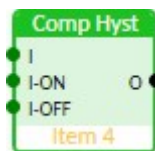
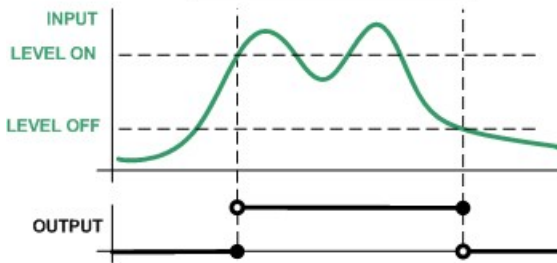
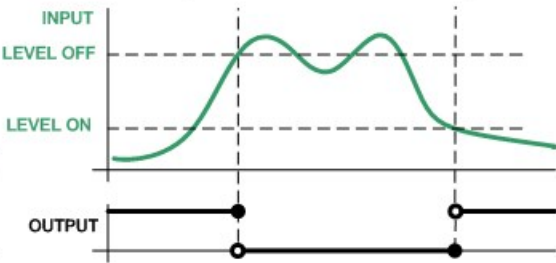
PLC group	Comparison of analog inputs			
Related FW	1.1.0			
Related applications	MCB			
PLC Block ID	3			
Inputs				
Input	Type	Negation	Range	Function
Input	Analog	No	$-2^{32} .. 2^{32}$	Compared value
Input ON	Analog	No	$-2^{32} .. 2^{32}$	Comparative level for switching on
Input OFF	Analog	No	$-2^{32} .. 2^{32}$	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><div>LEVEL ON > LEVEL OFF</div></div><div><div>LEVEL ON < LEVEL OFF</div></div></div>				

Image 7.17 Different On and Off levels

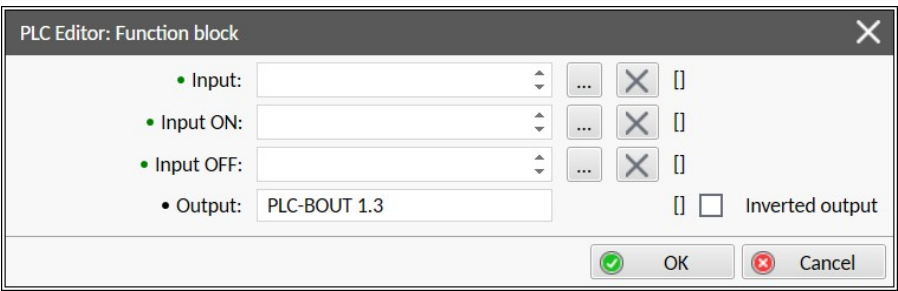



Image 7.18 Configuration of Comp Hyst block

⬅ back to List of PLC blocks

Comp Win

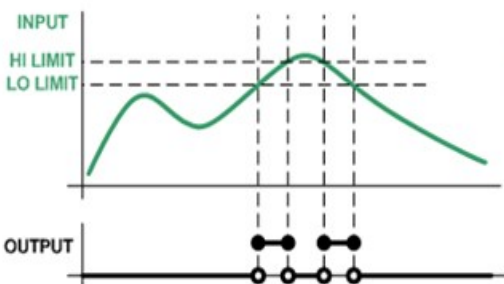
PLC group	Comparison of analog inputs	
Related FW	1.1.0	
Related applications	MCB	
PLC Block ID	18	

Inputs				
Input	Type	Negation	Range	Function
Input	Analog	No	$-2^{32} \dots 2^{32}$	Compared value
Input HIGH	Analog	No	$-2^{32} \dots 2^{32}$	Upper window limit
Input LOW	Analog	No	$-2^{32} \dots 2^{32}$	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.				

HI LIMIT > LO LIMIT



LO LIMIT > HI LIMIT

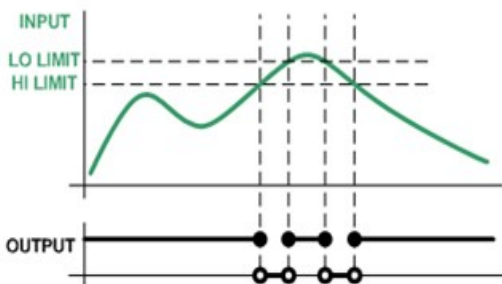


Image 7.19 Principle of delay

Image 7.19 Principle of delay

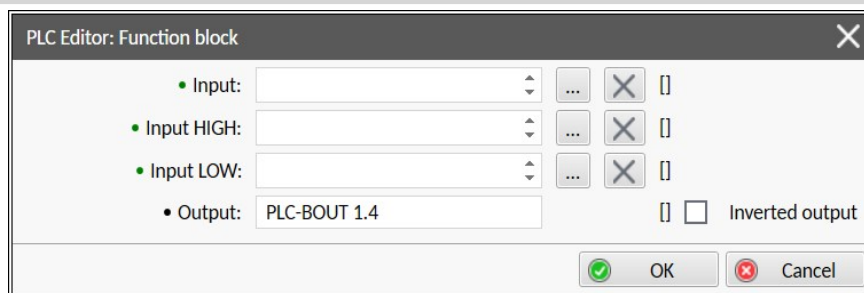



Image 7.20 Configuration of Comp Time block

Note: All inputs and can be constants or values from controller.

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Group: Time functions

Delay

PLC group	Time functions			
Related FW	1.1.0			
Related applications	MCB			
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>➤ Delay mode - the rising edge at the Output is generated with a delay of the Input time up lenght when arising edge is detected on the Input. A falling edge at the Output is generated with a delay of the Input time down length when a falling edge is detected on the Input. If the delayed falling</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.

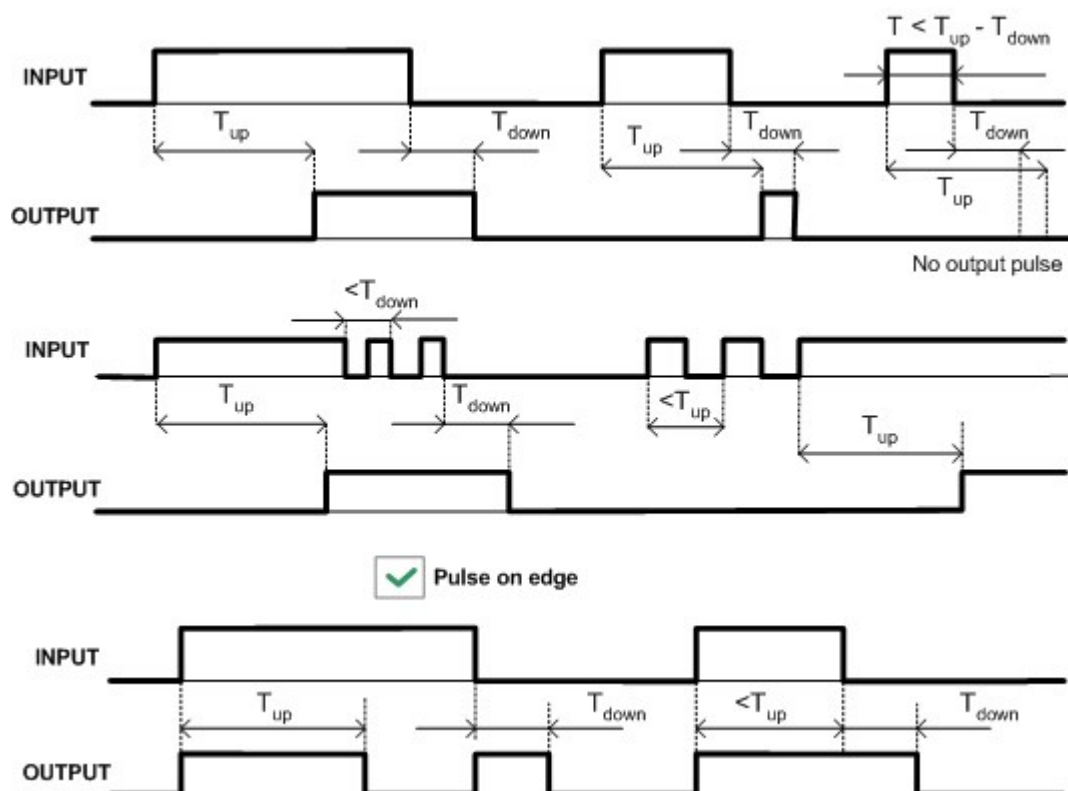


Image 7.21 Delay modes principles

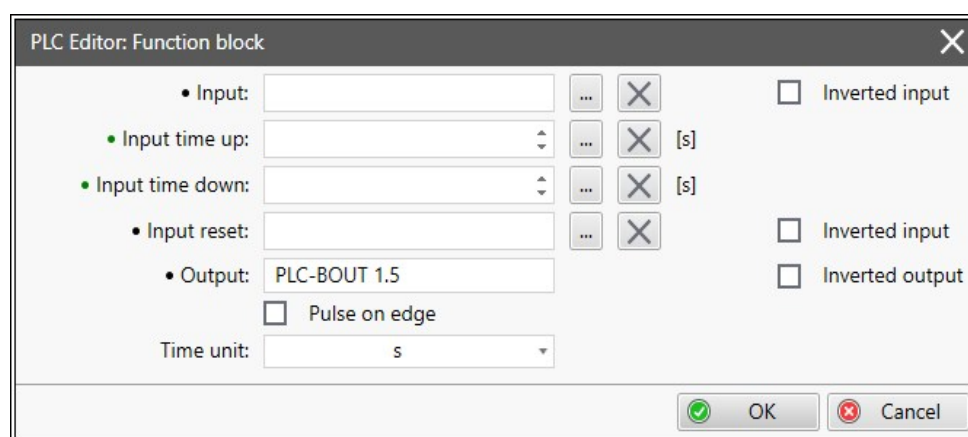
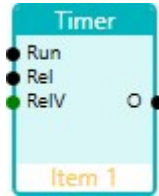


Image 7.22 Configuration of Delay block

Timer

PLC group	Time functions	
Related FW	1.1.0	
Related applications	MCB	
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 (page 567) to PLC Resource 16 (page 570)>

Description

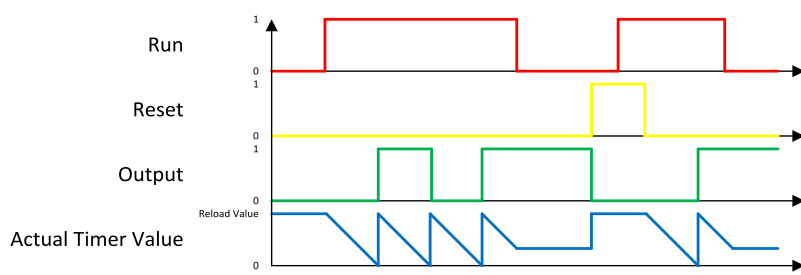
The block performs countdown Timer according to the selected Timer mode and actual inputs values.

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.

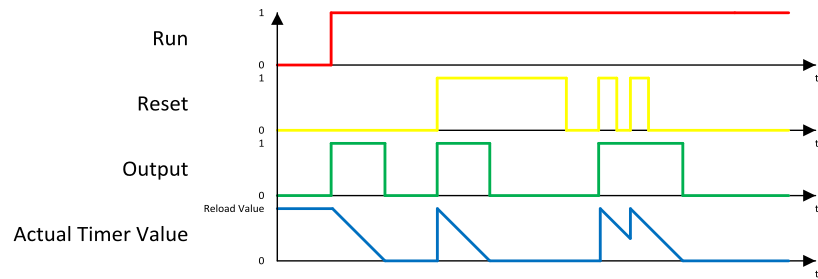
Timer mode ComAp

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.



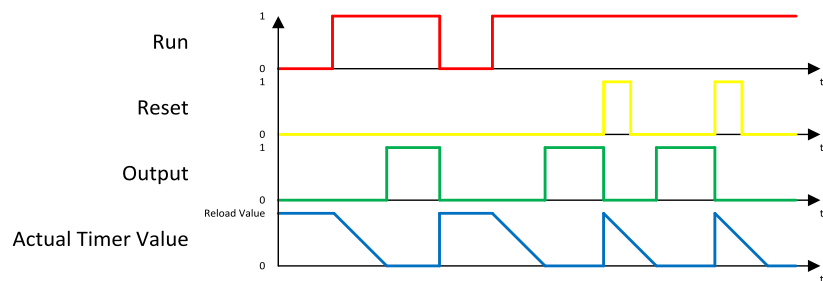
Timer mode TP

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).

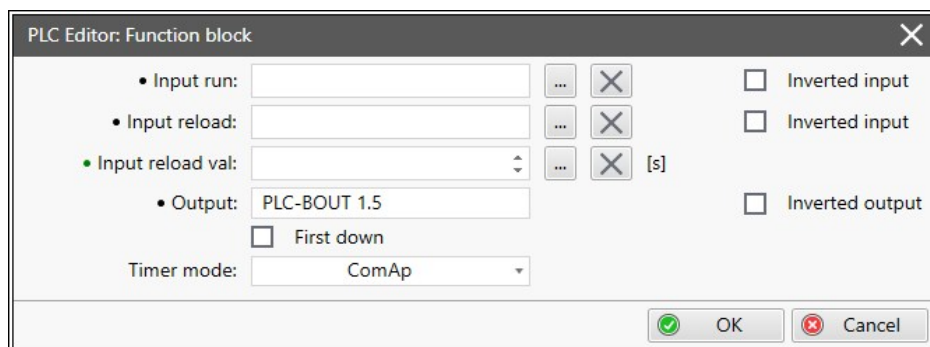
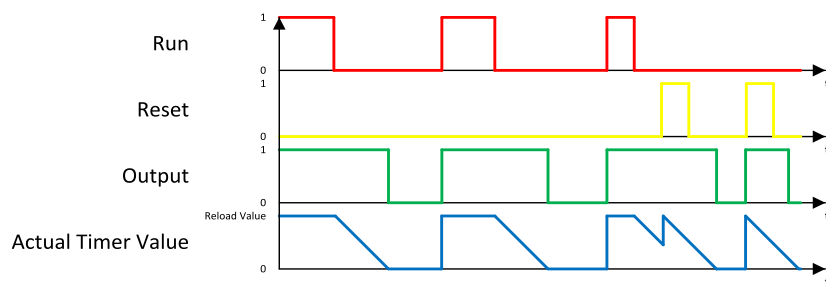


Image 7.23 Configuration of Timer block

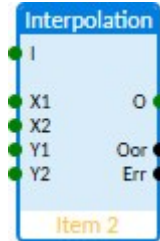
Note: For ComAp Timer mode: if you want the Output to start at logic 0, check the First down option. Otherwise, the Output will start at logical 1.

IMPORTANT: For ComAp Timer mode: if no inputs are connected and the First down option is not checked, the Output is active.

⬆ back to List of PLC blocks

Group: Math operations

Interpolation

PLC group			
Related FW	1.1.0		
Related applications	MCB		
PLC Block ID	34		
Inputs			
Input	Type	Range	Function
Input	Analog	$-2^{32} .. 2^{32}$	Input value
X1	Analog	$-2^{32} .. 2^{32}$	Low X limit of definition
X2	Analog	$-2^{32} .. 2^{32}$	High X limit of definition
Y1	Analog	$-2^{32} .. 2^{32}$	Low Y limit of definition
Y2	Analog	$-2^{32} .. 2^{32}$	High Y limit of definition
Outputs			
Output	Type	Range	Function
Output	Analog	Y1 .. Y2	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			
<p>This block performs a linear transformation of the input. The transformation function is defined by two pairs of points [X1, Y1] and [X2, Y2]. If the Input lies inside of the interval <X1, X2> 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 Y2 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, Y2 has resolution and dimension based on settings of the block. The resolution and dimensions of the X1 and X2 is same as resolution of the Input.</p>			

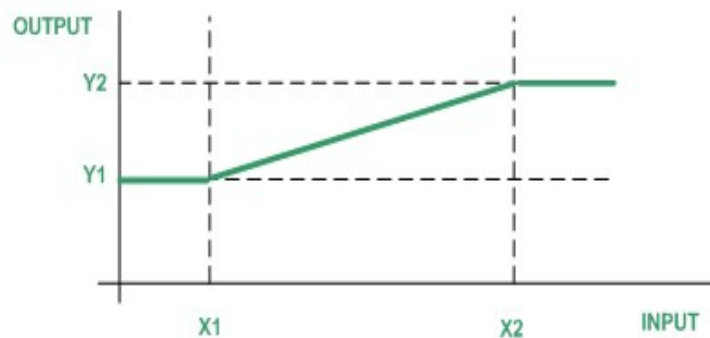


Image 7.24 Principle of Interpolation

PLC Editor: Function block

• Input: [] [X] []

• X 1: [] [X] []

• X 2: [] [X] []

• Y 1: [] [X] [-]

• Y 2: [] [X] [-]

• Output: PLC-AOUT 3 [-]

Dimension: -

Resolution: 1

• Out of Range: PLC-BOUT 1.6

• Data Invalid: PLC-BOUT 1.5

☐ Inverted output

☐ Inverted output

OK Cancel

Image 7.25 Configuration of Interpolation block

⬅ back to List of PLC blocks

AxB/C±D

PLC group				
Related FW	1.1.0			
Related applications	MCB			
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 Output is out of range or when dividing by zero occurs

Description

The block realizes the mathematical operation $A \cdot B / C \pm D$. The operation \pm is selected by **Function typeselector**. In case of any invalid data on any of the inputs, the **Output** is set to invalid value and **Data Invalid** is closed. The **Output** has resolution and dimension based on setting of the block.

PLC Editor: Function block

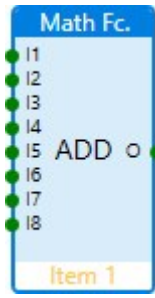
- Input A: [] [X] []
- Input B: [] [X] []
- Input C: [] [X] []
- Input D: [] [X] [-]
- Output: PLC-AOUT 1 [-]
- Dimension: -
- Resolution: 1
- Data Invalid: PLC-BOUT 1.1 [] ☐ Inverted output
- Function type: ADD

OK Cancel

Image 7.26 Configuration of Math $A \cdot B / C \pm D$ block

🔍 back to List of PLC blocks

Math Fc.

PLC group		
Related FW	1.1.0	
Related applications	MCB	
PLC Block ID	17	
Inputs		

Input	Type	Negation	Range	Function
Input 1	Analog	No	$-2^{32} \dots 2^{32}$	Input 1
Input 2	Analog	No	$-2^{32} \dots 2^{32}$	Input 2
Input 3	Analog	No	$-2^{32} \dots 2^{32}$	Input 3
Input 4	Analog	No	$-2^{32} \dots 2^{32}$	Input 4
Input 5	Analog	No	$-2^{32} \dots 2^{32}$	Input 5
Input 6	Analog	No	$-2^{32} \dots 2^{32}$	Input 6
Input 7	Analog	No	$-2^{32} \dots 2^{32}$	Input 7
Input 8	Analog	No	$-2^{32} \dots 2^{32}$	Input 8

Outputs				
Output	Type	Negation	Range	Function
Output	Analog	No	$-2^{32} \dots 2^{32}$	Result of the mathematical operation

Description
<p>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.</p> <p>The Output has a Resolution and Dimension according to the block settings.</p>

Function	Output
ADD - Addition	Input 1 + Input 2 + ... + Input N
SUB - Substraction	Input 1 - Input 2 - ... - Input N
 SUB - Absolute value of substraction	ABS(Input 1 - Input 2 - ... - Input N)
AVG - Average	Input 1 + Input 2 + ... + Input N) / N
MIN - Minimal value	MIN(Input 1, Input 2, ... ,Input N)
MAX - Maximal value	MAX(Input 1, Input 2, ... ,Input N)

Note: In case of AVG operation type the N is number of inputs with valid value.
--

PLC Editor: Function block

+

No.	Input	Unit
1		[-]
2		[-]
3		[-]
4		[-]
5		[-]
6		[-]
7		[-]
8		[-]

Output:

PLC-AOUT 6

[-]

Dimension:

-

Resolution:

1

Function type:

ADD

ADD

SUB

[SUB]

AVG

MAX

MIN

OK

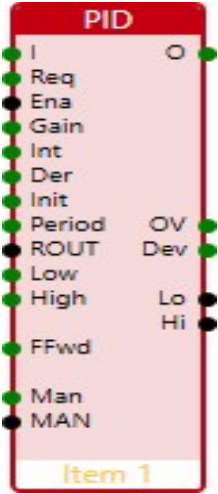
Cancel

Image 7.27 Configuration of Math Fc. block

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Group: Regulators

PID

PLC group		
Related FW	1.1.0	
Related applications	MCB	
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	0,00 .. 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
Outputs				
Output	Type	Negation	Range	Function
Output	Analog	No	-10 000 .. 10 000	Process value (controller output) "control value".
Output Velocity	Analog	No	-10 000 .. 10 000	Derivation of controller output "speed of control value".
Control Deviation	Analog	No	-10 000 .. 10 000	Control deviation (= "requested value" - "actual value").
Out Low Limit	Binary	Yes	0/1	Controller output reaches the Low Limit.
Out High Limit	Binary	Yes	0/1	Controller output reaches the High Limit.
Description				
The PID block is a PID controller, created by combining a proportional, an integration and a derivative controller together (all forming the feed-back controller) with an optional forward control path (intended for the feedforward control).				

The main purpose of using a PID controller is to eliminate the entry control deviation by changing the output control value (also called the manipulated value). The Control Deviation is evaluated as the difference between the Requested Value (setpoint value) and the Input Value (process value). If the controller is operating in automatic mode (MANual mode input is inactive), the action value is calculated according to the control law equation. In the case of manual control (MAN mode input is active), the value of the Manual Value is used instead. In both cases, the Output value is limited by the Low Limit and High Limit limit values.

The PID block features::

- Standard controller parameters (ISA Form).
- Limitation of the control (process) value (block output).
- Adjustable evaluation period.
- Feed-forward input (with feed-forward gain parameter).
- AUT/MAN switch with manual setpoint value.
- RACT switch (reversing of control value polarity).

The function of the PID controller can be disabled by the PID Enable. While the regulator is disabled, the output is set to a Init Value.

Note: Negative values of Gain are not allowed, use the Reverse Output input for such a purpose.

Note: There is a difference between Init Value (inactive PID block) and Manual Value - Manual Value is available only while the PID Enable is true, MAN mode is enabled and is limited by the High Limit and low Limit.

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 7.28 Configuration of PID block

⬅ back to List of PLC blocks

Up/Down Ctrl Block

PLC group		 <p>The diagram shows the U/D Ctrl block with the following inputs and outputs: Inputs (green dots): I, Dev, Period, ActTime, MinOn, MinOff, DBand. Outputs (black dots): Ena, Up, Dn, Low, High, ManUp, ManDn, MAN. A yellow label 'item 1' is at the bottom.</p>
Related FW	1.1.0	
Related applications	MCB	
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 ..	Deadband range (of input Control deviation,

			10 000	presumed symmetrical interval) → both outputs (Output Up or Output Down) are inactive (off).
Low Limit	Binary	Yes	0/1	Antecedent controller output reaches the Low Limit.
High Limit	Binary	Yes	0/1	Antecedent controller output reaches the High Limit.
Manual Up	Binary	Yes	0/1	In MANual mode force the SCU to activate (Manual Down must be inactive) Output Up.
Manual Down	Binary	Yes	0/1	In MANual mode force the SCU to activate (Manual Up must be inactive) Output Down.
MANual Mode	Binary	Yes	0/1	Manual Mode: off - AUTomatic mode (default) on - MANual mode
Outputs				
Output	Type	Negation	Range	Function
Output Up	Binary	Yes	0/1	Actuator control - Raise
Output Down	Binary	Yes	0/1	Actuator control - Lower
Description				
<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 <-10000; +10000>.</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>				
Use case:				
<ul style="list-style-type: none"> ➤ The U/D Ctrl block (Up/Down relay Control block) is intended for use as an output stage of the primary controller, converting its analog control action to up/down outputs (PWM controlled). ➤ Block parameters are therefore set according to the characteristics of the actuator connected onward. ➤ The PID block and U/D Ctrl block connected together thus forms PID controller with relay controlled Up / Down outputs. ➤ The U/D Ctrl block itself could also act as converting block from analog value to PWM modulated signals. 				

- If the U/D Ctrl block is operating in MANual mode, the manual setting of respective outputs (Output Up / Output Down) is possible.

PLC Editor: Function block

- Input Value: [] ... X []
- Control Deviation: [] ... X []
- U/D Enable: [] ... X ☐ Inverted input
- Period: [s] ... X [s]
- Actuator Time: [s] ... X [s]
- Min On Time: [s] ... X [s]
- Min Off Time: [s] ... 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-BOUT 1.3 ☐ Inverted output
- Output Down: PLC-BOUT 1.2 ☐ Inverted output

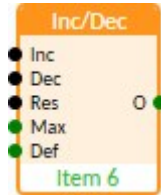
OK Cancel

Image 7.29 Configuration of Up/Down Ctrl Block

⬅ back to List of PLC blocks

Group: Ramp functions

Inc/Dec

PLC group				
Related FW	1.1.0			
Related applications	MCB			
PLC Block ID	22			
Inputs				
Input	Type	Negation	Range	Function
Increment	Binary	No	0/1	Rising edge increase value of Output by 1
Decrement	Binary	No	0/1	Rising edge decrease value of Output by 1

Reset	Binary	No	0/1	Rising edge resets Output to Default
Maximum	Analog	No	$-2^{32} .. 2^{32}$	Maximum value of Output
Default	Analog	No	$-2^{32} .. 2^{32}$	Initial value of Output

Outputs

Output	Type	Negation	Range	Function
Output	Analog	No	$-2^{32} .. \text{Maximum}$	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 7.30 Configuration of Inc/Dec block

⬅ back to List of PLC blocks

Mov Avg

PLC group		
Related FW	1.1.0	
Related applications	MCB	
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.

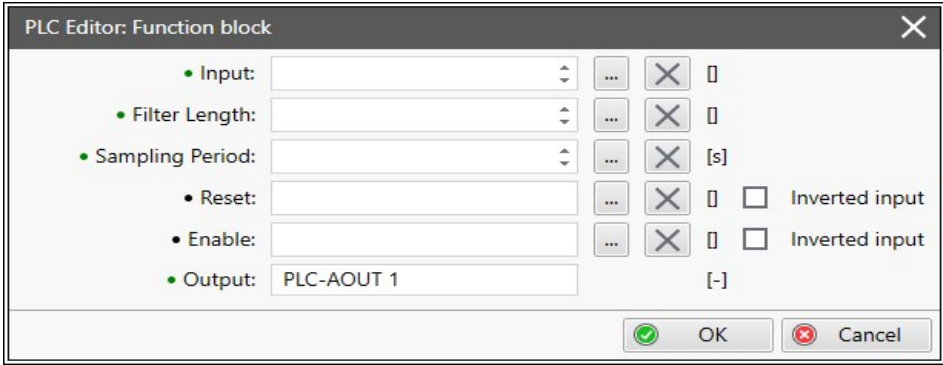


Image 7.31 Configuration of Moving Average block

⬅ back to List of PLC blocks

Ramp

PLC group		
Related FW	1.1.0	
Related applications	MCB	
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 Output per second
Down	Analog	No	$-2^{32} \dots 2^{32}$	Maximal lowering rate of the Output per second

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 **Output**. The maximal rates **Up** and **Down** are adjustable separately and ramping is based on enabled ramps. The **Output** has resolution and dimension based on setting of the block.

Function	Description
Enabled Up	Output can be ramped only up.
Enabled Down	Output can be ramped only down.
Enabled Up/Down	Output can be ramped up and down.

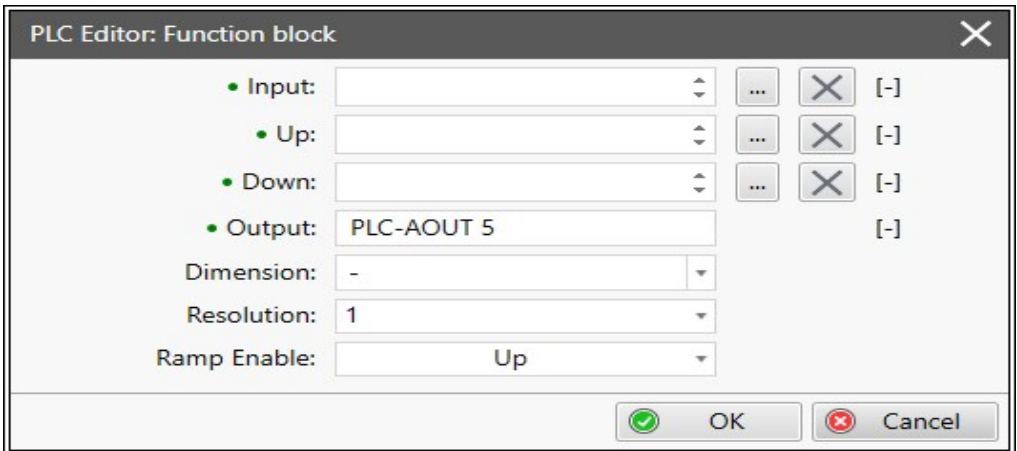



Image 7.32 Configuration of Ramp block

⬅ back to List of PLC blocks

Up/Down

PLC group		
Related FW	1.1.0	
Related applications	MCB	
PLC Block ID	20	
Inputs		

Input	Type	Negation	Range	Function
Limit 1	Analog	No	$-2^{32} \dots 2^{32}$	First limit of Output
Limit 2	Analog	No	$-2^{32} \dots 2^{32}$	Second limit of Output
Reset	Binary	No	0/1	Resets Output to Default Output Value when active
Speed Up	Analog	No	$-2^{32} \dots 2^{32}$	Rising rate of Output per second
Speed Down	Analog	No	$-2^{32} \dots 2^{32}$	Lowering rate of Output per second
Up	Binary	No	0/1	Activates rising of Output
Down	Binary	No	0/1	Activates lowering of Output
Default Output Value	Analog	No	$-2^{32} \dots 2^{32}$	Initial value of Output

Outputs				
Output	Type	Negation	Range	Function
Output	Analog	No	Limit 1 .. Limit 2	Output value

Description
<p>This block works as an analog ramp controlled by binary inputs Up and Down with a defined rate of increase/decrease.</p> <p>The ramp speed is adjusted by Speed Up and Speed Down.</p> <p>The Output limitation is set by Limit 1 and Limit 2. The default value of Output is set by Default Output Value.</p> <p>Activate Reset to reset Output to Default Output Value. The Output has resolution and dimension based on setting of the block.</p>

IMPORTANT: If both the inputs **Up** and **Down** are active, the **Output** is set to **Default Output Value**.

PLC Editor: Function block

Limit 1:

...

X

[-]

Limit 2:

...

X

[-]

Reset:

...

X

Speed Up:

...

X

[-]

Speed Down:

...

X

[-]

Up:

...

X

Down:

...

X

Default Output Value:

...

X

[-]

Output:

PLC-AOUT 5

[-]

Dimension:

-

Resolution:

1

☐

Inverted input

☐

Inverted input

☐

Inverted input

OK


Cancel

Image 7.33 Configuration of Up/Down block

⬅ back to List of PLC blocks

Group: Other functions

Analog Switch

PLC group	Other functions			
Related FW	1.1.0			
Related applications	MCB			
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 Input 1 and Input 2 based on value of Input SW . The Output has resolution and dimension based on setting of the block.				

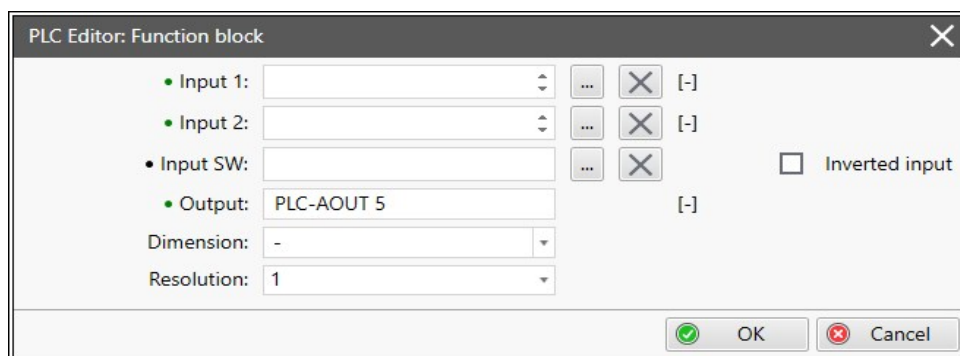
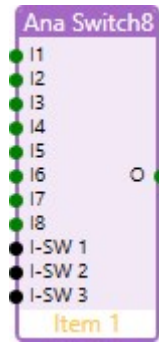


Image 7.34 Configuration of Analog Switch block

⬅ back to List of PLC blocks

Analog Switch 8

PLC group	Other functions			
Related FW	1.1.0			
Related applications	MCB			
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 7.35 Configuration of Analog Switch 8 block

[back to List of PLC blocks](#)

Circuit Breaker

PLC group	Other functions	
Related FW	1.1.0	
Related applications	MCB	
PLC Block ID	58	

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)
Close	Close	Binary	0/1	The rising edge of the Close signal forces the breaker to close (edge control)
Open	Open	Binary	0/1	The rising edge of the Open signal forces the breaker to open (edge 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)

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	Failed to close

Description

This block performs general **Circuit Breaker (CB)** control based on the state machine principle.

Inputs

- **Close/Open:** Input for level control of breaker close/open control. Since the block contains a state machine and the possibility of impulse (edge) control is required, an edge response is also introduced for level control as well, i.e., the rising edge is interpreted as a **CB** Close request and a falling edge as a **CB** Open request.
- **Close:** The request to switch on (Close **CB**) - minimum pulse length is 200 ms - manual issue, edge responsive.

- **Open:** The request to switch off (Open **CB**) - minimum pulse length is 200 ms - manual issue, edge responsive.
- **Feedback:** Feedback from auxiliary breaker contacts, not required to configure. (If not configured, the mismatch between requested and breaker state is not evaluated; it is assumed that the breaker is currently in the desired state).
- **Feedback Negative:** It is not required to be configured together with the **CBFeedback** input. However, if **Feedback Negative** is configured, the **Feedback** input must be configured too. Then, not only the mismatch between the desired state and the feedback is always evaluated, but also the mismatch between the two feedbacks.
- **Disable:** If the **CB** is disconnected (opened), the **Disable** input will blocks its switching (closing). If the **CB** has already been switched on, this input does not open it. It is not necessary to configure this input = if the input is not configured, it is evaluated as inactive.
- **Charged:** This input has the same function (but in inverse logic) as **CBDisabled**, it is used only in conjunction with information about the breaker spring tension. Configuration of the input is not required; if the input is not configured, it is evaluated as active.

Outputs

- **ON Coil:** Switching signal for ON (closing) **CB** coil - pulse length of 5 sec (the feedback confirmation is expected within this 5 sec).
- **OFF Coil:** Tripping signal for OFF (opening) **CB** coil - pulse length 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:** In case of a failed attempt to close the **CB** (second attempt), a 5s pulse is generated at the output. A user protection may be configured on it.
- **Failed To Open:** In case of a failed attempt to open the **CB**, a 5s pulse is generated at the output. A user protection may be configured on it.
- **Other Fail:** Information about other non-correlated **CB** events (states). A 5s pulse is generated at the breaker output in the event of a mismatch between **Feedback** and **Feedback Negative** and/or where **Feedback** is lost or, conversely, **Feedback** is set in a situation where a change in **CB** state is unexpected.

PLC Editor: Function block

• Close/Open: ... ☒ ☐ Inverted input

• Close: ... ☒ ☐ Inverted input

• Open: ... ☒ ☐ Inverted input

• Feedback: ... ☒ ☐ Inverted input

• Negative Feedback: ... ☒ ☐ Inverted input

• Disabled: ... ☒ ☐ Inverted input

• Charged: ... ☒ ☐ 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

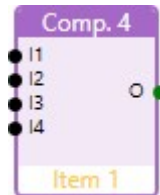
• Other Fail: PLC-BOUT 1.8 ☐ ☐ Inverted output

☒ OK ☐ Cancel

Image 7.36 Configuration of Circuit Breaker block

⬅ back to List of PLC blocks

Comp. 4

PLC group	Other functions			
Related FW	1.1.0			
Related applications	MCB			
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).

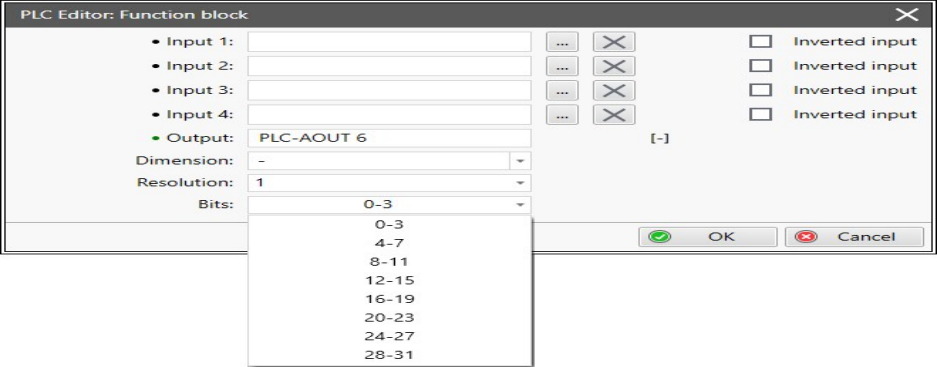
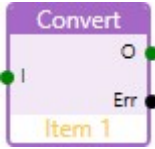


Image 7.37 Configuration of Comp. 4 block

⬅ back to List of PLC blocks

Convert

PLC group	Other functions	
Related FW	1.1.0	
Related applications	MCB	
PLC Block ID	52	

Inputs

Input	Type	Negation	Range	Function
Input	Analog	No	$-2^{32} .. 2^{32}$	Input value

Outputs

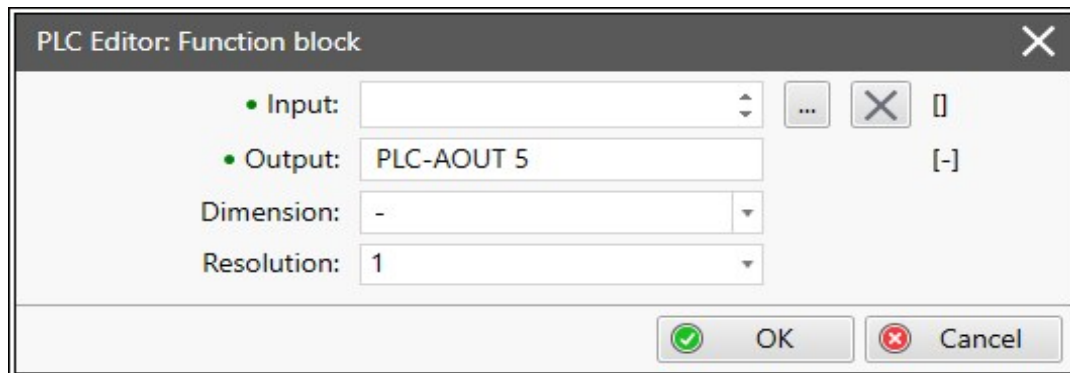
Output	Type	Negation	Range	Function
Output	Analog	No	$-2^{32} .. 2^{32}$	Converted Input value
Output	Binary	Yes	0/1	The attribute of invalid data on output

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.



The screenshot shows a dialog box titled "PLC Editor: Function block" with a close button (X) in the top right corner. Inside the dialog, there are four configuration fields:

- Input:** A text input field that is currently empty, with a small up/down arrow icon to its right. To the right of the field are three icons: an ellipsis (...), a close button (X), and a reset button (a square with a diagonal line).
- Output:** A text input field containing the text "PLC-AOUT 5". To the right of the field is a reset button (a square with a diagonal line).
- Dimension:** A dropdown menu showing a hyphen (-) as the selected value.
- Resolution:** A dropdown menu showing the value "1".

At the bottom right of the dialog, there are two buttons: "OK" with a green checkmark icon and "Cancel" with a red X icon.

Image 7.38 Configuration of Convert block

[◀ back to List of PLC blocks](#)

Counter

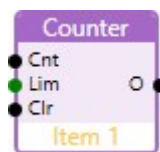
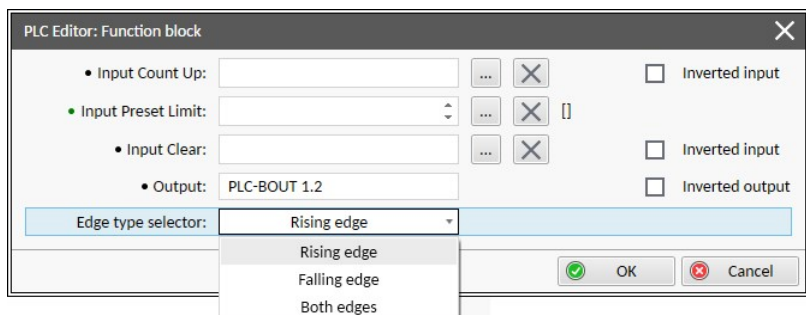
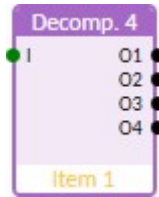
PLC group	Other functions				
Related FW	1.1.0				
Related applications	MCB				
PLC Block ID	13				
Inputs					
Input	Type	Negation	Range	Function	
Input Count Up	Binary	No	0/1	Input at which the edges are counted	
Input Preset Limit	Analog	No	0 .. 2 ³²	Counter value limit for activation of the output	
Input Clear	Binary	No	0/1	Reset input	
Outputs					
Output	Type	Negation	Range	Function	
Output	Binary	No	0/1	Output is activated when the counter value exceeds the limit	
Actual Counter Value	Analog	No	N/A	Analog value that shows Actual Counter Value Lowest available value from: <PLC Resource 1 (page 567) to PLC Resource 16 (page 570)>	
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 7.39 Configuration of the Counter block

Image 7.39 Configuration of the Counter block

◀ back to List of PLC blocks

Decomp. 4

PLC group	Other functions	
Related FW	1.1.0	
Related applications	MCB	
PLC Block ID	24	

Inputs

Input	Type	Negation	Range	Function
Input	Analog	No	$-2^{32} \dots 2^{32}$	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).

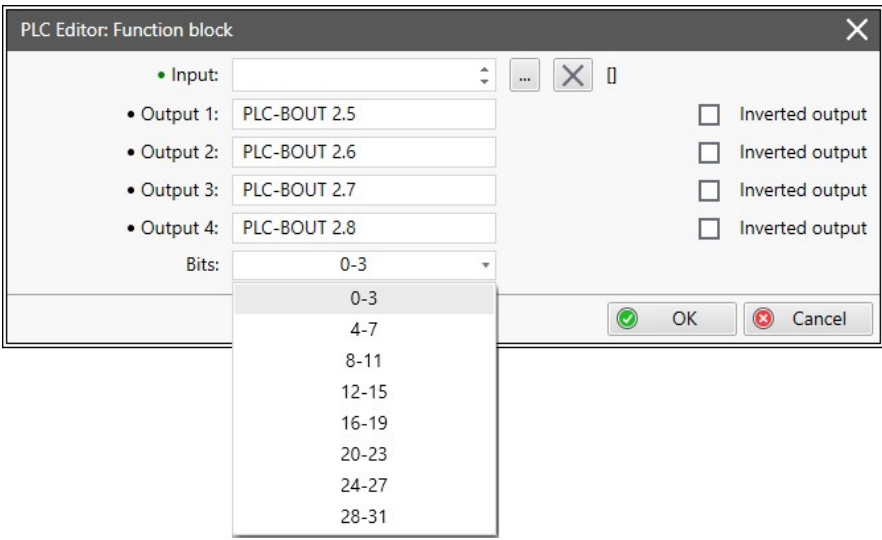
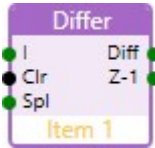


Image 7.40 Configuration of Decomp. 4 block

◀ back to List of PLC blocks

Differ

PLC group	Other functions	
Related FW	1.1.0	
Related applications	MCB	
PLC Block ID	55	

Inputs

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)

Outputs

Output	Type	Negation	Range	Function
Δ / Difference	Analog	No	$-2^{32}-1 \dots +2^{32}-1$	Difference-by-Time of Input 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 Δ is calculated from four successive internal values based on this equation :

$$\Delta k = \frac{e_k + 3e_{k-1} - 3e_{k-2} - e_{k-3}}{6 \quad T}$$

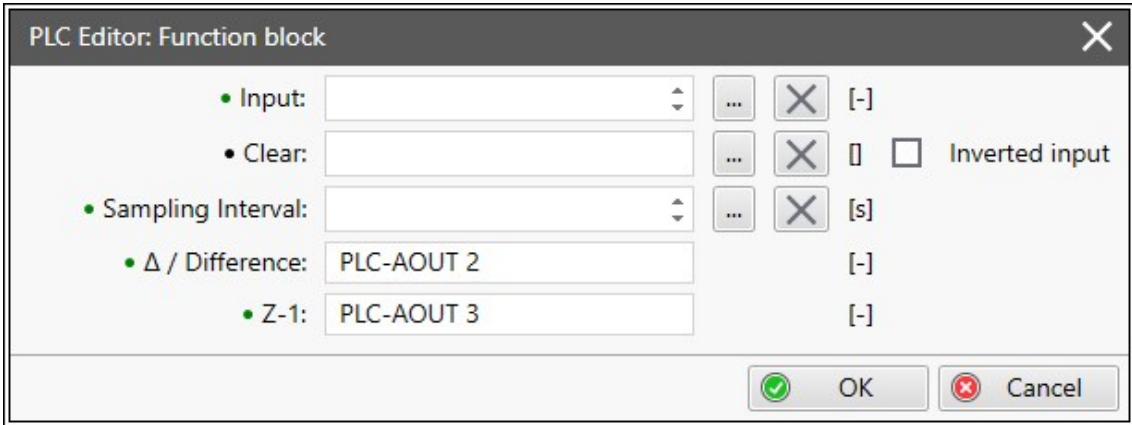



Image 7.41 Configuration of the Differ block

Hold

PLC group	Other functions	
Related FW	1.1.0	
Related applications	MCB	
PLC Block ID	37	

Inputs

Input	Type	Negation	Range	Function
Input	Analog	No	$-2^{32} \dots 2^{32}$	Input value
Hold	Binary	No	0/1	Input triggering the function

Outputs

Output	Type	Negation	Range	Function
Output	Analog	No	$-2^{32} \dots 2^{32}$	Hold output

Description

The block is holding **Input** value based on value of **Hold** and selected mode. The Output has resolution and dimension based on setting of the block.

Mode	Description
Edge	The block behaves like analog memory. Input Hold behaves like the reload trigger and reacts on rising edge. The initial value of the Output after restart of the controller is 0.
Level	The block is like a mirror of the Input while the Hold is inactive. The value of Output is latched at the last value while Hold is active.

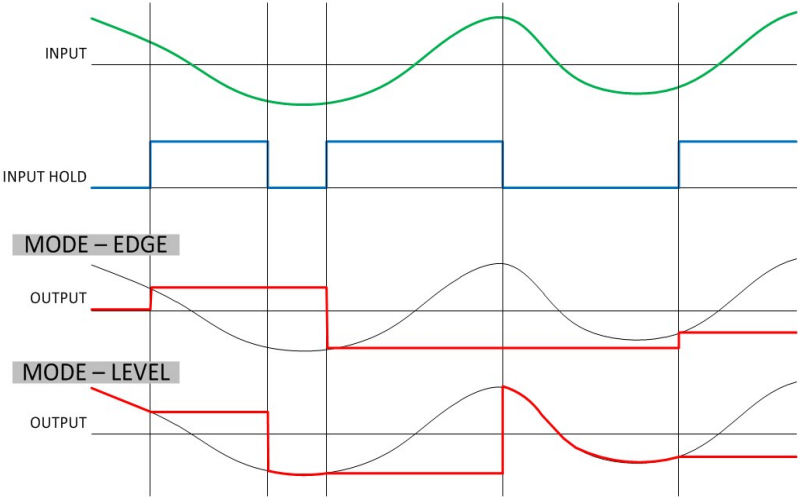


Image 7.42 Principle of the Hold modes

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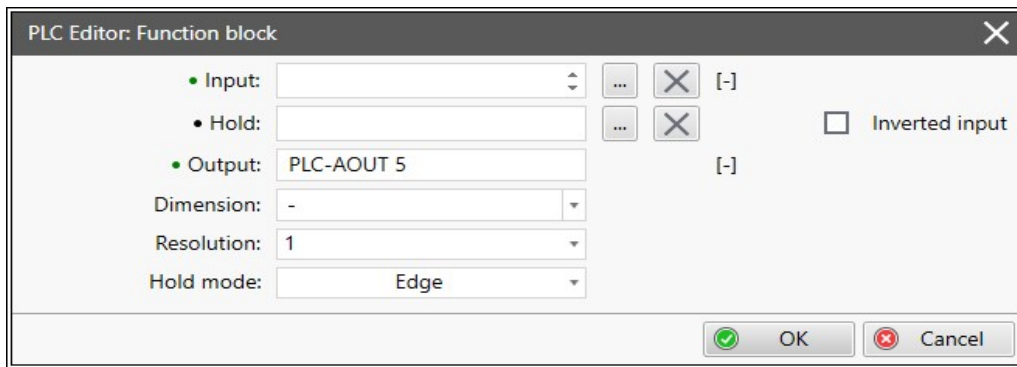
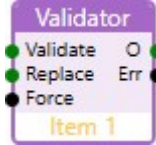


Image 7.43 Configuration of the Hold block

⬆ back to List of PLC blocks

Validator

PLC group	Other functions			
Related FW	1.1.0			
Related applications	MCB			
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 Output value is determined according to the following rules:				
Function Validate				
Input Validate	Input Force	Output O	Output Err	
Valid value	0	Validate	0	
Invalid value	0	Replace	1	
Valid value	1	Replace	0	
Invalid value	1	Replace	1	

PLC Editor: Function block

• Validate:

...

✕

[-]

• Replace:

...

✕

[-]

• Force:

...

✕

☐

Inverted input

• Output:

PLC-AOUT 1

[-]

• Data Invalid:

PLC-BOUT 1.1

☐

Inverted output

✓

OK

✕

Cancel

Image 7.44 Configuration of Validator block

⬅ back to List of PLC blocks

8.2 Alarms

What alarms are:

The controller evaluates two levels of alarms. For more information **see Alarm Management on page 120.**

8.2.1 Alarm levels in the controller

8.2.2 Alarms level 1	706
8.2.3 Alarms level 2	757

8.2.2 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	709	Wrn DISTIN 26	718	Wrn DISTIN 63	727
Wrn Alarm e-mail 1 Fail ...	709	Wrn DISTIN 27	718	Wrn DISTIN 64	727
Wrn Alarm e-mail 2 Fail ...	709	Wrn DISTIN 28	718	Wrn DISTOUT	728
Wrn Alarm e-mail 3 Fail ...	709	Wrn DISTIN 29	719	Wrn ECU 1 Comm Fail	729
Wrn Alarm e-mail 4 Fail ...	709	Wrn DISTIN 30	719	Wrn ECU 2 Comm Fail	729
Wrn Backup Controller		Wrn DISTIN 31	719	Wrn ECU 3 Comm Fail	729
Failed	710	Wrn DISTIN 32	719	Wrn ECU 4 Comm Fail	729
Wrn Backup Not Ready ...	710	Wrn DISTIN 33	720	Wrn ECU 5 Comm Fail	730
Wrn Brute Force		Wrn DISTIN 34	720	Wrn ECU 6 Comm Fail	730
Protection Active	710	Wrn DISTIN 35	720	Wrn ECU 7 Comm Fail	730
Wrn CAN2 Empty	711	Wrn DISTIN 36	720	Wrn ECU 8 Comm Fail	731
Wrn Default Password	711	Wrn DISTIN 37	721	Wrn ECU 9 Comm Fail	731
Wrn DISTIN 01	712	Wrn DISTIN 38	721	Wrn ECU 10 Comm Fail ..	731
Wrn DISTIN 02	712	Wrn DISTIN 39	721	Wrn ECU 11 Comm Fail ..	731
Wrn DISTIN 03	712	Wrn DISTIN 40	721	Wrn ECU 12 Comm Fail ..	732
Wrn DISTIN 04	712	Wrn DISTIN 41	722	Wrn ECU 13 Comm Fail ..	732
Wrn DISTIN 05	713	Wrn DISTIN 42	722	Wrn ECU 14 Comm Fail ..	732
Wrn DISTIN 06	713	Wrn DISTIN 43	722	Wrn ECU 15 Comm Fail ..	733
Wrn DISTIN 07	713	Wrn DISTIN 44	722	Wrn ECU 16 Comm Fail ..	733
Wrn DISTIN 08	713	Wrn DISTIN 45	723	Wrn Event e-mail 1 Fail ...	733
Wrn DISTIN 09	714	Wrn DISTIN 46	723	Wrn Event e-mail 2 Fail ...	733
Wrn DISTIN 10	714	Wrn DISTIN 47	723	Wrn Event e-mail 3 Fail ...	734
Wrn DISTIN 11	714	Wrn DISTIN 48	723	Wrn Event e-mail 4 Fail ...	734
Wrn DISTIN 12	714	Wrn DISTIN 49	724	Wrn Hot Swap	
Wrn DISTIN 13	715	Wrn DISTIN 50	724	Configuration Incorrect	734
Wrn DISTIN 14	715	Wrn DISTIN 51	724	Wrn Hot Swap Data	
Wrn DISTIN 15	715	Wrn DISTIN 52	724	Synchro Fail	735
Wrn DISTIN 16	715	Wrn DISTIN 53	725	Wrn Load IMP/EXP Fail ...	735
Wrn DISTIN 17	716	Wrn DISTIN 54	725	Wrn Long Term History	
Wrn DISTIN 18	716	Wrn DISTIN 55	725	Fail	735
Wrn DISTIN 19	716	Wrn DISTIN 56	725	Wrn Master Controller	
Wrn DISTIN 20	716	Wrn DISTIN 57	726	Failed	736
Wrn DISTIN 21	717	Wrn DISTIN 58	726	Wrn Password reset e-mail	
Wrn DISTIN 22	717	Wrn DISTIN 59	726	addr is not set	736
Wrn DISTIN 23	717	Wrn DISTIN 60	726	Wrn PF Control Fail	736
Wrn DISTIN 24	717	Wrn DISTIN 61	727	Wrn PF/Q IMP/EXP Fail ..	737
Wrn DISTIN 25	718	Wrn DISTIN 62	727	Wrn Q Control Fail	737

Wrn Redundant CAN inconsistency	738	ALI SD Card Formatting/Mounting	746	Hst ROCOF4	756
Wrn RTC Battery Flat	738	ALI Synchronization Blocked	747	Hst Synchronization Fail ..	757
Wrn SD Card Failed	738	ALI SW Key Hot Swap Error	747	Hst Vector Shift	757
Wrn SD Card File System Failed	738	ALI SW Key Modbus Master Error	747		
Wrn SHAIN 1	739	ALI Wrong Power Format ..	747	 back to Alarms	
Wrn SHAIN 2	739				
Wrn SHAIN Collision	739	Alarm List + History Indication	748		
Wrn SHBIN 1	740	AHI Battery Overvoltage ..	748		
Wrn SHBIN 2	740	AHI Battery Undervoltage ..	748		
Wrn SHBIN 3	740	AHI MCB Isolated	748		
Wrn SHBIN 4	740	History Record Only	748		
Wrn SHBIN 5	741	Hst Bus >V L1-N	748		
Wrn SHBIN 6	741	Hst Bus >V L2-N	749		
Wrn SHBIN Collision	741	Hst Bus >V L3-N	749		
Wrn SNMP TRAP 1 Fail ..	741	Hst Bus >V L1-L2	749		
Wrn SNMP TRAP 2 Fail ..	742	Hst Bus >V L2-L3	749		
Wrn Total Running PQS Value Overflow	742	Hst Bus >V L3-L1	750		
Wrong PLC Configuration ..	742	Hst Bus <V L1-N	750		
Alarm Only	743	Hst Bus <V L2-N	750		
Alarm List Indication	743	Hst Bus <V L3-N	750		
ALI Bus Ph L1 Inverted ..	743	Hst Bus <V L1-L2	751		
ALI Bus Ph L2 Inverted ..	743	Hst Bus <V L2-L3	751		
ALI Bus Ph L3 Inverted ..	743	Hst Bus <V L3-L1	751		
ALI Bus Ph Rotation Opposite	743	Hst Bus >f	751		
ALI Mains Ph L1 Inverted ..	744	Hst Bus <f	752		
ALI Mains Ph L2 Inverted ..	744	Hst Bus V Unbalance Ph-N	752		
ALI Mains Ph L3 Inverted ..	744	Hst Bus V Unbalance Ph-Ph	752		
ALI Mains Ph Rotation Opposite	744	Bus Meas Error	752		
ALI CAN Mode Inconsistency	745	Hst MCB Fail	753		
ALI Redundant CAN Error ..	745	Hst MCB Fail To Close	754		
ALI SD Card Not Compatible	745	Hst MCB Fail To Open	755		
ALI SD Card In Slot	746	Hst Synchronization Fail ..	755		
ALI SD Card Full	746	Hst ROCOF 1	756		
		Hst ROCOF2	756		
		Hst ROCOF3	756		

Warning

Wrn Alarm e-mail 1 Fail

Alarm Type	Warning (page 211)
Alarmlist message	Wrn Alarm e-mail 1 Fail
Alarm evaluated	All the time
Related applications	MCB
Alarm ID	815
Description	<p>The alarm indicates that there was a request to send an alarm email to email address which is adjusted by setpoint E-mail Address 1 (page 385) and email wasn't send.</p> <p>This alarm has FPS - FIXED PROTECTIONS STATES 4 (PAGE 661).</p>

🔍 back to List of alarms level 1

Wrn Alarm e-mail 2 Fail

Alarm Type	Warning (page 211)
Alarmlist message	Wrn Alarm e-mail 2 Fail
Alarm evaluated	All the time
Related applications	MCB
Alarm ID	816
Description	<p>The alarm indicates that there was a request to send an alarm email to email address which is adjusted by setpoint E-mail Address 2 (page 385) and email wasn't send.</p> <p>This alarm has FPS - FIXED PROTECTIONS STATES 4 (PAGE 661).</p>

🔍 back to List of alarms level 1

Wrn Alarm e-mail 3 Fail

Alarm Type	Warning (page 211)
Alarmlist message	Wrn Alarm e-mail 3 Fail
Alarm evaluated	All the time
Related applications	MCB
Alarm ID	817
Description	<p>The alarm indicates that there was a request to send an alarm email to email address which is adjusted by setpoint E-mail Address 3 (page 385) and email wasn't send.</p> <p>This alarm has FPS - FIXED PROTECTIONS STATES 4 (PAGE 661).</p>

🔍 back to List of alarms level 1

Wrn Alarm e-mail 4 Fail

Alarm Type	Warning (page 211)
Alarmlist message	Wrn Alarm e-mail 4 Fail
Alarm evaluated	All the time

Related applications	MCB
Alarm ID	818
Description	<p>The alarm indicates that there was a request to send an alarm email to email address which is adjusted by setpoint E-mail Address 4 (page 386) and email wasn't send.</p> <p>This alarm has FPS - FIXED PROTECTIONS STATES 4 (PAGE 661).</p>

🔍 back to List of alarms level 1

Wrn Backup Controller Failed

Alarm Type	Warning (page 211)
Alarmlist message	Wrn Backup Controller Failed
Alarm evaluated	Only if Hot Swap Redundancy (page 274) != Disabled
Related applications	MCB
Alarm ID	1289
Description	<p>This alarm is activated on Hot Swap Redundancy (page 141) master controller when master controller does not detect the HOT SWAP HEARTBEAT (PAGE 638) signal from backup.</p>

🔍 back to List of alarms level 1

Wrn Backup Not Ready

Alarm Type	Warning (page 211)
Alarmlist message	Wrn Backup Not Ready
Alarm evaluated	Only if Hot Swap Redundancy (page 274) = Master
Related applications	MCB
Alarm ID	1146
Description	<p>This alarm is related to the Hot Swap Redundancy (page 141). It is activated when the BACKUP controller has announced any 2nd level alarm while the MASTER controller does not indicate such alarm.</p> <p>In this case, the BACKUP is unable to take over the control if Master controller fails. This is a marginal issue and may be caused due to wrong configuration.</p>

🔍 back to List of alarms level 1

Wrn Brute Force Protection Active

Alarm Type	Warning (page 211)
Alarmlist message	Wrn Brute Force Protection Active
Alarm evaluated	All the time
Related applications	MCB
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 Account break protection (page 180) rules.</p> <p>This alarm has FPS - FIXED PROTECTIONS STATES 1 (PAGE 658).</p>

 [back to List of alarms level 1](#)

Wrn CAN2 Empty

Alarm Type	Warning (page 211)
Alarmlist message	Wrn CAN Intercontroller Empty
Alarm evaluated	Only if CAN Intercontroller Empty Check (page 367) = Enabled
Related applications	MCB
Alarm ID	46
Description	<p>This alarm is activated when controller is alone on Intercontroller CAN (Ⓢ CAN2A (page 43) and/or Ⓣ CAN2B (page 43)) and setpoint CAN Intercontroller Empty Check (page 367) = Enabled.</p> <p>This alarm has FPS - FIXED PROTECTIONS STATES 1 (PAGE 658).</p>

 [back to List of alarms level 1](#)

Wrn Default Password

Alarm Type	Warning (page 211)
Alarmlist message	Wrn Default Credentials
Alarm evaluated	All the time
Related applications	MCB
Alarm ID	1071
Description	<p>This alarm is active until the default password for administrator account is changed.</p>

 [back to List of alarms level 1](#)

Wrn DISTIN 01

Alarm Type	Warning (page 211)
Alarmlist message	Wrn DISTIN 01
Alarm evaluated	Only if DIST-IN 01 is configured
Related applications	MCB
Alarm ID	1156
Description	This alarm is activated when DIST-IN data are not received from controller with CAN Controller Address (page 362) = 1.

⬅ back to List of alarms level 1

Wrn DISTIN 02

Alarm Type	Warning (page 211)
Alarmlist message	Wrn DISTIN 02
Alarm evaluated	Only if DIST-IN 02 is configured
Related applications	MCB
Alarm ID	1157
Description	This alarm is activated when DIST-IN data are not received from controller with CAN Controller Address (page 362) = 2.

⬅ back to List of alarms level 1

Wrn DISTIN 03

Alarm Type	Warning (page 211)
Alarmlist message	Wrn DISTIN 03
Alarm evaluated	Only if DIST-IN 03 is configured
Related applications	MCB
Alarm ID	1158
Description	This alarm is activated when DIST-IN data are not received from controller with CAN Controller Address (page 362) = 3.

⬅ back to List of alarms level 1

Wrn DISTIN 04

Alarm Type	Warning (page 211)
Alarmlist message	Wrn DISTIN 04
Alarm evaluated	Only if DIST-IN 04 is configured
Related applications	MCB
Alarm ID	1159
Description	This alarm is activated when DIST-IN data are not received from controller with CAN Controller Address (page 362) = 4.

⬅ back to List of alarms level 1

Wrn DISTIN 05

Alarm Type	Warning (page 211)
Alarmlist message	Wrn DISTIN 05
Alarm evaluated	Only if DIST-IN 05 is configured
Related applications	MCB
Alarm ID	1160
Description	This alarm is activated when DIST-IN data are not received from controller with CAN Controller Address (page 362) = 5.

⬅ back to List of alarms level 1

Wrn DISTIN 06

Alarm Type	Warning (page 211)
Alarmlist message	Wrn DISTIN 06
Alarm evaluated	Only if DIST-IN 06 is configured
Related applications	MCB
Alarm ID	1161
Description	This alarm is activated when DIST-IN data are not received from controller with CAN Controller Address (page 362) = 6.

⬅ back to List of alarms level 1

Wrn DISTIN 07

Alarm Type	Warning (page 211)
Alarmlist message	Wrn DISTIN 07
Alarm evaluated	Only if DIST-IN 07 is configured
Related applications	MCB
Alarm ID	1162
Description	This alarm is activated when DIST-IN data are not received from controller with CAN Controller Address (page 362) = 7.

⬅ back to List of alarms level 1

Wrn DISTIN 08

Alarm Type	Warning (page 211)
Alarmlist message	Wrn DISTIN 08
Alarm evaluated	Only if DIST-IN 08 is configured
Related applications	MCB
Alarm ID	1163
Description	This alarm is activated when DIST-IN data are not received from controller with CAN Controller Address (page 362) = 8.

⬅ back to List of alarms level 1

Wrn DISTIN 09

Alarm Type	Warning (page 211)
Alarmlist message	Wrn DISTIN 09
Alarm evaluated	Only if DIST-IN 09 is configured
Related applications	MCB
Alarm ID	1164
Description	This alarm is activated when DIST-IN data are not received from controller with CAN Controller Address (page 362) = 9.

⬅ back to List of alarms level 1

Wrn DISTIN 10

Alarm Type	Warning (page 211)
Alarmlist message	Wrn DISTIN 10
Alarm evaluated	Only if DIST-IN 10 is configured
Related applications	MCB
Alarm ID	1165
Description	This alarm is activated when DIST-IN data are not received from controller with CAN Controller Address (page 362) = 10.

⬅ back to List of alarms level 1

Wrn DISTIN 11

Alarm Type	Warning (page 211)
Alarmlist message	Wrn DISTIN 11
Alarm evaluated	Only if DIST-IN 11 is configured
Related applications	MCB
Alarm ID	1166
Description	This alarm is activated when DIST-IN data are not received from controller with CAN Controller Address (page 362) = 11.

⬅ back to List of alarms level 1

Wrn DISTIN 12

Alarm Type	Warning (page 211)
Alarmlist message	Wrn DISTIN 12
Alarm evaluated	Only if DIST-IN 12 is configured
Related applications	MCB
Alarm ID	1167
Description	This alarm is activated when DIST-IN data are not received from controller with CAN Controller Address (page 362) = 12.

⬅ back to List of alarms level 1

Wrn DISTIN 13

Alarm Type	Warning (page 211)
Alarmlist message	Wrn DISTIN 13
Alarm evaluated	Only if DIST-IN 13 is configured
Related applications	MCB
Alarm ID	1168
Description	This alarm is activated when DIST-IN data are not received from controller with CAN Controller Address (page 362) = 13.

⬅ back to List of alarms level 1

Wrn DISTIN 14

Alarm Type	Warning (page 211)
Alarmlist message	Wrn DISTIN 14
Alarm evaluated	Only if DIST-IN 14 is configured
Related applications	MCB
Alarm ID	1169
Description	This alarm is activated when DIST-IN data are not received from controller with CAN Controller Address (page 362) = 14.

⬅ back to List of alarms level 1

Wrn DISTIN 15

Alarm Type	Warning (page 211)
Alarmlist message	Wrn DISTIN 15
Alarm evaluated	Only if DIST-IN 15 is configured
Related applications	MCB
Alarm ID	1170
Description	This alarm is activated when DIST-IN data are not received from controller with CAN Controller Address (page 362) = 15.

⬅ back to List of alarms level 1

Wrn DISTIN 16

Alarm Type	Warning (page 211)
Alarmlist message	Wrn DISTIN 16
Alarm evaluated	Only if DIST-IN 16 is configured
Related applications	MCB
Alarm ID	1171
Description	This alarm is activated when DIST-IN data are not received from controller with CAN Controller Address (page 362) = 16.

⬅ back to List of alarms level 1

Wrn DISTIN 17

Alarm Type	Warning (page 211)
Alarmlist message	Wrn DISTIN 17
Alarm evaluated	Only if DIST-IN 17 is configured
Related applications	MCB
Alarm ID	1172
Description	This alarm is activated when DIST-IN data are not received from controller with CAN Controller Address (page 362) = 17.

⬅ back to List of alarms level 1

Wrn DISTIN 18

Alarm Type	Warning (page 211)
Alarmlist message	Wrn DISTIN 18
Alarm evaluated	Only if DIST-IN 18 is configured
Related applications	MCB
Alarm ID	1173
Description	This alarm is activated when DIST-IN data are not received from controller with CAN Controller Address (page 362) = 18.

⬅ back to List of alarms level 1

Wrn DISTIN 19

Alarm Type	Warning (page 211)
Alarmlist message	Wrn DISTIN 19
Alarm evaluated	Only if DIST-IN 19 is configured
Related applications	MCB
Alarm ID	1174
Description	This alarm is activated when DIST-IN data are not received from controller with CAN Controller Address (page 362) = 19.

⬅ back to List of alarms level 1

Wrn DISTIN 20

Alarm Type	Warning (page 211)
Alarmlist message	Wrn DISTIN 20
Alarm evaluated	Only if DIST-IN 20 is configured
Related applications	MCB
Alarm ID	1175
Description	This alarm is activated when DIST-IN data are not received from controller with CAN Controller Address (page 362) = 20.

⬅ back to List of alarms level 1

Wrn DISTIN 21

Alarm Type	Warning (page 211)
Alarmlist message	Wrn DISTIN 21
Alarm evaluated	Only if DIST-IN 21 is configured
Related applications	MCB
Alarm ID	1176
Description	This alarm is activated when DIST-IN data are not received from controller with CAN Controller Address (page 362) = 21.

⬅ back to List of alarms level 1

Wrn DISTIN 22

Alarm Type	Warning (page 211)
Alarmlist message	Wrn DISTIN 22
Alarm evaluated	Only if DIST-IN 22 is configured
Related applications	MCB
Alarm ID	1177
Description	This alarm is activated when DIST-IN data are not received from controller with CAN Controller Address (page 362) = 22.

⬅ back to List of alarms level 1

Wrn DISTIN 23

Alarm Type	Warning (page 211)
Alarmlist message	Wrn DISTIN 23
Alarm evaluated	Only if DIST-IN 23 is configured
Related applications	MCB
Alarm ID	1178
Description	This alarm is activated when DIST-IN data are not received from controller with CAN Controller Address (page 362) = 23.

⬅ back to List of alarms level 1

Wrn DISTIN 24

Alarm Type	Warning (page 211)
Alarmlist message	Wrn DISTIN 24
Alarm evaluated	Only if DIST-IN 24 is configured
Related applications	MCB
Alarm ID	1179
Description	This alarm is activated when DIST-IN data are not received from controller with CAN Controller Address (page 362) = 24.

⬅ back to List of alarms level 1

Wrn DISTIN 25

Alarm Type	Warning (page 211)
Alarmlist message	Wrn DISTIN 25
Alarm evaluated	Only if DIST-IN 25 is configured
Related applications	MCB
Alarm ID	1180
Description	This alarm is activated when DIST-IN data are not received from controller with CAN Controller Address (page 362) = 25.

⬅ back to List of alarms level 1

Wrn DISTIN 26

Alarm Type	Warning (page 211)
Alarmlist message	Wrn DISTIN 26
Alarm evaluated	Only if DIST-IN 26 is configured
Related applications	MCB
Alarm ID	1181
Description	This alarm is activated when DIST-IN data are not received from controller with CAN Controller Address (page 362) = 26.

⬅ back to List of alarms level 1

Wrn DISTIN 27

Alarm Type	Warning (page 211)
Alarmlist message	Wrn DISTIN 27
Alarm evaluated	Only if DIST-IN 27 is configured
Related applications	MCB
Alarm ID	1182
Description	This alarm is activated when DIST-IN data are not received from controller with CAN Controller Address (page 362) = 27.

⬅ back to List of alarms level 1

Wrn DISTIN 28

Alarm Type	Warning (page 211)
Alarmlist message	Wrn DISTIN 28
Alarm evaluated	Only if DIST-IN 28 is configured
Related applications	MCB
Alarm ID	1183
Description	This alarm is activated when DIST-IN data are not received from controller with CAN Controller Address (page 362) = 28.

⬅ back to List of alarms level 1

Wrn DISTIN 29

Alarm Type	Warning (page 211)
Alarmlist message	Wrn DISTIN 29
Alarm evaluated	Only if DIST-IN 29 is configured
Related applications	MCB
Alarm ID	1184
Description	This alarm is activated when DIST-IN data are not received from controller with CAN Controller Address (page 362) = 29.

⬅ back to List of alarms level 1

Wrn DISTIN 30

Alarm Type	Warning (page 211)
Alarmlist message	Wrn DISTIN 30
Alarm evaluated	Only if DIST-IN 30 is configured
Related applications	MCB
Alarm ID	1185
Description	This alarm is activated when DIST-IN data are not received from controller with CAN Controller Address (page 362) = 30.

⬅ back to List of alarms level 1

Wrn DISTIN 31

Alarm Type	Warning (page 211)
Alarmlist message	Wrn DISTIN 31
Alarm evaluated	Only if DIST-IN 31 is configured
Related applications	MCB
Alarm ID	1186
Description	This alarm is activated when DIST-IN data are not received from controller with CAN Controller Address (page 362) = 31.

⬅ back to List of alarms level 1

Wrn DISTIN 32

Alarm Type	Warning (page 211)
Alarmlist message	Wrn DISTIN 32
Alarm evaluated	Only if DIST-IN 32 is configured
Related applications	MCB
Alarm ID	1187
Description	This alarm is activated when DIST-IN data are not received from controller with CAN Controller Address (page 362) = 32.

⬅ back to List of alarms level 1

Wrn DISTIN 33

Alarm Type	Warning (page 211)
Alarmlist message	Wrn DISTIN 33
Alarm evaluated	Only if DIST-IN 33 is configured
Related applications	MCB
Alarm ID	1344
Description	This alarm is activated when DIST-IN data are not received from controller with CAN Controller Address (page 362) = 33.

⬅ back to List of alarms level 1

Wrn DISTIN 34

Alarm Type	Warning (page 211)
Alarmlist message	Wrn DISTIN 34
Alarm evaluated	Only if DIST-IN 34 is configured
Related applications	MCB
Alarm ID	1345
Description	This alarm is activated when DIST-IN data are not received from controller with CAN Controller Address (page 362) = 34.

⬅ back to List of alarms level 1

Wrn DISTIN 35

Alarm Type	Warning (page 211)
Alarmlist message	Wrn DISTIN 35
Alarm evaluated	Only if DIST-IN 35 is configured
Related applications	MCB
Alarm ID	1346
Description	This alarm is activated when DIST-IN data are not received from controller with CAN Controller Address (page 362) = 35.

⬅ back to List of alarms level 1

Wrn DISTIN 36

Alarm Type	Warning (page 211)
Alarmlist message	Wrn DISTIN 36
Alarm evaluated	Only if DIST-IN 36 is configured
Related applications	MCB
Alarm ID	1347
Description	This alarm is activated when DIST-IN data are not received from controller with CAN Controller Address (page 362) = 36.

⬅ back to List of alarms level 1

Wrn DISTIN 37

Alarm Type	Warning (page 211)
Alarmlist message	Wrn DISTIN 37
Alarm evaluated	Only if DIST-IN 37 is configured
Related applications	MCB
Alarm ID	1348
Description	This alarm is activated when DIST-IN data are not received from controller with CAN Controller Address (page 362) = 37.

⬅ back to List of alarms level 1

Wrn DISTIN 38

Alarm Type	Warning (page 211)
Alarmlist message	Wrn DISTIN 38
Alarm evaluated	Only if DIST-IN 38 is configured
Related applications	MCB
Alarm ID	1349
Description	This alarm is activated when DIST-IN data are not received from controller with CAN Controller Address (page 362) = 38.

⬅ back to List of alarms level 1

Wrn DISTIN 39

Alarm Type	Warning (page 211)
Alarmlist message	Wrn DISTIN 39
Alarm evaluated	Only if DIST-IN 39 is configured
Related applications	MCB
Alarm ID	1350
Description	This alarm is activated when DIST-IN data are not received from controller with CAN Controller Address (page 362) = 39.

⬅ back to List of alarms level 1

Wrn DISTIN 40

Alarm Type	Warning (page 211)
Alarmlist message	Wrn DISTIN 40
Alarm evaluated	Only if DIST-IN 40 is configured
Related applications	MCB
Alarm ID	1351
Description	This alarm is activated when DIST-IN data are not received from controller with CAN Controller Address (page 362) = 40.

⬅ back to List of alarms level 1

Wrn DISTIN 41

Alarm Type	Warning (page 211)
Alarmlist message	Wrn DISTIN 41
Alarm evaluated	Only if DIST-IN 41 is configured
Related applications	MCB
Alarm ID	1352
Description	This alarm is activated when DIST-IN data are not received from controller with CAN Controller Address (page 362) = 41.

⬅ back to List of alarms level 1

Wrn DISTIN 42

Alarm Type	Warning (page 211)
Alarmlist message	Wrn DISTIN 42
Alarm evaluated	Only if DIST-IN 42 is configured
Related applications	MCB
Alarm ID	1353
Description	This alarm is activated when DIST-IN data are not received from controller with CAN Controller Address (page 362) = 42.

⬅ back to List of alarms level 1

Wrn DISTIN 43

Alarm Type	Warning (page 211)
Alarmlist message	Wrn DISTIN 43
Alarm evaluated	Only if DIST-IN 43 is configured
Related applications	MCB
Alarm ID	1354
Description	This alarm is activated when DIST-IN data are not received from controller with CAN Controller Address (page 362) = 43.

⬅ back to List of alarms level 1

Wrn DISTIN 44

Alarm Type	Warning (page 211)
Alarmlist message	Wrn DISTIN 44
Alarm evaluated	Only if DIST-IN 44 is configured
Related applications	MCB
Alarm ID	1355
Description	This alarm is activated when DIST-IN data are not received from controller with CAN Controller Address (page 362) = 44.

⬅ back to List of alarms level 1

Wrn DISTIN 45

Alarm Type	Warning (page 211)
Alarmlist message	Wrn DISTIN 45
Alarm evaluated	Only if DIST-IN 45 is configured
Related applications	MCB
Alarm ID	1356
Description	This alarm is activated when DIST-IN data are not received from controller with CAN Controller Address (page 362) = 45.

⬅ back to List of alarms level 1

Wrn DISTIN 46

Alarm Type	Warning (page 211)
Alarmlist message	Wrn DISTIN 46
Alarm evaluated	Only if DIST-IN 46 is configured
Related applications	MCB
Alarm ID	1357
Description	This alarm is activated when DIST-IN data are not received from controller with CAN Controller Address (page 362) = 46.

⬅ back to List of alarms level 1

Wrn DISTIN 47

Alarm Type	Warning (page 211)
Alarmlist message	Wrn DISTIN 47
Alarm evaluated	Only if DIST-IN 47 is configured
Related applications	MCB
Alarm ID	1358
Description	This alarm is activated when DIST-IN data are not received from controller with CAN Controller Address (page 362) = 47.

⬅ back to List of alarms level 1

Wrn DISTIN 48

Alarm Type	Warning (page 211)
Alarmlist message	Wrn DISTIN 48
Alarm evaluated	Only if DIST-IN 48 is configured
Related applications	MCB
Alarm ID	1359
Description	This alarm is activated when DIST-IN data are not received from controller with CAN Controller Address (page 362) = 48.

⬅ back to List of alarms level 1

Wrn DISTIN 49

Alarm Type	Warning (page 211)
Alarmlist message	Wrn DISTIN 49
Alarm evaluated	Only if DIST-IN 49 is configured
Related applications	MCB
Alarm ID	1360
Description	This alarm is activated when DIST-IN data are not received from controller with CAN Controller Address (page 362) = 49.

⬅ back to List of alarms level 1

Wrn DISTIN 50

Alarm Type	Warning (page 211)
Alarmlist message	Wrn DISTIN 50
Alarm evaluated	Only if DIST-IN 50 is configured
Related applications	MCB
Alarm ID	1361
Description	This alarm is activated when DIST-IN data are not received from controller with CAN Controller Address (page 362) = 50.

⬅ back to List of alarms level 1

Wrn DISTIN 51

Alarm Type	Warning (page 211)
Alarmlist message	Wrn DISTIN 51
Alarm evaluated	Only if DIST-IN 51 is configured
Related applications	MCB
Alarm ID	1362
Description	This alarm is activated when DIST-IN data are not received from controller with CAN Controller Address (page 362) = 51.

⬅ back to List of alarms level 1

Wrn DISTIN 52

Alarm Type	Warning (page 211)
Alarmlist message	Wrn DISTIN 52
Alarm evaluated	Only if DIST-IN 52 is configured
Related applications	MCB
Alarm ID	1363
Description	This alarm is activated when DIST-IN data are not received from controller with CAN Controller Address (page 362) = 52.

⬅ back to List of alarms level 1

Wrn DISTIN 53

Alarm Type	Warning (page 211)
Alarmlist message	Wrn DISTIN 53
Alarm evaluated	Only if DIST-IN 53 is configured
Related applications	MCB
Alarm ID	1364
Description	This alarm is activated when DIST-IN data are not received from controller with CAN Controller Address (page 362) = 53.

⬅ back to List of alarms level 1

Wrn DISTIN 54

Alarm Type	Warning (page 211)
Alarmlist message	Wrn DISTIN 54
Alarm evaluated	Only if DIST-IN 54 is configured
Related applications	MCB
Alarm ID	1365
Description	This alarm is activated when DIST-IN data are not received from controller with CAN Controller Address (page 362) = 54.

⬅ back to List of alarms level 1

Wrn DISTIN 55

Alarm Type	Warning (page 211)
Alarmlist message	Wrn DISTIN 55
Alarm evaluated	Only if DIST-IN 55 is configured
Related applications	MCB
Alarm ID	1366
Description	This alarm is activated when DIST-IN data are not received from controller with CAN Controller Address (page 362) = 55.

⬅ back to List of alarms level 1

Wrn DISTIN 56

Alarm Type	Warning (page 211)
Alarmlist message	Wrn DISTIN 56
Alarm evaluated	Only if DIST-IN 56 is configured
Related applications	MCB
Alarm ID	1367
Description	This alarm is activated when DIST-IN data are not received from controller with CAN Controller Address (page 362) = 56.

⬅ back to List of alarms level 1

Wrn DISTIN 57

Alarm Type	Warning (page 211)
Alarmlist message	Wrn DISTIN 57
Alarm evaluated	Only if DIST-IN 57 is configured
Related applications	MCB
Alarm ID	1368
Description	This alarm is activated when DIST-IN data are not received from controller with CAN Controller Address (page 362) = 57.

⬅ back to List of alarms level 1

Wrn DISTIN 58

Alarm Type	Warning (page 211)
Alarmlist message	Wrn DISTIN 58
Alarm evaluated	Only if DIST-IN 58 is configured
Related applications	MCB
Alarm ID	1369
Description	This alarm is activated when DIST-IN data are not received from controller with CAN Controller Address (page 362) = 58.

⬅ back to List of alarms level 1

Wrn DISTIN 59

Alarm Type	Warning (page 211)
Alarmlist message	Wrn DISTIN 59
Alarm evaluated	Only if DIST-IN 59 is configured
Related applications	MCB
Alarm ID	1370
Description	This alarm is activated when DIST-IN data are not received from controller with CAN Controller Address (page 362) = 59.

⬅ back to List of alarms level 1

Wrn DISTIN 60

Alarm Type	Warning (page 211)
Alarmlist message	Wrn DISTIN 60
Alarm evaluated	Only if DIST-IN 60 is configured
Related applications	MCB
Alarm ID	1371
Description	This alarm is activated when DIST-IN data are not received from controller with CAN Controller Address (page 362) = 60.

⬅ back to List of alarms level 1

Wrn DISTIN 61

Alarm Type	Warning (page 211)
Alarmlist message	Wrn DISTIN 61
Alarm evaluated	Only if DIST-IN 61 is configured
Related applications	MCB
Alarm ID	1372
Description	This alarm is activated when DIST-IN data are not received from controller with CAN Controller Address (page 362) = 61.

⬅ back to List of alarms level 1

Wrn DISTIN 62

Alarm Type	Warning (page 211)
Alarmlist message	Wrn DISTIN 62
Alarm evaluated	Only if DIST-IN 62 is configured
Related applications	MCB
Alarm ID	1373
Description	This alarm is activated when DIST-IN data are not received from controller with CAN Controller Address (page 362) = 62.

⬅ back to List of alarms level 1

Wrn DISTIN 63

Alarm Type	Warning (page 211)
Alarmlist message	Wrn DISTIN 63
Alarm evaluated	Only if DIST-IN 63 is configured
Related applications	MCB
Alarm ID	1374
Description	This alarm is activated when DIST-IN data are not received from controller with CAN Controller Address (page 362) = 63.

⬅ back to List of alarms level 1

Wrn DISTIN 64

Alarm Type	Warning (page 211)
Alarmlist message	Wrn DISTIN 64
Alarm evaluated	Only if DIST-IN 64 is configured
Related applications	MCB
Alarm ID	1375
Description	This alarm is activated when DIST-IN data are not received from controller with CAN Controller Address (page 362) = 64.

⬅ back to List of alarms level 1

Wrn DISTOUT

Alarm Type	Warning (page 211)
Alarmlist message	Wrn DISTOUT
Alarm evaluated	Only if DIST-OUT is configured
Related applications	MCB
Description	This alarm is activated when failure of virtual module DIST-OUT is detected.

 [back to List of alarms level 1](#)

Wrn ECU 1 Comm Fail

Alarm Type	Warning (page 211)
Alarmlist message	Name of ECU in ECU slot 1
Alarm evaluated	<ol style="list-style-type: none">1. ECU with protection configured in ECU slot 12. LBI ECU COMMUNICATION FAIL BLOCK (PAGE 601) and ECU COMMUNICATION FAIL BLOCK 1 (PAGE 601) not activated
Related applications	MCB
Alarm ID	945
Description	This alarm is activated when there is no communication received from ECU configured in ECU slot 1.

⬅ back to List of alarms level 1

Wrn ECU 2 Comm Fail

Alarm Type	Warning (page 211)
Alarmlist message	Name of ECU in ECU slot 2
Alarm evaluated	<ol style="list-style-type: none">1. ECU with protection configured in ECU slot 22. LBI ECU COMMUNICATION FAIL BLOCK (PAGE 601) and ECU COMMUNICATION FAIL BLOCK 2 (PAGE 601) not activated
Related applications	MCB
Alarm ID	946
Description	This alarm is activated when there is no communication received from ECU configured in ECU slot 2.

⬅ back to List of alarms level 1

Wrn ECU 3 Comm Fail

Alarm Type	Warning (page 211)
Alarmlist message	Name of ECU in ECU slot 3
Alarm evaluated	<ol style="list-style-type: none">1. ECU with protection configured in ECU slot 32. LBI ECU COMMUNICATION FAIL BLOCK (PAGE 601) and ECU COMMUNICATION FAIL BLOCK 3 (PAGE 601) not activated
Related applications	MCB
Alarm ID	947
Description	This alarm is activated when there is no communication received from ECU configured in ECU slot 3.

⬅ back to List of alarms level 1

Wrn ECU 4 Comm Fail

Alarm Type	Warning (page 211)
Alarmlist message	Name of ECU in ECU slot 4
Alarm evaluated	<ol style="list-style-type: none">1. ECU with protection configured in ECU slot 42. LBI ECU COMMUNICATION FAIL BLOCK (PAGE 601) and ECU COMMUNICATION FAIL BLOCK 4 (PAGE 601) not activated

Related applications	MCB
Alarm ID	948
Description	This alarm is activated when there is no communication received from ECU configured in ECU slot 4.

🔍 back to List of alarms level 1

Wrn ECU 5 Comm Fail

Alarm Type	Warning (page 211)
Alarmlist message	Name of ECU in ECU slot 5
Alarm evaluated	<ol style="list-style-type: none"> 1. ECU with protection configured in ECU slot 5 2. LBI ECU COMMUNICATION FAIL BLOCK (PAGE 601) and ECU COMMUNICATION FAIL BLOCK 5 (PAGE 602) not activated
Related applications	MCB
Alarm ID	949
Description	This alarm is activated when there is no communication received from ECU configured in ECU slot 5.

🔍 back to List of alarms level 1

Wrn ECU 6 Comm Fail

Alarm Type	Warning (page 211)
Alarmlist message	Name of ECU in ECU slot 6
Alarm evaluated	<ol style="list-style-type: none"> 1. ECU with protection configured in ECU slot 6 2. LBI ECU COMMUNICATION FAIL BLOCK (PAGE 601) and ECU COMMUNICATION FAIL BLOCK 6 (PAGE 602) not activated
Related applications	MCB
Alarm ID	950
Description	This alarm is activated when there is no communication received from ECU configured in ECU slot 6.

🔍 back to List of alarms level 1

Wrn ECU 7 Comm Fail

Alarm Type	Warning (page 211)
Alarmlist message	Name of ECU in ECU slot 7
Alarm evaluated	<ol style="list-style-type: none"> 1. ECU with protection configured in ECU slot 7 2. LBI ECU COMMUNICATION FAIL BLOCK (PAGE 601) and ECU COMMUNICATION FAIL BLOCK 7 (PAGE 602) not activated
Related applications	MCB
Alarm ID	951
Description	This alarm is activated when there is no communication received from ECU configured in ECU slot 7.

🔍 back to List of alarms level 1

Wrn ECU 8 Comm Fail

Alarm Type	Warning (page 211)
Alarmlist message	Name of ECU in ECU slot 8
Alarm evaluated	<ol style="list-style-type: none">1. ECU with protection configured in ECU slot 82. LBI ECU COMMUNICATION FAIL BLOCK (PAGE 601) and ECU COMMUNICATION FAIL BLOCK 8 (PAGE 602) not activated
Related applications	MCB
Alarm ID	952
Description	This alarm is activated when there is no communication received from ECU configured in ECU slot 8.

⬅ back to List of alarms level 1

Wrn ECU 9 Comm Fail

Alarm Type	Warning (page 211)
Alarmlist message	Name of ECU in ECU slot 9
Alarm evaluated	<ol style="list-style-type: none">1. ECU with protection configured in ECU slot 92. LBI ECU COMMUNICATION FAIL BLOCK (PAGE 601) and ECU COMMUNICATION FAIL BLOCK 9 (PAGE 602) not activated
Related applications	MCB
Alarm ID	953
Description	This alarm is activated when there is no communication received from ECU configured in ECU slot 9.

⬅ back to List of alarms level 1

Wrn ECU 10 Comm Fail

Alarm Type	Warning (page 211)
Alarmlist message	Name of ECU in ECU slot 10
Alarm evaluated	<ol style="list-style-type: none">1. ECU with protection configured in ECU slot 102. LBI ECU COMMUNICATION FAIL BLOCK (PAGE 601) and ECU COMMUNICATION FAIL BLOCK 10 (PAGE 603) not activated
Related applications	MCB
Alarm ID	954
Description	This alarm is activated when there is no communication received from ECU configured in ECU slot 10.

⬅ back to List of alarms level 1

Wrn ECU 11 Comm Fail

Alarm Type	Warning (page 211)
Alarmlist message	Name of ECU in ECU slot 11
Alarm evaluated	<ol style="list-style-type: none">1. ECU with protection configured in ECU slot 112. LBI ECU COMMUNICATION FAIL BLOCK (PAGE 601) and ECU COMMUNICATION FAIL BLOCK 11 (PAGE 603) not activated

Related applications	MCB
Alarm ID	955
Description	This alarm is activated when there is no communication received from ECU configured in ECU slot 11.

🔍 back to List of alarms level 1

Wrn ECU 12 Comm Fail

Alarm Type	Warning (page 211)
Alarmlist message	Name of ECU in ECU slot 12
Alarm evaluated	<ol style="list-style-type: none"> 1. ECU with protection configured in ECU slot 12 2. LBI ECU COMMUNICATION FAIL BLOCK (PAGE 601) and ECU COMMUNICATION FAIL BLOCK 12 (PAGE 603) not activated
Related applications	MCB
Alarm ID	956
Description	This alarm is activated when there is no communication received from ECU configured in ECU slot 12.

🔍 back to List of alarms level 1

Wrn ECU 13 Comm Fail

Alarm Type	Warning (page 211)
Alarmlist message	Name of ECU in ECU slot 13
Alarm evaluated	<ol style="list-style-type: none"> 1. ECU with protection configured in ECU slot 13 2. LBI ECU COMMUNICATION FAIL BLOCK (PAGE 601) and ECU COMMUNICATION FAIL BLOCK 13 (PAGE 603) not activated
Related applications	MCB
Alarm ID	957
Description	This alarm is activated when there is no communication received from ECU configured in ECU slot 13.

🔍 back to List of alarms level 1

Wrn ECU 14 Comm Fail

Alarm Type	Warning (page 211)
Alarmlist message	Name of ECU in ECU slot 14
Alarm evaluated	<ol style="list-style-type: none"> 1. ECU with protection configured in ECU slot 14 2. LBI ECU COMMUNICATION FAIL BLOCK (PAGE 601) and ECU COMMUNICATION FAIL BLOCK 14 (PAGE 603) not activated
Related applications	MCB
Alarm ID	958
Description	This alarm is activated when there is no communication received from ECU configured in ECU slot 14.

🔍 back to List of alarms level 1

Wrn ECU 15 Comm Fail

Alarm Type	Warning (page 211)
Alarmlist message	Name of ECU in ECU slot 15
Alarm evaluated	<ol style="list-style-type: none">1. ECU with protection configured in ECU slot 152. LBI ECU COMMUNICATION FAIL BLOCK (PAGE 601) and ECU COMMUNICATION FAIL BLOCK 15 (PAGE 604) not activated
Related applications	MCB
Alarm ID	959
Description	This alarm is activated when there is no communication received from ECU configured in ECU slot 15.

⬅ back to List of alarms level 1

Wrn ECU 16 Comm Fail

Alarm Type	Warning (page 211)
Alarmlist message	Name of ECU in ECU slot 16
Alarm evaluated	<ol style="list-style-type: none">1. ECU with protection configured in ECU slot 162. LBI ECU COMMUNICATION FAIL BLOCK (PAGE 601) and ECU COMMUNICATION FAIL BLOCK 16 (PAGE 604) not activated
Related applications	MCB
Alarm ID	960
Description	This alarm is activated when there is no communication received from ECU configured in ECU slot 16.

⬅ back to List of alarms level 1

Wrn Event e-mail 1 Fail

Alarm Type	Warning (page 211)
Alarmlist message	Wrn Event e-mail 1 Fail
Alarm evaluated	All the time
Related applications	MCB
Alarm ID	734
Description	The alarm indicates that there was a request to send an event email to email address which is adjusted by setpoint E-mail Address 1 (page 385) and email wasn't send.

⬅ back to List of alarms level 1

Wrn Event e-mail 2 Fail

Alarm Type	Warning (page 211)
Alarmlist message	Wrn Event e-mail 2 Fail
Alarm evaluated	All the time
Related applications	MCB
Alarm ID	735
Description	The alarm indicates that there was a request to send an event email to email

	address which is adjusted by setpoint E-mail Address 2 (page 385) and email wasn't send.
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⬅ back to List of alarms level 1

Wrn Event e-mail 3 Fail

Alarm Type	Warning (page 211)
Alarmlist message	Wrn Event e-mail 3 Fail
Alarm evaluated	All the time
Related applications	MCB
Alarm ID	736
Description	The alarm indicates that there was a request to send an event email to email address which is adjusted by setpoint E-mail Address 3 (page 385) and email wasn't send.

⬅ back to List of alarms level 1

Wrn Event e-mail 4 Fail

Alarm Type	Warning (page 211)
Alarmlist message	Wrn Event e-mail 4 Fail
Alarm evaluated	All the time
Related applications	MCB
Alarm ID	737
Description	The alarm indicates that there was a request to send an event email to email address which is adjusted by setpoint E-mail Address 4 (page 386) and email wasn't send.

⬅ back to List of alarms level 1

Wrn Hot Swap Configuration Incorrect

Alarm Type	Warning (page 211)
Alarmlist message	Wrn Hot Swap Configuration Incorrect
Alarm evaluated	Only if Hot Swap Redundancy (page 274) != Disabled and ALI SW Key Hot Swap Error (page 747) is not present in the alarmlist
Related applications	MCB
Alarm ID	1426
Description	<p>This alarm is activated when Hot Swap Redundancy (page 141) is missing the correct configuration of mandatory LBI and LBO.</p> <p>List of mandatory objects:</p> <ul style="list-style-type: none"> ➤ LBI HOT SWAP CTRL BLOCK (PAGE 612) ➤ LBI HOT SWAP HEARTBEAT DETECT (PAGE 613) ➤ LBO HOT SWAP SWITCH (PAGE 639) ➤ LBO HOT SWAP HEARTBEAT (PAGE 638) <p>IMPORTANT: All mandatory objects have to be configured to physical input/output of the controller.</p>

🔍 back to List of alarms level 1

Wrn Hot Swap Data Synchro Fail

Alarm Type	Warning (page 211)
Alarmlist message	Wrn Hot Swap Data Synchro Fail
Alarm evaluated	Only if Hot Swap Redundancy (page 274) != Disabled
Related applications	MCB
Alarm ID	1426
Description	This alarm is activated when communication between Hot Swap Redundancy (page 141) master and backup controllers failed. This can be caused because of wrong configuration or wiring. While this alarm is active the backup controller doesn't have the data which needs for the smooth transition.

🔍 back to List of alarms level 1

Wrn Load IMP/EXP Fail

Alarm Type	Warning (page 211)
Alarmlist message	Wrn Load IMP/EXP Fail
Alarm evaluated	Always
Related applications	MCB
Alarm ID	1448
Description	<p>This alarm is active when LBI IMP/EXP CONTROL (PAGE 613) is active but Mains Measurement P is unavailable.</p> <p>Alarm is caused by:</p> <ul style="list-style-type: none">➤ Mains Measurement P (page 308) = None➤ Mains Measurement P (page 308) = Analog Input and<ul style="list-style-type: none">» LAI MAINS MEASUREMENT P (PAGE 654) is not configured» Value from LAI Mains Measurement P (page 308) has Invalid flag (page 441) <p>This alarm has FPS - FIXED PROTECTIONS STATES 1 (PAGE 658)</p>

🔍 back to List of alarms level 1

Wrn Long Term History Fail

Alarm Type	Warning (page 211)
Alarmlist message	Wrn Long Term History Fail
Alarm evaluated	Only when Long Term History (page 368) = Enabled
Related applications	MCB
Alarm ID	1281
Description	<p>This alarm is activated when Long Term History (page 368) = Enabled but for any reason it is not possible to write the history onto the SD card.</p> <p>This alarm has FPS - FIXED PROTECTIONS STATES 1 (PAGE 658)</p>

🔍 back to List of alarms level 1

Wrn Master Controller Failed

Alarm Type	Warning (page 211)
Alarmlist message	Wrn Master Controller Failed
Alarm evaluated	Only if Hot Swap Redundancy (page 274) != Disabled
Related applications	MCB
Alarm ID	1288
Description	This alarm is activated on Hot Swap Redundancy (page 141) backup controller when backup controller does not detect the HOT SWAP HEARTBEAT (PAGE 638) signal from master.

🔍 back to List of alarms level 1

Wrn Password reset e-mail addr is not set

Alarm Type	Warning (page 211)
Alarmlist message	Wrn Password reset e-mail addr is not set
Alarm evaluated	All the time
Related applications	MCB
Alarm ID	1292
Description	This alarm is active when password reset e-mail address is not filled. Fill out the password reset e-mail via IntelliConfig to remove this alarm.

🔍 back to List of alarms level 1

Wrn PF Control Fail

Alarm Type	Warning (page 211)
Alarmlist message	Wrn PF Control Fail
Alarm evaluated	
Related applications	MCB
Alarm ID	1053
Description	<p>This alarm indicates PF Control Fail which can be caused by:</p> <ul style="list-style-type: none"> ➤ If LBI IMP/EXP CONTROL (PAGE 613) is not active <ul style="list-style-type: none"> ➤➤ LAI PF CONTROL: SYSTEM BASE PF (PAGE 655) is not configured ➤➤ Value from LAI PF CONTROL: SYSTEM BASE PF (PAGE 655) is out of sensor range (i.e. "###") ➤ If LBI IMP/EXP CONTROL (PAGE 613) is active <ul style="list-style-type: none"> ➤➤ LAI PF CONTROL: IMP/EXP PF (PAGE 656) is not configured ➤➤ Value from LAI PF CONTROL: IMP/EXP PF (PAGE 656) is out of sensor range (i.e. "###") <p>When this alarm is active, required power factor is taken from #System Power Factor (page 304) or Import Power Factor (page 303), based on LBI IMP/EXP CONTROL (PAGE 613).</p> <p>This alarm has FPS - FIXED PROTECTIONS STATES 1 (PAGE 658)</p>

🔍 back to List of alarms level 1

Wrn PF/Q IMP/EXP Fail

Alarm Type	Warning (page 211)
Alarmlist message	Wrn PF/Q IMP/EXP Fail
Alarm evaluated	Always
Related applications	MCB
Alarm ID	1054
Description	<p>This alarm is active when LBI IMP/EXP CONTROL (PAGE 613) is active but Mains Measurement P or Q is unavailable.</p> <p>Alarm is caused by:</p> <ul style="list-style-type: none"> > Mains Measurement P (page 308) = None > Mains Measurement P (page 308) = Analog Input and <ul style="list-style-type: none"> >> LAI MAINS MEASUREMENT P (PAGE 654) is not configured >> Value from LAI Mains Measurement P (page 308) has Invalid flag (page 441) > Mains Measurement Q (page 308) = None > Mains Measurement Q (page 308) = Analog Input and <ul style="list-style-type: none"> >> LAI MAINS MEASUREMENT Q (PAGE 655) is not configured >> Value from LAI Mains Measurement Q (page 308) has Invalid flag (page 441) <p>This alarm has FPS - FIXED PROTECTIONS STATES 1 (PAGE 658)</p>

◀ back to List of alarms level 1

Wrn Q Control Fail

Alarm Type	Warning (page 211)
Alarmlist message	Wrn Q Control Fail
Alarm evaluated	Only when PF/Q Request Source (page 302) = Analog External Value, PF/Q Control Mode (page 302) = Q Control and Breaker state (page 494) = ParalOper and at least one Gen-set is excited
Related applications	MCB
Alarm ID	1049
Description	<p>This alarm indicates Q Control Fail which can be caused by:</p> <ul style="list-style-type: none"> > If LBI IMP/EXP CONTROL (PAGE 613) is not active <ul style="list-style-type: none"> >> LAI Q CONTROL: SYSTEM BASE Q (PAGE 656) is not configured >> Value from LAI Q CONTROL: SYSTEM BASE Q (PAGE 656) is out of sensor range (i.e. "####") > If LBI IMP/EXP CONTROL (PAGE 613) is active <ul style="list-style-type: none"> >> LAI Q CONTROL: IMP/EXP Q (PAGE 656) is not configured >> Value from LAI Q CONTROL: IMP/EXP Q (PAGE 656) is out of sensor range (i.e. "####") <p>When this alarm is active, Required Q (page 486) is taken from #System Base Q (page 304) or Import Q (page 303), based on LBI IMP/EXP CONTROL</p>

	(PAGE 613). This alarm has FPS - FIXED PROTECTIONS STATES 1 (PAGE 658).
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🔍 back to List of alarms level 1

Wrn Redundant CAN inconsistency

Alarm Type	Warning (page 211)
Alarmlist message	Wrn Redundant CAN inconsistency
Alarm evaluated	Only when CAN Intercontroller Comm Redundancy (page 365) = Enabled
Related applications	MCB
Alarm ID	1079
Description	This alarm is issued when there is inconsistency between CAN2A (page 18) and CAN2B (page 18) . This alarm has FPS - FIXED PROTECTIONS STATES 1 (PAGE 658).

🔍 back to List of alarms level 1

Wrn RTC Battery Flat

Alarm Type	Warning (page 211)
Alarmlist message	Wrn RTC Battery Flat
Alarm evaluated	Only during power-on of the controller
Related applications	MCB
Alarm ID	42
Description	This alarm indicates that the controller detected a flat RTC Battery during power-on. The RTC battery is considered to be flat if its voltage drops below 2.8 V. To remove this alarm follow the Backup battery replacement (page 79) .

🔍 back to List of alarms level 1

Wrn SD Card Failed

Alarm Type	Warning (page 211)
Alarmlist message	Wrn SD Card Fail
Alarm evaluated	Only when Long Term History (page 368) = Mount or Format
Related applications	MCB
Alarm ID	1280
Description	This alarm is activated when it is not possible to read or write to the SD card. The alarm is also displayed in case that the setpoint SD Card File System (page 367) is set to Mount or Format but the SD card is not inserted. This alarm will not be activated if the card is not compatible (ALI SD Card Not Compatible (page 745) is active). This alarm has FPS - FIXED PROTECTIONS STATES 1 (PAGE 658)

🔍 back to List of alarms level 1

Wrn SD Card File System Failed

Alarm Type	Warning (page 211)
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Alarmlist message	Wrn SD Card File System Failed
Alarm evaluated	Only when Long Term History (page 368) = Mount
Related applications	MCB
Alarm ID	1639
Description	This alarm is activated when there is a wrong file system on the SD Card. The alarm is not activated if the SDcard is not compatible. This alarm has FPS - FIXED PROTECTIONS STATES 1 (PAGE 658) .

⬅ back to List of alarms level 1

Wrn SHAIN 1

Alarm Type	Warning (page 211)
Alarmlist message	Wrn SHAIN 1
Alarm evaluated	Only if SHAIN 1 is configured
Related applications	MCB
Alarm ID	36
Description	This alarm is activated when shared analog inputs are not received from SHAIN module 1.

⬅ back to List of alarms level 1

Wrn SHAIN 2

Alarm Type	Warning (page 211)
Alarmlist message	Wrn SHAIN 2
Alarm evaluated	Only if SHAIN 2 is configured
Related applications	MCB
Alarm ID	233
Description	This alarm is activated when shared analog inputs are not received from SHAIN module 2.

⬅ back to List of alarms level 1

Wrn SHAIN Collision

Alarm Type	Warning (page 211)
Alarmlist message	Wrn SHAIN Collision
Alarm evaluated	Only if SHIN 1 or SHAIN 2 module is configured
Related applications	MCB
Alarm ID	38
Description	This alarm is activated when controller receives shared analog inputs of any SHAIN module from more than just one controller. This alarm has FPS - FIXED PROTECTIONS STATES 1 (PAGE 658)

⬅ back to List of alarms level 1

Wrn SHBIN 1

Alarm Type	Warning (page 211)
Alarmlist message	Wrn SHBIN 1
Alarm evaluated	Only if SHBIN 1 is configured
Related applications	MCB
Alarm ID	32
Description	This alarm is activated when shared binary inputs are not received from SHBIN module 1.

 [back to List of alarms level 1](#)

Wrn SHBIN 2

Alarm Type	Warning (page 211)
Alarmlist message	Wrn SHBIN 2
Alarm evaluated	Only if SHBIN 2 is configured
Related applications	MCB
Alarm ID	33
Description	This alarm is activated when shared binary inputs are not received from SHBIN module 2.

 [back to List of alarms level 1](#)

Wrn SHBIN 3

Alarm Type	Warning (page 211)
Alarmlist message	Wrn SHBIN 3
Alarm evaluated	Only if SHBIN 3 is configured
Related applications	MCB
Alarm ID	34
Description	This alarm is activated when shared binary inputs are not received from SHBIN module 3.

 [back to List of alarms level 1](#)

Wrn SHBIN 4

Alarm Type	Warning (page 211)
Alarmlist message	Wrn SHBIN 4
Alarm evaluated	Only if SHBIN 4 is configured
Related applications	MCB
Alarm ID	35
Description	This alarm is activated when shared binary inputs are not received from SHBIN module 4.

 [back to List of alarms level 1](#)

Wrn SHBIN 5

Alarm Type	Warning (page 211)
Alarmlist message	Wrn SHBIN 5
Alarm evaluated	Only if SHBIN 5 is configured
Related applications	MCB
Alarm ID	216
Description	This alarm is activated when shared binary inputs are not received from SHBIN module 5.

⬅ back to List of alarms level 1

Wrn SHBIN 6

Alarm Type	Warning (page 211)
Alarmlist message	Wrn SHBIN 6
Alarm evaluated	Only if SHBIN 6 is configured
Related applications	MCB
Alarm ID	217
Description	This alarm is activated when shared binary inputs are not received from SHBIN module 6.

⬅ back to List of alarms level 1

Wrn SHBIN Collision

Alarm Type	Warning (page 211)
Alarmlist message	Wrn SHBIN Collision
Alarm evaluated	Only if at least one of SHBIN 1 to SHBIN 6 modules is configured
Related applications	MCB
Alarm ID	37
Description	This alarm is activated when controller receives shared binary inputs of any SHBIN module from more than just one controller. This alarm has FPS - FIXED PROTECTIONS STATES 1 (PAGE 658)

⬅ back to List of alarms level 1

Wrn SNMP TRAP 1 Fail

Alarm Type	Warning (page 211)
Alarmlist message	Wrn SNMP TRAP 1 Fail
Alarm evaluated	Only when SNMP Agent (page 389) = Enabled and SNMP Traps IP Address 1 (page 390) is set.
Related applications	MCB
Alarm ID	823
Description	This alarm is activated if sending of SNMP trap to IP address set by SNMP Traps IP Address 1 (page 390) failed. This alarm has FPS - FIXED PROTECTIONS STATES 4 (PAGE 661).

⬆ back to List of alarms level 1

Wrn SNMP TRAP 2 Fail

Alarm Type	Warning (page 211)
Alarmlist message	Wrn SNMP TRAP 2 Fail
Alarm evaluated	Only when SNMP Agent (page 389) = Enabled and SNMP Traps IP Address 2 (page 391) is set.
Related applications	MCB
Alarm ID	824
Description	This alarm is activated if sending of SNMP trap to IP address set by SNMP Traps IP Address 2 (page 391) failed. This alarm has FPS - FIXED PROTECTIONS STATES 4 (PAGE 661).

⬆ back to List of alarms level 1

Wrn Total Running PQS Value Overflow

Alarm Type	Warning (page 211)
Alarmlist message	Wrn Total Running PQS Value Overflow
Alarm evaluated	All the time
Related applications	MCB
Alarm ID	1077
Description	This alarm is activated in case the sum of all Controllers' apparent power is above range of value Total Running Samax (page 482) . Changing of the power format should be considered if this alarm appears.

⬆ back to List of alarms level 1

Wrong PLC Configuration

Alarm Type	Warning (page 211)
Alarmlist message	Wrong PLC Configuration
Alarm evaluated	Always
Related applications	MCB
Alarm ID	41
Description	This alarm is activated when the PLC - Programmable Logic Controller (page 156) 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.

⬆ back to List of alarms level 1

Alarm Only

Alarm List Indication

ALI Bus Ph L1 Inverted

Alarm Type	Alarm List Indication (page 211)
Alarmlist message	ALI Bus Ph L1 Inverted
Alarm evaluated	All the time
Related applications	MCB
Alarm ID	928
Description	This alarm is activated when Bus Phase L1 is inverted.

 back to List of alarms level 1

ALI Bus Ph L2 Inverted

Alarm Type	Alarm List Indication (page 211)
Alarmlist message	ALI Bus Ph L2 Inverted
Alarm evaluated	All the time
Related applications	MCB
Alarm ID	929
Description	This alarm is activated when Bus Phase L2 is inverted.

 back to List of alarms level 1

ALI Bus Ph L3 Inverted

Alarm Type	Alarm List Indication (page 211)
Alarmlist message	ALI Bus Ph L3 Inverted
Alarm evaluated	All the time
Related applications	MCB
Alarm ID	930
Description	This alarm is activated when Bus Phase L3 is inverted.

 back to List of alarms level 1

ALI Bus Ph Rotation Opposite

Alarm Type	Alarm List Indication (page 211)
Alarmlist message	ALI Bus Ph Rotation Opposite
Alarm evaluated	All the time
Related applications	MCB
Alarm ID	847
Description	This alarm is activated when controller detects wrong phase rotation, e.g. Phase Rotation (page 270) is set to Clockwise and actual rotation is Counterclockwise, on the Bus side.

 back to List of alarms level 1

ALI Mains Ph L1 Inverted

Alarm Type	Alarm List Indication (page 211)
Alarmlist message	ALI Mains Ph L1 Inverted
Alarm evaluated	All the time
Related applications	MCB
Alarm ID	925
Description	This alarm is activated when Mains Phase L1 is inverted.

⬅ back to List of alarms level 1

ALI Mains Ph L2 Inverted

Alarm Type	Alarm List Indication (page 211)
Alarmlist message	ALI Mains Ph L2 Inverted
Alarm evaluated	All the time
Related applications	MCB
Alarm ID	926
Description	This alarm is activated when Mains Phase L2 is inverted.

⬅ back to List of alarms level 1

ALI Mains Ph L3 Inverted

Alarm Type	Alarm List Indication (page 211)
Alarmlist message	ALI Mains Ph L3 Inverted
Alarm evaluated	All the time
Related applications	MCB
Alarm ID	927
Description	This alarm is activated when Mains Phase L3 is inverted.

⬅ back to List of alarms level 1

ALI Mains Ph Rotation Opposite

Alarm Type	Alarm List Indication (page 211)
Alarmlist message	ALI Mains Ph Rotation Opposite
Alarm evaluated	All the time
Related applications	MCB
Alarm ID	158
Description	<p>This alarm is activated when controller detects wrong phase rotation, e.g. Phase Rotation (page 270) is set to Clockwise and actual rotation is Counterclockwise, on the Mains side.</p> <p>This alarm has FPS - FIXED PROTECTIONS STATES 3 (PAGE 660).</p>

⬅ back to List of alarms level 1

ALI CAN Mode Inconsistency

Alarm Type	Alarm List Indication (page 211)
Alarmlist message	ALI CAN Mode Inconsistency
Alarm evaluated	All the time
Related applications	MCB
Alarm ID	1291
Description	This alarm is active when there is mismatch between setpoint CAN Intercontroller Comm Mode (page 366) and value CAN Intercontroller Comm Mode (page 496) .

🔍 back to List of alarms level 1

ALI Redundant CAN Error

Alarm Type	Alarm List Indication (page 211)
Alarmlist message	ALI Redundant CAN Error
Alarm evaluated	All the time
Related applications	MCB
Alarm ID	1290
Description	This alarm is active when there is a mismatch between setpoint CAN Intercontroller Comm Redundancy (page 365) and actual state of ⑦ CAN2B (page 43) .

🔍 back to List of alarms level 1

ALI SD Card Not Compatible

Alarm Type	Alarm List Indication (page 211)
Alarmlist message	ALI SD Card Not Compatible
Alarm evaluated	Only when Long Term History (page 368) = Mount or Format
Related applications	MCB
Alarm ID	1610
Description	<p>This alarm is activated when the value SD Card Status (page 497) shows Status: Not Supported.</p> <p>Alarm is active all the time until the card is unmounted, or a compatible card is inserted.</p> <p>This alarm has FPS - FIXED PROTECTIONS STATES 4 (PAGE 661).</p>

🔍 back to List of alarms level 1

ALI SD Card In Slot

Alarm Type	Alarm List Indication (page 211)
Alarmlist message	ALI SD Card In Slot
Alarm evaluated	Only when Long Term History (page 368) = Unmount
Related applications	MCB
Alarm ID	1611
Description	This alarm is activated when SD Card File System (page 367) is set to Unmount but SD Card is detected in the slot. This alarm has FPS - FIXED PROTECTIONS STATES 4 (PAGE 661) .

🔍 back to List of alarms level 1

ALI SD Card Full

Alarm Type	Alarm List Indication (page 211)
Alarmlist message	ALI SD Card Full
Alarm evaluated	Only when Long Term History (page 368) = Mount
Related applications	MCB
Alarm ID	1621
Description	This alarm is activated if value SD Card Free Space (page 497) drops below 10 %. This alarm has FPS - FIXED PROTECTIONS STATES 4 (PAGE 661) .

🔍 back to List of alarms level 1

ALI SD Card Formatting/Mounting

Alarm Type	Alarm List Indication (page 211)
Alarmlist message	ALI SD Card Formating/Mounting
Alarm evaluated	Only when Long Term History (page 368) = Mount or Format
Related applications	MCB
Alarm ID	1638
Description	This alarm is activated when the process of mounting or formatting is active. This alarm has FPS - FIXED PROTECTIONS STATES 1 (PAGE 658) .

🔍 back to List of alarms level 1

ALI Synchronization Blocked

Alarm Type	Alarm List Indication (page 211)
Alarmlist message	Synchronization Blocked
Alarm evaluated	All the time
Related applications	MCB
Alarm ID	1649
Description	This alarm is activated when multiple synchronization commands are active or when any Synchronization command and UTILITY UNLOAD (PAGE 622) are active.

⬅ back to List of alarms level 1

ALI SW Key Hot Swap Error

Alarm Type	Alarm List Indication (page 211)
Alarmlist message	ALI SW Key Hot Swap Error
Alarm evaluated	Only if Hot Swap Redundancy (page 274) != Disabled
Related applications	MCB
Alarm ID	1461
Description	This alarm is activated when there is an attempt to enable premium feature Hot Swap Redundancy (page 141) without valid SW Key (page 273) .

⬅ back to List of alarms level 1

ALI SW Key Modbus Master Error

Alarm Type	Alarm List Indication (page 211)
Alarmlist message	ALI SW Key Modbus Master Error
Alarm evaluated	Always
Related applications	MCB
Alarm ID	1286
Description	This alarm is activated when more than 2 datapoints for Modbus Client (Master) (page 151) are configured without the valid SW Key inserted into the Setpoint SW Key (page 273) .

⬅ back to List of alarms level 1

ALI Wrong Power Format

Alarm Type	Alarm List Indication (page 211)
Alarmlist message	ALI Wrong Power Format
Alarm evaluated	All the time
Related applications	MCB
Alarm ID	149
Description	This alarm is activated when there is inconsistency of Power Formats And Units (page 168) on any controller which is connected via CAN2A (page 18) or CAN2B (page 18) .

⬅ back to List of alarms level 1

Alarm List + History Indication

AHI Battery Overvoltage

Alarm Type	Alarm List + History Record Indication (page 211)
Alarmlist message	AHI Battery Overvoltage
Alarm evaluated	All the time
Related applications	MCB
Alarm ID	941
Description	<p>This alarm is activated when Battery Voltage (page 488) is over Battery Overvoltage (page 275) for period longer than Battery Under And Overvoltage Delay (page 275).</p> <p>This alarm has FPS - FIXED PROTECTIONS STATES 1 (PAGE 658)</p>

⬅ back to List of alarms level 1

AHI Battery Undervoltage

Alarm Type	Alarm List + History Record Indication (page 211)
Alarmlist message	AHI Battery Undervoltage
Alarm evaluated	All the time
Related applications	MCB
Alarm ID	940
Description	<p>This alarm is activated when Battery Voltage (page 488) is bellow Battery Undervoltage (page 274) for period longer than Battery Under And Overvoltage Delay (page 275).</p> <p>This alarm has FPS - FIXED PROTECTIONS STATES 1 (PAGE 658)</p>

⬅ back to List of alarms level 1

AHI MCB Isolated

Alarm Type	Alarm List + History Record Indication (page 211)
Alarmlist message	AHI MCB Isolated
Alarm evaluated	Only if MCB ISOLATED (PAGE 617) is configured
Related applications	MCB
Alarm ID	548
Description	<p>This alarm is activated by the LBI MCB ISOLATED (PAGE 617) and it signalizes that Load is cut off from Mains by an external isolator.</p>

⬅ back to List of alarms level 1

History Record Only

Hst Bus >V L1-N

Alarm Type	History Record Only (page 211)
Alarmlist message	Hst Bus >V L1-N

Alarm evaluated	Only if Bus >V Protection (page 346) != Disabled
Related applications	MCB
Alarm ID	98
Description	This alarm is activated by Bus >V Protection (page 346) . This alarm has FPS - FIXED PROTECTIONS STATES 3 (PAGE 660).

⬅ back to List of alarms level 1

Hst Bus >V L2-N

Alarm Type	History Record Only (page 211)
Alarmlist message	Hst Bus >V L2-N
Alarm evaluated	Only if Bus >V Protection (page 346) != Disabled
Related applications	MCB
Alarm ID	99
Description	This alarm is activated by Bus >V Protection (page 346) . This alarm has FPS - FIXED PROTECTIONS STATES 3 (PAGE 660).

⬅ back to List of alarms level 1

Hst Bus >V L3-N

Alarm Type	History Record Only (page 211)
Alarmlist message	Hst Bus >V L3-N
Alarm evaluated	Only if Bus >V Protection (page 346) != Disabled
Related applications	MCB
Alarm ID	100
Description	This alarm is activated by Bus >V Protection (page 346) . This alarm has FPS - FIXED PROTECTIONS STATES 3 (PAGE 660).

⬅ back to List of alarms level 1

Hst Bus >V L1-L2

Alarm Type	History Record Only (page 211)
Alarmlist message	Hst Bus >V L1-L2
Alarm evaluated	Only if Bus >V Protection (page 346) != Disabled
Related applications	MCB
Alarm ID	107
Description	This alarm is activated by Bus >V Protection (page 346) . This alarm has FPS - FIXED PROTECTIONS STATES 3 (PAGE 660).

⬅ back to List of alarms level 1

Hst Bus >V L2-L3

Alarm Type	History Record Only (page 211)
Alarmlist message	Hst Bus >V L2-L3
Alarm evaluated	Only if Bus >V Protection (page 346) != Disabled

Related applications	MCB
Alarm ID	108
Description	This alarm is activated by Bus >V Protection (page 346) . This alarm has FPS - FIXED PROTECTIONS STATES 3 (PAGE 660).

⬅ back to List of alarms level 1

Hst Bus >V L3-L1

Alarm Type	History Record Only (page 211)
Alarmlist message	Hst Bus >V L3-L1
Alarm evaluated	Only if Bus >V Protection (page 346) != Disabled
Related applications	MCB
Alarm ID	109
Description	This alarm is activated by Bus >V Protection (page 346) . This alarm has FPS - FIXED PROTECTIONS STATES 3 (PAGE 660).

⬅ back to List of alarms level 1

Hst Bus <V L1-N

Alarm Type	History Record Only (page 211)
Alarmlist message	Hst Bus <V L1-N
Alarm evaluated	Only if Bus >V Protection (page 346) != Disabled
Related applications	MCB
Alarm ID	95
Description	This alarm is activated by Bus >V Protection (page 346) . This alarm has FPS - FIXED PROTECTIONS STATES 3 (PAGE 660).

⬅ back to List of alarms level 1

Hst Bus <V L2-N

Alarm Type	History Record Only (page 211)
Alarmlist message	Hst Bus <V L2-N
Alarm evaluated	Only if Bus >V Protection (page 346) != Disabled
Related applications	MCB
Alarm ID	96
Description	This alarm is activated by Bus >V Protection (page 346) . This alarm has FPS - FIXED PROTECTIONS STATES 3 (PAGE 660).

⬅ back to List of alarms level 1

Hst Bus <V L3-N

Alarm Type	History Record Only (page 211)
Alarmlist message	Hst Bus <V L3-N
Alarm evaluated	Only if Bus >V Protection (page 346) != Disabled

Related applications	MCB
Alarm ID	97
Description	This alarm is activated by Bus <V Protection (page 347) . This alarm has FPS - FIXED PROTECTIONS STATES 3 (PAGE 660).

⬅ back to List of alarms level 1

Hst Bus <V L1-L2

Alarm Type	History Record Only (page 211)
Alarmlist message	Hst Bus <V L1-L2
Alarm evaluated	Only if Bus >V Protection (page 346) != Disabled
Related applications	MCB
Alarm ID	104
Description	This alarm is activated by Bus <V Protection (page 347) . This alarm has FPS - FIXED PROTECTIONS STATES 3 (PAGE 660).

⬅ back to List of alarms level 1

Hst Bus <V L2-L3

Alarm Type	History Record Only (page 211)
Alarmlist message	Hst Bus <V L2-L3
Alarm evaluated	Only if Bus >V Protection (page 346) != Disabled
Related applications	MCB
Alarm ID	105
Description	This alarm is activated by Bus <V Protection (page 347) . This alarm has FPS - FIXED PROTECTIONS STATES 3 (PAGE 660).

⬅ back to List of alarms level 1

Hst Bus <V L3-L1

Alarm Type	History Record Only (page 211)
Alarmlist message	Hst Bus <V L3-L1
Alarm evaluated	Only if Bus >V Protection (page 346) != Disabled
Related applications	MCB
Alarm ID	106
Description	This alarm is activated by Bus <V Protection (page 347) . This alarm has FPS - FIXED PROTECTIONS STATES 3 (PAGE 660).

⬅ back to List of alarms level 1

Hst Bus >f

Alarm Type	History Record Only (page 211)
Alarmlist message	Hst Bus >f
Alarm evaluated	Only if Bus >f Protection (page 353) != Disabled

Related applications	MCB
Alarm ID	121
Description	This alarm is activated by Bus >f Protection (page 353) . This alarm has FPS - FIXED PROTECTIONS STATES 3 (PAGE 660).

⬅ back to List of alarms level 1

Hst Bus <f

Alarm Type	History Record Only (page 211)
Alarmlist message	Hst Bus <f
Alarm evaluated	Only if Bus >f Protection (page 353) != Disabled
Related applications	MCB
Alarm ID	120
Description	This alarm is activated by Bus <f Protection (page 354) . This alarm has FPS - FIXED PROTECTIONS STATES 3 (PAGE 660).

⬅ back to List of alarms level 1

Hst Bus V Unbalance Ph-N

Alarm Type	History Record Only (page 211)
Alarmlist message	Hst Bus V Unbalance Ph-N
Alarm evaluated	Only if Bus >V Protection (page 346) != Disabled
Related applications	MCB
Alarm ID	589
Description	This alarm is activated by Bus V Unbalance Protection (page 347) . This alarm has FPS - FIXED PROTECTIONS STATES 3 (PAGE 660).

⬅ back to List of alarms level 1

Hst Bus V Unbalance Ph-Ph

Alarm Type	History Record Only (page 211)
Alarmlist message	Hst Bus V Unbalance Ph-Ph
Alarm evaluated	Only if Bus >V Protection (page 346) != Disabled
Related applications	MCB
Alarm ID	588
Description	This alarm is activated by Bus V Unbalance Protection (page 347) . This alarm has FPS - FIXED PROTECTIONS STATES 3 (PAGE 660).

⬅ back to List of alarms level 1

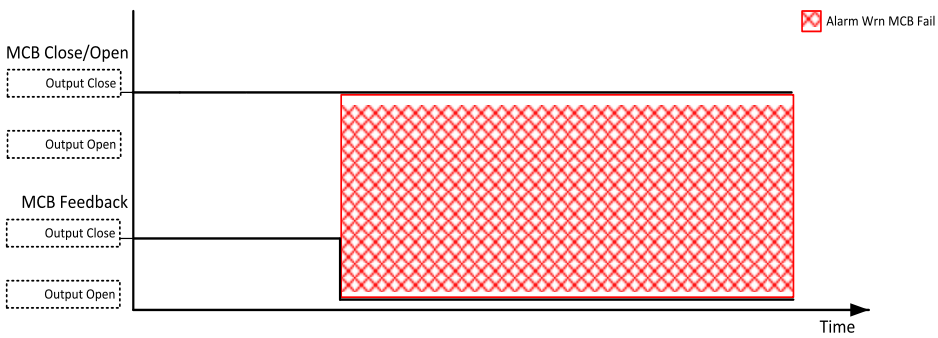
Bus Meas Error

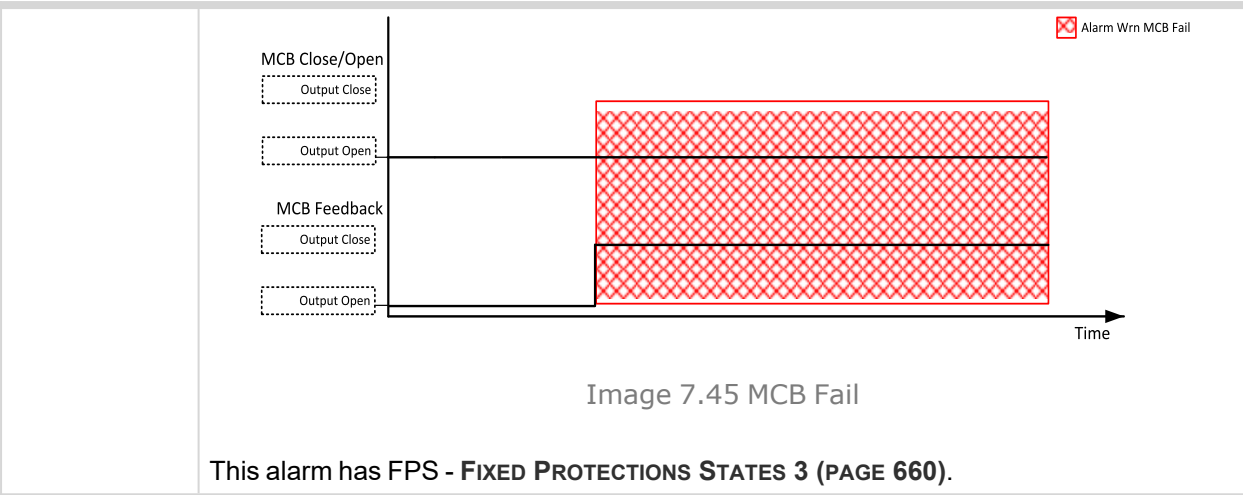
Alarm Type	Protection types (page 211)
Alarmlist message	Bus Meas Error
Alarm evaluated	Bus Meas Error (page 356) != Disabled

Related applications	MCB
Alarm ID	143
Description	<p>This protection is activated in case that voltage mismatch on Bus side is detected for longer than 20 seconds. The mismatch is detected according to the conditions below:</p> <ul style="list-style-type: none"> ➤ Own MCB was closed and LBO Mains Healthy (page 641) is active ➤ Any other controller in Control Group (page 276) closed MLCB ➤ BTB connected another Control Group with MCB Feedback or controller with closed MLCB <p>This alarm has FPS - FIXED PROTECTIONS STATES 3 (PAGE 660).</p>

🔍 back to List of alarms level 1

Hst MCB Fail

Alarm Type	Warning (page 211)
Alarmlist message	Hst MCB Fail
Alarm evaluated	Only if MCB Control Mode (page 287) = Internal
Related applications	MCB
Alarm ID	90
Description	<p>This alarm is activated when there is a problem with position of the circuit breaker.</p> <ul style="list-style-type: none"> ➤ LBI MCB FEEDBACK (PAGE 616) does not match expected position given by LBO MCB CLOSE/OPEN (PAGE 641). ➤ There is a mismatch between LBI MCB FEEDBACK (PAGE 616) and MCB FEEDBACK NEGATIVE (PAGE 617). ➤ Self-opening of breaker with mains parameters without limits – not considered as fault, MCB open command is issued when Mains fails according to the setpoint MCB Opens On (page 287).  <p>The diagram illustrates the timing of the Hst MCB Fail alarm. It shows four signals: MCB Close/Open, Output Close, Output Open, and MCB Feedback. A red hatched area indicates the alarm is active. A legend shows a red square with a cross and the text 'Alarm Wrn MCB Fail'.</p>



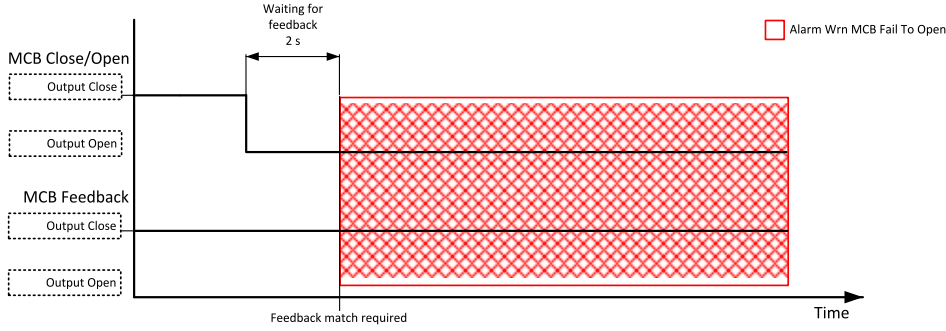
🔍 back to List of alarms level 1

Hst MCB Fail To Close

Alarm Type	Warning (page 211)
Alarmlist message	Hst MCB Fail To Close
Alarm evaluated	Only if MCB Control Mode (page 287) = Internal
Related applications	MCB
Alarm ID	1553
Description	<p>This alarm is activated when there is a problem with circuit breaker position while closing.</p> <ul style="list-style-type: none">➤ LBO MCB CLOSE/OPEN (PAGE 641) closed but LBI MCB FEEDBACK (PAGE 616) did not closed in 2 seconds.➤ Self-closing of breaker with mains parameters with limits – not considered as fault, MCB close command is issued according to the setpoint MCB Opens On (page 287). <p>Image 7.46 MCB Fail To Close</p> <p>This alarm has FPS - FIXED PROTECTIONS STATES 4 (PAGE 661).</p>

🔍 back to List of alarms level 1

Hst MCB Fail To Open

Alarm Type	Warning (page 211)
Alarmlist message	Hst MCB Fail To Open
Alarm evaluated	Only if MCB Control Mode (page 287) = Internal
Related applications	MCB
Alarm ID	1552
Description	<p>This alarm is activated when there is a problem with circuit breaker position while opening.</p> <ul style="list-style-type: none"> > LBO MCB CLOSE/OPEN (PAGE 641) opened but LBI MCB FEEDBACK (PAGE 616) did not opened in 2 seconds. > Self-opening of breaker with mains parameters without limits - not considered as fault, MCB open command is issued according to the setpoint MCB Opens On (page 287).  <p style="text-align: center;">Image 7.47 MCB Fail To Open</p> <p>This alarm has FPS - FIXED PROTECTIONS STATES 4 (PAGE 661).</p>

🔍 back to List of alarms level 1

Hst Synchronization Fail

Alarm Type	Warning (page 211)
Alarmlist message	Hst Reverse Synchro Fail
Alarm evaluated	Only if LBO SYNCHRONIZATION (PAGE 648) is closed
Related applications	MCB
Alarm ID	93
Description	<p>This alarm is activated when Reverse Synchronization fails. Reverse Synchronization is activated when synchronization is done over MCB breaker.</p> <p>This alarm has FPS - FIXED PROTECTIONS STATES 3 (PAGE 660).</p>

🔍 back to List of alarms level 1

Hst ROCOF 1

Alarm Type	History Record Only (page 211)
Alarmlist message	Hst ROCOF 1
Alarm evaluated	Only if ROCOF1 Protection (page 358) = Enabled or (ROCOF1 Protection (page 358) = Parallel Only and MCB FEEDBACK (PAGE 616) is active)
Related applications	MCB
Alarm ID	851
Description	<p>This alarm is activated by ROCOF1 Protection (page 358).</p> <p>Note: <i>There are 4 ROCOF Protections which can be enabled.</i></p> <ul style="list-style-type: none">➤ ROCOF1 Protection (page 358)➤ ROCOF2 Protection (page 359)➤ ROCOF3 Protection (page 360)➤ ROCOF4 Protection (page 361)

⬅ back to List of alarms level 1

Hst ROCOF2

Alarm Type	History Record Only (page 211)
Alarmlist message	Hst ROCOF2
Alarm evaluated	Only if ROCOF2 Protection (page 359) = Enabled or (ROCOF2 Protection (page 359) = Parallel Only and MCB FEEDBACK (PAGE 616) is active)
Related applications	MCB
Alarm ID	1112
Description	This alarm is activated by ROCOF2 Protection (page 359)

⬅ back to List of alarms level 1

Hst ROCOF3

Alarm Type	History Record Only (page 211)
Alarmlist message	Hst ROCOF3
Alarm evaluated	Only if ROCOF3 Protection (page 360) = Enabled or (ROCOF3 Protection (page 360) = Parallel Only and MCB FEEDBACK (PAGE 616) is active)
Related applications	MCB
Alarm ID	1113
Description	This alarm is activated by ROCOF3 Protection (page 360)

⬅ back to List of alarms level 1

Hst ROCOF4

Alarm Type	History Record Only (page 211)
Alarmlist message	Hst ROCOF4
Alarm evaluated	Only if ROCOF4 Protection (page 361) = Enabled or (ROCOF4 Protection (page 361) = Parallel Only and MCB FEEDBACK (PAGE 616) is active)

Related applications	MCB
Alarm ID	1114
Description	This alarm is activated by ROCOF4 Protection (page 361)

⬅ back to List of alarms level 1

Hst Synchronization Fail

Alarm Type	History Record Only (page 211)
Alarmlist message	Hst Synchronization Fail
Alarm evaluated	During synchronization
Related applications	
Alarm ID	94
Description	This alarm is activated if the synchronization fails, e.g. Synchronization Timeout (page 283) elapses. This alarm has FPS - FIXED PROTECTIONS STATES 3 (PAGE 660).

⬅ back to List of alarms level 2

Hst Vector Shift

Alarm Type	History Record Only (page 211)
Alarmlist message	Hst Vector Shift
Alarm evaluated	Only if Vector Shift Protection (page 357) = Enabled or (Vector Shift Protection (page 357) = Parallel Only and MCB FEEDBACK (PAGE 616) is closed)
Related applications	MCB
Alarm ID	850
Description	This alarm is activated when Vector shift (page 199) is detected.

⬅ back to List of alarms level 1

8.2.3 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

Mains Protection	759	MP Mains >>f	768
MP Mains >V L1-N	759	MP Mains <<f	769
MP Mains >V L2-N	759	Mains Protection + FltRes ..	770
MP Mains >V L3-N	759	MPR Current Unbalance ..	770
MP Mains >V L1-L2	759	IDMT Overload	770
MP Mains >V L2-L3	760	MPR IDMT Mains >A	770
MP Mains >V L3-L1	760	MPR Short Circuit	770
MP Mains >>V L1-N	760	System Protection	771
MP Mains >>V L2-N	761	SP Request Under	
MP Mains >>V L3-N	761	MinPowerPTM	771
MP Mains >>V L1-L2	761		
MP Mains >>V L2-L3	761	⬅ back to Alarms	
MP Mains >>V L3-L1	762		
MP Mains Avg >V L1-N ...	762		
MP Mains Avg >V L2-N ...	762		
MP Mains Avg >V L3-N ...	762		
MP Mains Avg >V L1-L2 ...	763		
MP Mains Avg >V L2-L3 ...	763		
MP Mains Avg >V L3-L1 ...	763		
MP Mains <V L1-N	763		
MP Mains <V L2-N	764		
MP Mains <V L3-N	764		
MP Mains <V L1-L2	764		
MP Mains <V L2-L3	765		
MP Mains <V L3-L1	765		
MP Mains <<V L1-N	765		
MP Mains <<V L2-N	766		
MP Mains <<V L3-N	766		
MP Mains <<V L1-L2	766		
MP Mains <<V L2-L3	766		
MP Mains <<V L3-L1	767		
MP Mains V Unbalance			
Ph-Ph	767		
MP Mains V Unbalance			
Ph-N	767		
MP Mains >f	768		
MP Mains <f	768		

Mains Protection

MP Mains >V L1-N

Alarm Type	Mains Protection* (page 212)
Alarmlist message	MP Mains >V L1-N
Alarm evaluated	Only if Mains >V Protection (page 339) != Disabled
Related applications	MCB
Alarm ID	125
Description	<p>This alarm is activated by Mains >V Protection (page 339).</p> <p>This alarm is activated when Mains Voltage L1-N (page 454) rises over preset value.</p> <p>This alarm has FPS - FIXED PROTECTIONS STATES 2 (PAGE 659).</p>

⬅ back to List of alarms level 1

MP Mains >V L2-N

Alarm Type	Mains Protection* (page 212)
Alarmlist message	MP Mains >V L2-N
Alarm evaluated	Only if Mains >V Protection (page 339) != Disabled
Related applications	MCB
Alarm ID	126
Description	<p>This alarm is activated by Mains >V Protection (page 339).</p> <p>This alarm is activated when Mains Voltage L2-N (page 454) rises above preset value.</p> <p>This alarm has FPS - FIXED PROTECTIONS STATES 2 (PAGE 659).</p>

⬅ back to List of alarms level 1

MP Mains >V L3-N

Alarm Type	Mains Protection* (page 212)
Alarmlist message	MP Mains >V L3-N
Alarm evaluated	Only if Mains >V Protection (page 339) != Disabled
Related applications	MCB
Alarm ID	127
Description	<p>This alarm is activated by Mains >V Protection (page 339).</p> <p>This alarm has FPS - FIXED PROTECTIONS STATES 2 (PAGE 659).</p>

⬅ back to List of alarms level 1

MP Mains >V L1-L2

Alarm Type	Mains Protection* (page 212)
Alarmlist message	MP Mains >V L1-L2
Alarm evaluated	Only if Mains >V Protection (page 339) != Disabled
Related applications	MCB

Alarm ID	131
Description	<p>This alarm is activated by Mains >V Protection (page 339).</p> <p>This alarm is activated when Mains Voltage L1-L2 (page 454) rises over preset value.</p> <p>This alarm has FPS - FIXED PROTECTIONS STATES 2 (PAGE 659).</p>

⬅ back to List of alarms level 1

MP Mains >V L2-L3

Alarm Type	Mains Protection* (page 212)
Alarmlist message	MP Mains >V L2-L3
Alarm evaluated	Only if Mains >V Protection (page 339) != Disabled
Related applications	MCB
Alarm ID	132
Description	<p>This alarm is activated by Mains >V Protection (page 339).</p> <p>This alarm is activated when Mains Voltage L2-L3 (page 454) rises over preset value.</p> <p>This alarm has FPS - FIXED PROTECTIONS STATES 2 (PAGE 659).</p>

⬅ back to List of alarms level 1

MP Mains >V L3-L1

Alarm Type	Mains Protection* (page 212)
Alarmlist message	MP Mains >V L3-L1
Alarm evaluated	Only if Mains >V Protection (page 339) != Disabled
Related applications	MCB
Alarm ID	133
Description	<p>This alarm is activated by Mains >V Protection (page 339).</p> <p>This alarm has FPS - FIXED PROTECTIONS STATES 2 (PAGE 659).</p>

⬅ back to List of alarms level 1

MP Mains >>V L1-N

Alarm Type	Mains Protection* (page 212)
Alarmlist message	MP Mains >>V L1-N
Alarm evaluated	Only if Mains >>V Protection (page 341) != Disabled
Related applications	MCB
Alarm ID	1080
Description	<p>This alarm is activated by Mains >>V Protection (page 341).</p> <p>This alarm is activated when Mains Voltage L1-N (page 454) rises over preset value.</p> <p>This alarm has FPS - FIXED PROTECTIONS STATES 2 (PAGE 659).</p>

⬅ back to List of alarms level 1

MP Mains >>V L2-N

Alarm Type	Mains Protection* (page 212)
Alarmlist message	MP Mains >>V L2-N
Alarm evaluated	Only if Mains >>V Protection (page 341) != Disabled
Related applications	MCB
Alarm ID	1082
Description	<p>This alarm is activated by Mains >>V Protection (page 341).</p> <p>This alarm is activated when Mains Voltage L2-N (page 454) rises over preset value.</p> <p>This alarm has FPS - FIXED PROTECTIONS STATES 2 (PAGE 659).</p>

◀ back to List of alarms level 1

MP Mains >>V L3-N

Alarm Type	Mains Protection* (page 212)
Alarmlist message	
Alarm evaluated	Only if Mains >>V Protection (page 341) != Disabled
Related applications	MCB
Alarm ID	1084
Description	<p>This alarm is activated by Mains >>V Protection (page 341).</p> <p>This alarm is activated when Mains Voltage L3-N (page 454) rises over preset value.</p> <p>This alarm has FPS - FIXED PROTECTIONS STATES 2 (PAGE 659).</p>

◀ back to List of alarms level 1

MP Mains >>V L1-L2

Alarm Type	Mains Protection* (page 212)
Alarmlist message	MP Mains >>V L1-L2
Alarm evaluated	Only if Mains >>V Protection (page 341) != Disabled
Related applications	MCB
Alarm ID	1086
Description	<p>This alarm is activated by Mains >>V Protection (page 341).</p> <p>This alarm is activated when Mains Voltage L1-L2 (page 454) rises over preset value.</p> <p>This alarm has FPS - FIXED PROTECTIONS STATES 2 (PAGE 659).</p>

◀ back to List of alarms level 1

MP Mains >>V L2-L3

Alarm Type	Mains Protection* (page 212)
Alarmlist message	MP Mains >>V L2-L3
Alarm evaluated	Only if Mains >>V Protection (page 341) != Disabled
Related applications	MCB

Alarm ID	1088
Description	<p>This alarm is activated by Mains >>V Protection (page 341).</p> <p>This alarm is activated when Mains Voltage L2-L3 (page 454) rises over preset value.</p> <p>This alarm has FPS - FIXED PROTECTIONS STATES 2 (PAGE 659).</p>

⬅ back to List of alarms level 1

MP Mains >>V L3-L1

Alarm Type	Mains Protection* (page 212)
Alarmlist message	MP Mains >>V L3-L1
Alarm evaluated	Only if Mains >>V Protection (page 341) != Disabled
Related applications	MCB
Alarm ID	1090
Description	<p>This alarm is activated by Mains >>V Protection (page 341).</p> <p>This alarm is activated when Mains Voltage L3-L1 (page 455) rises over preset value.</p> <p>This alarm has FPS - FIXED PROTECTIONS STATES 2 (PAGE 659).</p>

⬅ back to List of alarms level 1

MP Mains Avg >V L1-N

Alarm Type	Mains Protection* (page 212)
Alarmlist message	MP Mains Avg >V L1-N
Alarm evaluated	Only if Mains 10min Avg >V (page 316) != Disabled
Related applications	MCB
Alarm ID	1466
Description	<p>This alarm is activated by Mains 10min Avg >V (page 316) protection.</p> <p>This alarm has FPS - FIXED PROTECTIONS STATES 2 (PAGE 659).</p>

⬅ back to List of alarms level 2

MP Mains Avg >V L2-N

Alarm Type	Mains Protection* (page 212)
Alarmlist message	MP Mains Avg >V L2-N
Alarm evaluated	Only if Mains 10min Avg >V (page 316) != Disabled
Related applications	MCB
Alarm ID	1467
Description	<p>This alarm is activated by Mains 10min Avg >V (page 316) protection.</p> <p>This alarm has FPS - FIXED PROTECTIONS STATES 2 (PAGE 659).</p>

⬅ back to List of alarms level 2

MP Mains Avg >V L3-N

Alarm Type	Mains Protection* (page 212)
-------------------	-------------------------------------

Alarmlist message	MP Mains Avg >V L3-N
Alarm evaluated	Only if Mains 10min Avg >V (page 316) != Disabled
Related applications	MCB
Alarm ID	1468
Description	This alarm is activated by Mains 10min Avg >V (page 316) protection. This alarm has FPS - FIXED PROTECTIONS STATES 2 (PAGE 659).

⬅ back to List of alarms level 2

MP Mains Avg >V L1-L2

Alarm Type	Mains Protection* (page 212)
Alarmlist message	MP Mains Avg >V L1-L2
Alarm evaluated	Only if Mains 10min Avg >V (page 316) != Disabled
Related applications	MCB
Alarm ID	1144
Description	This alarm is activated by Mains 10min Avg >V (page 316) protection. This alarm has FPS - FIXED PROTECTIONS STATES 2 (PAGE 659).

⬅ back to List of alarms level 2

MP Mains Avg >V L2-L3

Alarm Type	Mains Protection* (page 212)
Alarmlist message	MP Mains Avg >V L2-L3
Alarm evaluated	Only if Mains 10min Avg >V (page 316) != Disabled
Related applications	MCB
Alarm ID	1145
Description	This alarm is activated by Mains 10min Avg >V (page 316) protection. This alarm has FPS - FIXED PROTECTIONS STATES 2 (PAGE 659).

⬅ back to List of alarms level 2

MP Mains Avg >V L3-L1

Alarm Type	Mains Protection* (page 212)
Alarmlist message	MP Mains Avg >V L3-L1
Alarm evaluated	Only if Mains 10min Avg >V (page 316) != Disabled
Related applications	MCB
Alarm ID	1146
Description	This alarm is activated by Mains 10min Avg >V (page 316) protection. This alarm has FPS - FIXED PROTECTIONS STATES 2 (PAGE 659).

⬅ back to List of alarms level 2

MP Mains <V L1-N

Alarm Type	Mains Protection* (page 212)
Alarmlist message	MP Mains <V L1-N

Alarm evaluated	Only if Mains >V Protection (page 339) != Disabled
Related applications	MCB
Alarm ID	122
Description	<p>This alarm is activated by Mains <V Protection (page 343).</p> <p>This alarm is activated when Mains Voltage L1-N (page 454) drops below preset value.</p> <p>This alarm has FPS - FIXED PROTECTIONS STATES 2 (PAGE 659).</p>

⬅ back to List of alarms level 1

MP Mains <V L2-N

Alarm Type	Mains Protection* (page 212)
Alarmlist message	MP Mains <V L2-N
Alarm evaluated	Only if Mains >V Protection (page 339) != Disabled
Related applications	MCB
Alarm ID	123
Description	<p>This alarm is activated by Mains <V Protection (page 343).</p> <p>This alarm is activated when Mains Voltage L2-N (page 454) drops below preset value.</p> <p>This alarm has FPS - FIXED PROTECTIONS STATES 2 (PAGE 659).</p>

⬅ back to List of alarms level 1

MP Mains <V L3-N

Alarm Type	Mains Protection* (page 212)
Alarmlist message	MP Mains <V L3-N
Alarm evaluated	Only if Mains >V Protection (page 339) != Disabled
Related applications	MCB
Alarm ID	124
Description	<p>This alarm is activated by Mains <V Protection (page 343).</p> <p>This alarm is activated when Mains Voltage L3-N (page 454) drops below preset value.</p> <p>This alarm has FPS - FIXED PROTECTIONS STATES 2 (PAGE 659).</p>

⬅ back to List of alarms level 1

MP Mains <V L1-L2

Alarm Type	Mains Protection* (page 212)
Alarmlist message	MP Mains <V L1-L2
Alarm evaluated	Only if Mains >V Protection (page 339) != Disabled
Related applications	MCB
Alarm ID	128
Description	<p>This alarm is activated by Mains <V Protection (page 343).</p> <p>This alarm is activated when Mains Voltage L1-L2 (page 454) drops below</p>

	<p>preset value.</p> <p>This alarm has FPS - FIXED PROTECTIONS STATES 2 (PAGE 659).</p>
--	---

⬅ back to List of alarms level 1

MP Mains <V L2-L3

Alarm Type	Mains Protection* (page 212)
Alarmlist message	MP Mains <V L2-L3
Alarm evaluated	Only if Mains >V Protection (page 339) != Disabled
Related applications	MCB
Alarm ID	129
Description	<p>This alarm is activated by Mains <V Protection (page 343).</p> <p>This alarm is activated when Mains Voltage L2-L3 (page 454) drops below preset value.</p> <p>This alarm has FPS - FIXED PROTECTIONS STATES 2 (PAGE 659).</p>

⬅ back to List of alarms level 1

MP Mains <V L3-L1

Alarm Type	Mains Protection* (page 212)
Alarmlist message	MP Mains <V L3-L1
Alarm evaluated	Only if Mains >V Protection (page 339) != Disabled
Related applications	MCB
Alarm ID	130
Description	<p>This alarm is activated by Mains <V Protection (page 343).</p> <p>This alarm is activated when Mains Voltage L3-L1 (page 455) drops below preset value.</p> <p>This alarm has FPS - FIXED PROTECTIONS STATES 2 (PAGE 659).</p>

⬅ back to List of alarms level 1

MP Mains <<V L1-N

Alarm Type	Mains Protection* (page 212)
Alarmlist message	MP Mains <<V L1-N
Alarm evaluated	Only if Mains <<V Protection (page 344) != Disabled
Related applications	MCB
Alarm ID	1081
Description	<p>This alarm is activated by Mains <<V Protection (page 344).</p> <p>This alarm is activated when Mains Voltage L1-N (page 454) drops below preset value.</p> <p>This alarm has FPS - FIXED PROTECTIONS STATES 2 (PAGE 659).</p>

⬅ back to List of alarms level 1

MP Mains <<V L2-N

Alarm Type	Mains Protection* (page 212)
Alarmlist message	MP Mains <<V L2-N
Alarm evaluated	Only if Mains <<V Protection (page 344) != Disabled
Related applications	MCB
Alarm ID	1083
Description	<p>This alarm is activated by Mains <<V Protection (page 344).</p> <p>This alarm is activated when Mains Voltage L2-N (page 454) drops below preset value.</p> <p>This alarm has FPS - FIXED PROTECTIONS STATES 2 (PAGE 659).</p>

⬅ back to List of alarms level 1

MP Mains <<V L3-N

Alarm Type	Mains Protection* (page 212)
Alarmlist message	MP Mains <<V L3-N
Alarm evaluated	Only if Mains <<V Protection (page 344) != Disabled
Related applications	MCB
Alarm ID	1085
Description	<p>This alarm is activated by Mains <<V Protection (page 344).</p> <p>This alarm is activated when Mains Voltage L3-N (page 454) drops below preset value.</p> <p>This alarm has FPS - FIXED PROTECTIONS STATES 2 (PAGE 659).</p>

⬅ back to List of alarms level 1

MP Mains <<V L1-L2

Alarm Type	Mains Protection* (page 212)
Alarmlist message	MP Mains <<V L1-L2
Alarm evaluated	Only if Mains <<V Protection (page 344) != Disabled
Related applications	MCB
Alarm ID	1087
Description	<p>This alarm is activated by Mains <<V Protection (page 344).</p> <p>This alarm is activated when Mains Voltage L1-L2 (page 454) drops below preset value.</p> <p>This alarm has FPS - FIXED PROTECTIONS STATES 2 (PAGE 659).</p>

⬅ back to List of alarms level 1

MP Mains <<V L2-L3

Alarm Type	Mains Protection* (page 212)
Alarmlist message	MP Mains <<V L2-L3
Alarm evaluated	Only if Mains <<V Protection (page 344) != Disabled
Related applications	MCB

Alarm ID	1089
Description	<p>This alarm is activated by Mains <<V Protection (page 344).</p> <p>This alarm is activated when Mains Voltage L2-L3 (page 454) drops below preset value.</p> <p>This alarm has FPS - FIXED PROTECTIONS STATES 2 (PAGE 659).</p>

⬅ back to List of alarms level 1

MP Mains <<V L3-L1

Alarm Type	Mains Protection* (page 212)
Alarmlist message	MP Mains <<V L3-L1
Alarm evaluated	Only if Mains <<V Protection (page 344) != Disabled
Related applications	MCB
Alarm ID	1091
Description	<p>This alarm is activated by Mains <<V Protection (page 344).</p> <p>This alarm is activated when Mains Voltage L3-L1 (page 455) drops below preset value.</p> <p>This alarm has FPS - FIXED PROTECTIONS STATES 2 (PAGE 659).</p>

⬅ back to List of alarms level 1

MP Mains V Unbalance Ph-Ph

Alarm Type	Mains Protection* (page 212)
Alarmlist message	MPMains V Unbalance Ph-Ph
Alarm evaluated	Only if Mains V Unbalance Protection (page 345) != Disabled
Related applications	MCB
Alarm ID	592
Description	<p>This alarm is activated by Mains V Unbalance Protection (page 345)</p> <p>This alarm is activated when relative difference between Mains Voltage L1-L2 (page 454), Mains Voltage L2-L3 (page 454) or Mains Voltage L3-L1 (page 455) rises over preset value.</p> <p>This alarm has FPS - FIXED PROTECTIONS STATES 2 (PAGE 659).</p>

⬅ back to List of alarms level 1

MP Mains V Unbalance Ph-N

Alarm Type	Mains Protection* (page 212)
Alarmlist message	MP Mains V Unbalance Ph-N
Alarm evaluated	Only if Mains V Unbalance Protection (page 345) != Disabled
Related applications	MCB
Alarm ID	593
Description	<p>This alarm is activated by Mains V Unbalance Protection (page 345)</p> <p>This alarm is activated when relative difference between Mains Voltage L1-N (page 454), Mains Voltage L2-N (page 454) or Mains Voltage L3-N (page 455) rises over preset value.</p>

	454) rises over preset value. This alarm has FPS - FIXED PROTECTIONS STATES 2 (PAGE 659).
--	---

⬅ back to List of alarms level 1

MP Mains >f

Alarm Type	Mains Protection* (page 212)
Alarmlist message	MP Mains >f
Alarm evaluated	Only if Mains >f Protection (page 349) != Disabled
Related applications	MCB
Alarm ID	135
Description	This alarm is activated by Mains >f Protection (page 349) . This alarm is activated when Mains Frequency (page 453) , rises over preset value. This alarm has FPS - FIXED PROTECTIONS STATES 3 (PAGE 660).

⬅ back to List of alarms level 1

MP Mains <f

Alarm Type	Mains Protection* (page 212)
Alarmlist message	MP Mains <f
Alarm evaluated	Only if Mains <f Protection (page 351) != Disabled
Related applications	MCB
Alarm ID	134
Description	This alarm is activated by Mains >f Protection (page 349) . This alarm is activated when Mains Frequency (page 453) , drops below preset value. This alarm has FPS - FIXED PROTECTIONS STATES 3 (PAGE 660).

⬅ back to List of alarms level 1

MP Mains >>f

Alarm Type	Mains Protection* (page 212)
Alarmlist message	MP Mains >>f
Alarm evaluated	Only if Mains >>f Protection (page 350) != Disabled
Related applications	MCB
Alarm ID	1092
Description	This alarm is activated by Mains >>f Protection (page 350) . This alarm is activated when Mains Frequency (page 453) , rises over preset value. This alarm has FPS - FIXED PROTECTIONS STATES 3 (PAGE 660).

⬅ back to List of alarms level 1

MP Mains <<f

Alarm Type	Mains Protection* (page 212)
Alarmlist message	MP Mains <<f
Alarm evaluated	Only if Mains <<f Protection (page 352) != Disabled
Related applications	MCB
Alarm ID	1093
Description	<p>This alarm is activated by Mains <<f Protection (page 352).</p> <p>This alarm is activated when Mains Frequency (page 453), drops below preset value.</p> <p>This alarm has FPS - FIXED PROTECTIONS STATES 3 (PAGE 660).</p>

 [back to List of alarms level 1](#)

Mains Protection + FltRes

MPR Current Unbalance

Alarm Type	Mains Protection + FltRes (page 212)
Alarmlist message	MPR Current Unbalance
Alarm evaluated	Only if Current Unbalance Protection (page 339) != Disabled
Related applications	MCB
Alarm ID	1064
Description	This alarm is activated by Current Unbalance Protection (page 339) . This alarm has FPS - FIXED PROTECTIONS STATES 3 (PAGE 660).

⬅ back to List of alarms level 2

IDMT Overload

Alarm Type	Protection types (page 211)
Alarmlist message	IDMT Overload
Alarm evaluated	Only if IDMT Overload Protection (page 335) != Disabled
Related applications	MCB
Alarm ID	147
Description	This alarm is activated by IDMT Overload Protection (page 335) . This alarm has FPS - FIXED PROTECTIONS STATES 3 (PAGE 660).

⬅ back to List of alarms level 2

MPR IDMT Mains >A

Alarm Type	Mains Protection + FltRes (page 212)
Alarmlist message	MPR IDMT Mains >A
Alarm evaluated	Only if IDMT Overcurrent Protection (page 337) != Disabled
Related applications	MCB
Alarm ID	1063
Description	This alarm is activated by IDMT Overcurrent Protection (page 337) . This alarm has FPS - FIXED PROTECTIONS STATES 3 (PAGE 660).

⬅ back to List of alarms level 2

MPR Short Circuit

Alarm Type	Mains Protection + FltRes (page 212)
Alarmlist message	MPR Short Circuit
Alarm evaluated	Only if Short Circuit Protection (page 337) != Disabled
Related applications	MCB
Alarm ID	1066
Description	This alarm is activated by Short Circuit Protection (page 337) . This alarm has FPS - FIXED PROTECTIONS STATES 3 (PAGE 660).

⬅ back to List of alarms level 2

System Protection

SP Request Under MinPowerPTM

Alarm Type	Protection types (page 211)
Alarmlist message	SP Request under MinPowerPTM
Alarm evaluated	Only if Minimal Power PTM Protection (page 355) != Disabled
Related applications	MCB
Alarm ID	1511
Description	This alarm is activated if controller detects that the System goes below Minimal Power PTM (page 334) , Minimal Power PTM Protection Del (page 334) elapsed and Minimal Power PTM Protection (page 355) is not Disabled.

🔍 back to List of alarms level 2

8.3 Electronic Control Unit (ECU)

The electronic control unit is used to monitoring and regulating of the controlled system such as engines.

There are generally four types of data communicated between the controller and ECU.

- Values read from the ECU (e.g. Engine coolant temperature, Lube oil pressure)
- Values/parameters written to ECU (e.g. Speed control, Frequency select)
- Commands written to ECU (e.g. Start/Stop, Fault reset)
- Fault codes

In order to use the ECU you need to firstly import ESL (ECU specification list) file which contains list of all supported ECUs for the controller. The ESL file also defines communication/diagnostic protocol used in the ECU. The ECU list package can be downloaded from ComAp website (www.comap-control.com) and imported into a PC configuration tool in the same way as a standard controller firmware package. It can also be a part of an installation package, in this case it is not necessary to import it separately.

To configure the ECU

- Open IntelliConfig (PC configuration tool)
- Connect and login the controller
- Open the controller configuration window (Control > Controller Configuration)
- Select Modules and Click on + Add New Module in ECU section
- Choose the ECU list (IntelliConfig or MODBUS) and ECU module
- Click on Add Module on the right side
- Confirm by OK and Restart

There are several possibilities to connect CAN bus interface between ECU and ComAp controller. Refer to ComAp [Electronic Engines Support manual](#).

8.4 Modules

8.4.1 CAN modules

Supported combinations of modules	772
Module's protections	773

Theory of binary inputs and outputs	773
Extension modules	777

Supported combinations of modules

The maximal number of CAN modules is limited by the number of the controller's generic modules. Once the physical module is configured, it allocates necessary generic modules. So, it is possible to configure as many CAN modules as many generic modules are available. The maximum number of CAN modules is also limited by the number of addresses (indexes) that can be configured for each type of the generic module. CAN modules and generic modules share indexes.

Example: If you configure Inteli IO8/8 module which is using 1x BI, BO, and AO generic module with index (address) 1, any other module using same generic modules will not be able to be configured with index (address) 1 (IGS-PTM, Inteli AIO9/1).

Each generic module has 8 "terminals" (inputs/outputs) and the InteliMains 1010 SC has the following amount of the generic modules:

- > AI generic: 10
- > AO generic: 8
- > BI generic: 16
- > BO generic: 12
- > AI32 generic: 2

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 InteliMains 1010 SC.

CAN Module	Max number of indexes	AI generic	AO generic	BI generic	BO generic
Inteli AIN8	10	1	0	0	0
Inteli IO 8/8	12	0	1	1	1
Inteli IO 16/0	8	0	1	2	0
IGL-RA15	4	0	0	0	2
IGS-PTM	4	1	1	1	1
Inteli AIO9/1	5	2	1	0	0
Inteli AIN8TC	10	1	0	0	0
I-AOUT8	4	0	1	0	0
IS-AIN8	10	1	0	0	0
IS-AIN8TC	10	1	0	0	0
IS-BIN16/8	7	0	0	2	1

Note: When configuring modules do not forget to let first 4 indexes free for modules which can't use high addresses such as IGL-RA15, IGS-PTM, AIO9/1, I-AOUT8.

Note: Module Inteli IO8/8 has available AOUT only if it is configured with index number below 9 and Inteli AIO9/1 has available AOUT only if it is configured with index number below 5.

Note: Module Inteli IO8/8 with older FW than 1.3.1.2 has available AOUT only if it is configured with index number below 5.

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.

Note: The name and color of the alarm is automatically generated according to the options **Protection Upon Module Failure**, **Module Name**, and **Module Index**. The module name is automatically generated or renamed by the user.

- ### > Protection State
- If you check the check box the new User Protection State will be displayed in the User Protection States group in the Values after the configuration is imported to the CU.

Note: The name of the User Protection State is automatically generated according to the options **Protection Upon Module Failure**, **Module Name**, and **Module Index**. The module name is automatically generated or renamed by the user.

Example: Wrn Inteli AIN8 10 = Warning upon module failure of the Inteli AIN8 module with index 10.

Theory of binary inputs and outputs

Binary inputs	773
Binary outputs	775

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.

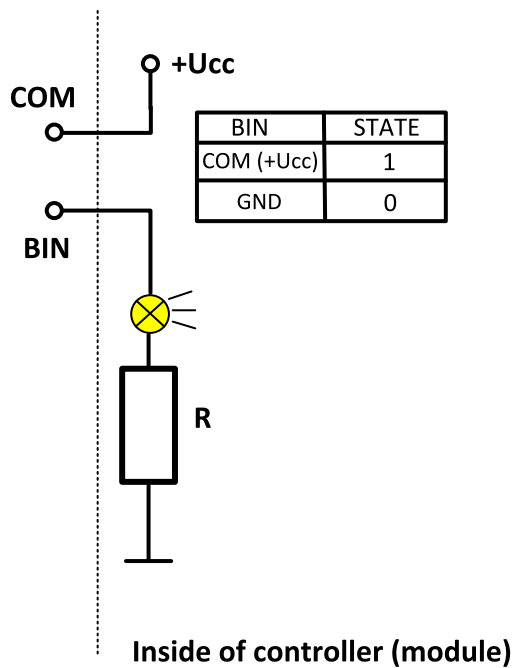
Binary inputs

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 logical 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



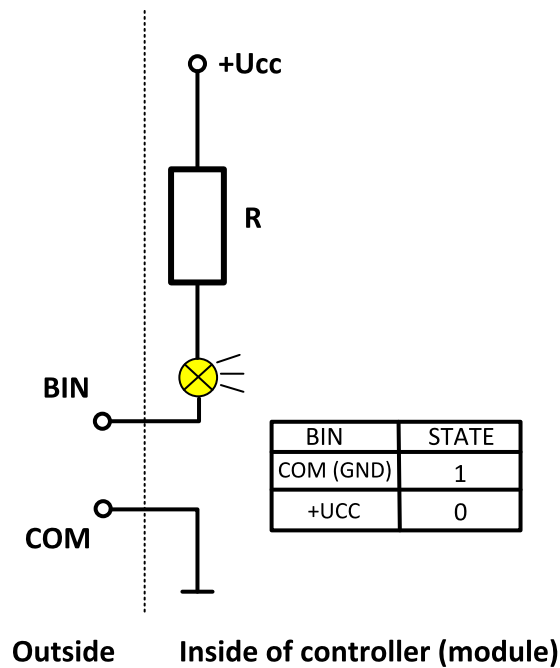
Note: There is not any COM terminal on the controller, the wire is directly connected to the input terminal "BIN", so if input signal is log 1 the +Ucc is directly connected to the "BIN".

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

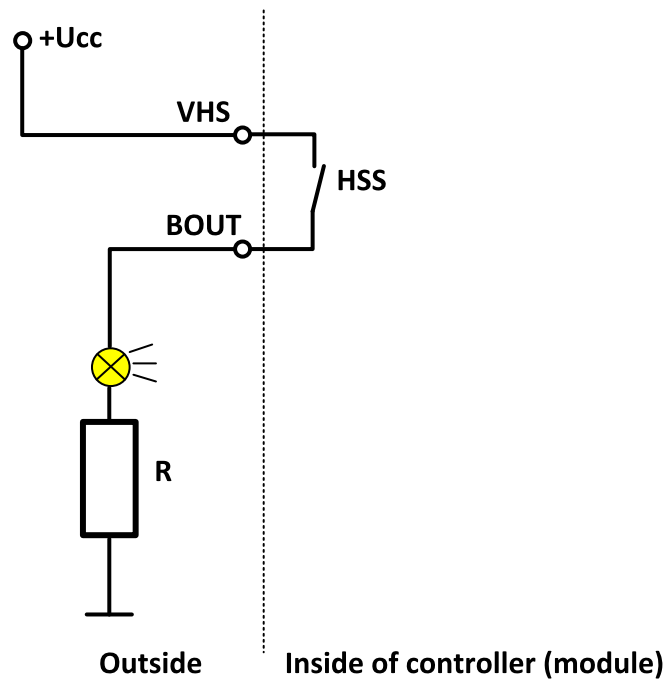
Binary outputs

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



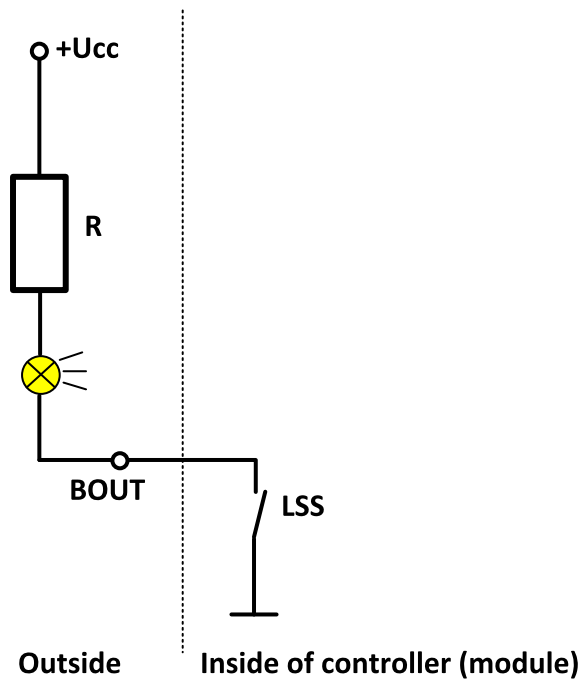
Low side switch - LSS

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 IntelliMains 1010 SC 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	777
Inteli IO8/8	783
IGL-RA15	790
IGS-PTM	795
Inteli AIO9/1	800
Inteli AIN8TC	805
I-AOUT8	809
IS-AIN8	813
IS-AIN8TC	822
IS-BIN16/8	827

Inteli AIN8

Inteli AIN8 module is extension module equipped with analog inputs and Impulse/RPM input. The module is connected to controller by **CAN1A (page 18)** 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 7.48 IntelI AIN8

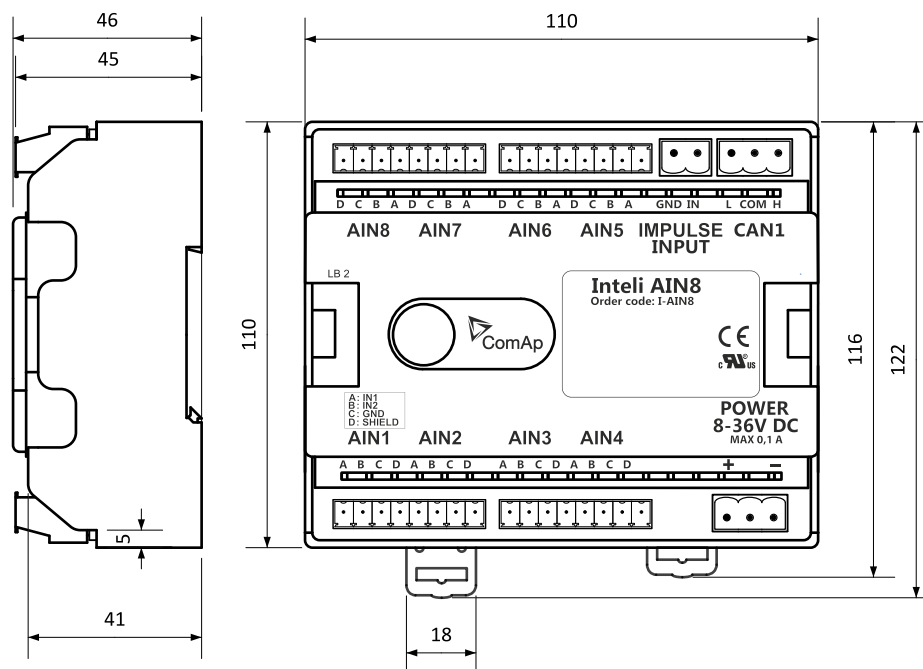
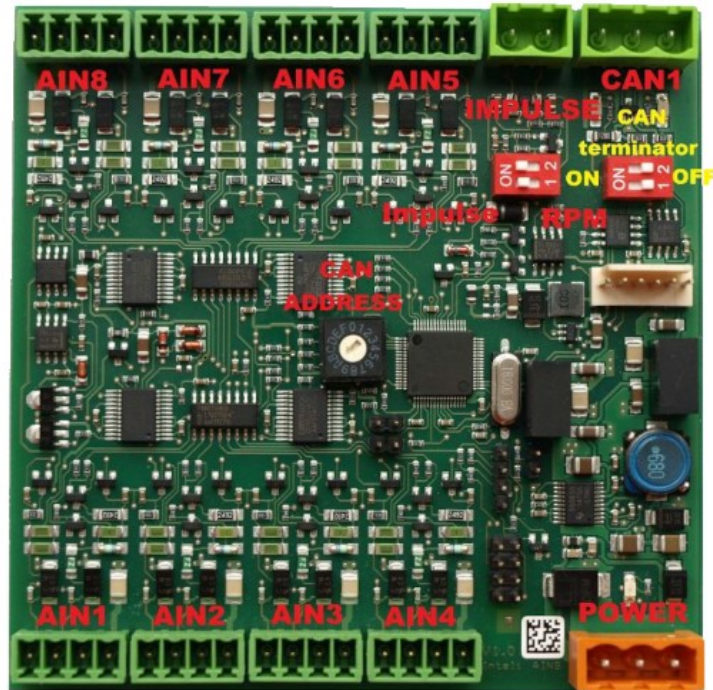


Image 7.49 IntelI AIN8 dimensions

Note: All dimensions are in mm.

Terminals



Analog input	8 analog Inputs
CAN1	CAN1A (page 18) 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.

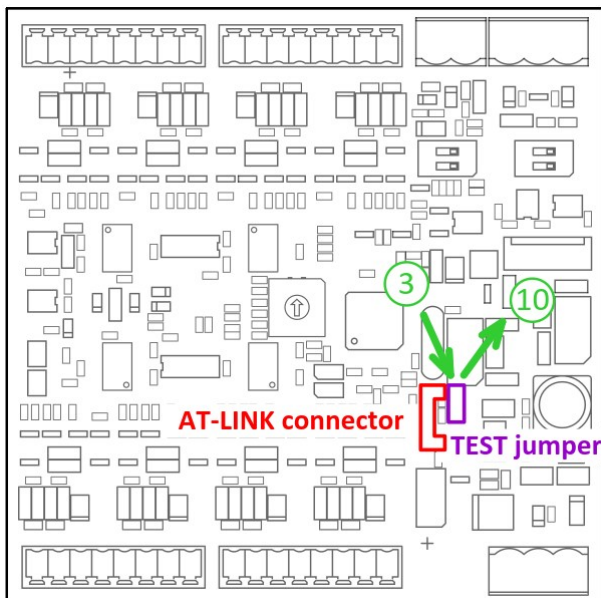


Note: In case of setting the CAN address to zero, the appropriate group of signals is deactivated.

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 Intel 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

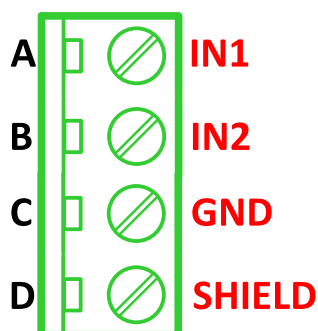
LED indication

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).

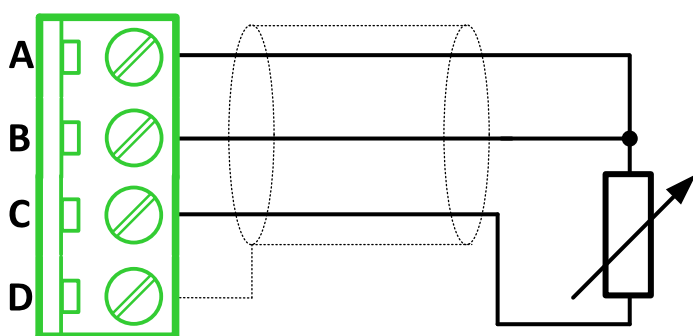
Wiring

The following diagrams show the correct connection of sensors.

Terminator

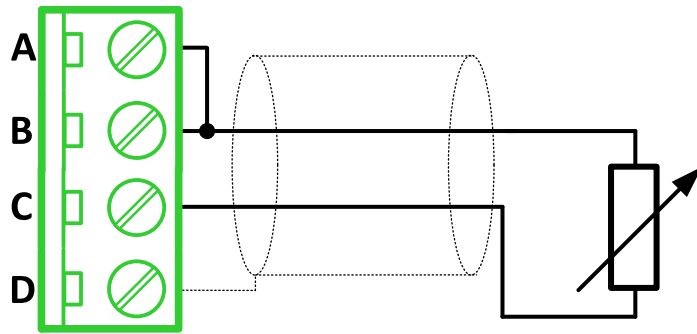


Resistance sensor - 3 wires



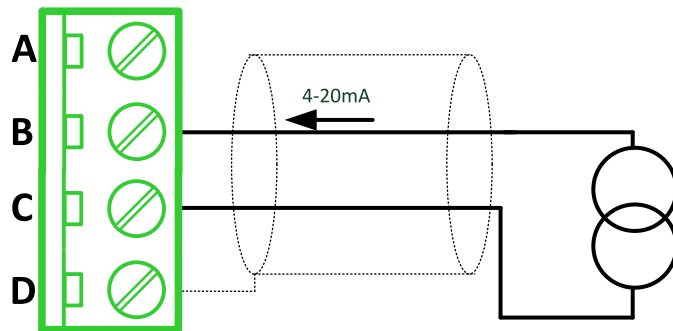
Note: Ranges: Pt100, Pt1000, Ni100, Ni1000, 0 – 2400 Ω , 0 – 10 k Ω

Resistance sensor - 2 wires



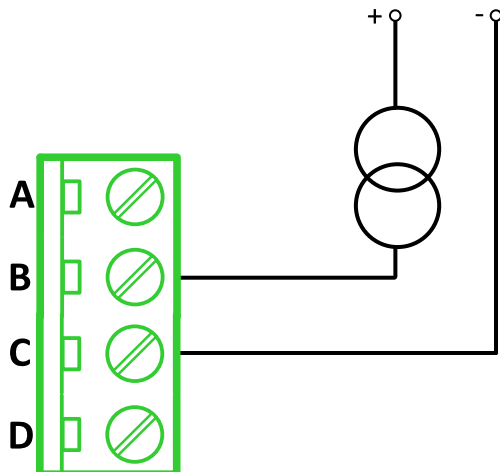
Note: Ranges: Pt100, Pt1000, Ni100, Ni1000, 0 – 2400 Ω , 0 – 10 k Ω

Current sensor - active



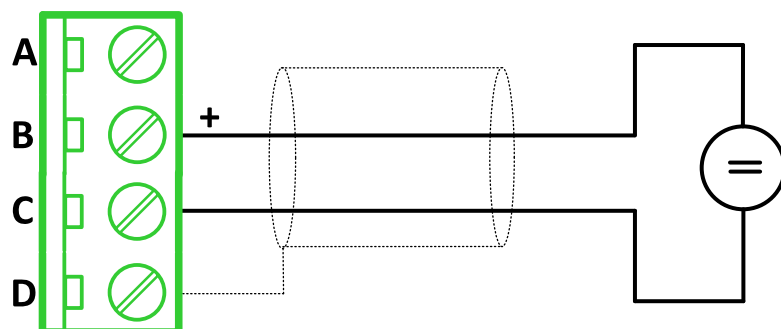
Note: Ranges: ± 20 mA, 4 – 20 mA

Current sensor - passive



Note: Ranges: 0 – 20 mA, 4 – 20 mA

Voltage sensor



Note: Ranges: $\pm 1\text{ V}$, $0 - 2,5\text{ V}$, $0 - 5\text{ V}$, $0 - 10\text{ V}$

Technical data

General data

Power supply	8 to 36 V DC
Current consumption	35 mA at 24 V ÷ 100 mA at 8 V
Interface to controller	CAN1A (page 18)
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 + $\pm 25\text{ mV}$
Current	Range: $\pm 20\text{ mA}$ Accuracy: $\pm 0,25\%$ of actual value + $\pm 50\text{ }\mu\text{A}$
Resistive	Range: 0- 10 k Ω Accuracy: $\pm 0,5\%$ of actual value + $\pm 2\text{ }\Omega$

🔍 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 **CAN1A (page 18)** 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 7.50 IntelI IO8/8

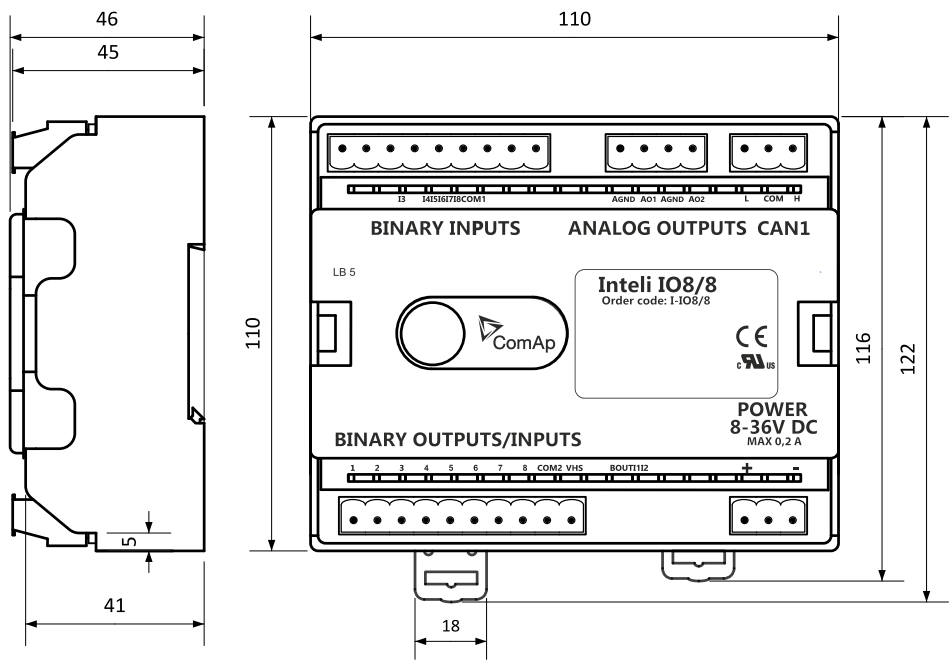
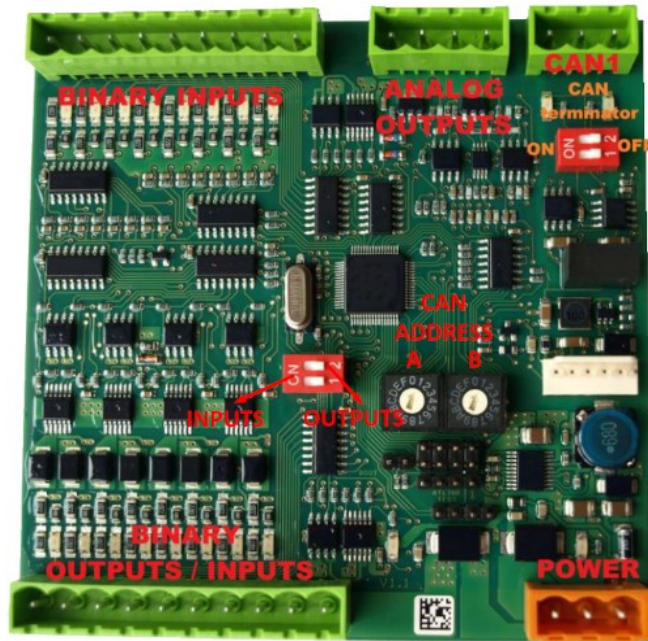


Image 7.51 IntelI IO8/8 dimensions

Note: All dimensions are in mm.

Terminals



Binary inputs	8 binary inputs
Binary outputs	8 binary outputs (8 binary inputs)
Analog outputs	2 analog outputs
CAN1	CAN1A (page 18) 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)).

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.



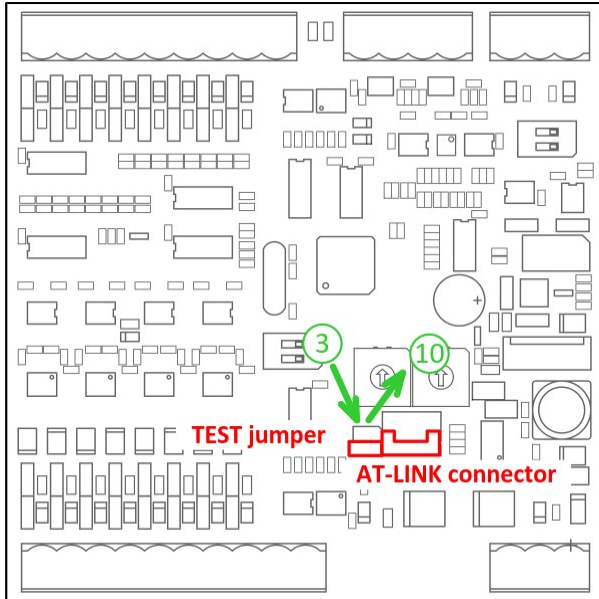
Note: In case of setting the CAN address to zero, the appropriate group of signals is deactivated.

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.

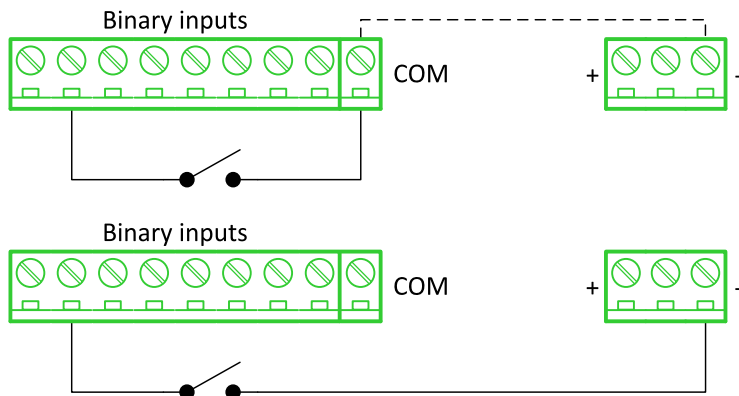
LED at power connector - status LED

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.

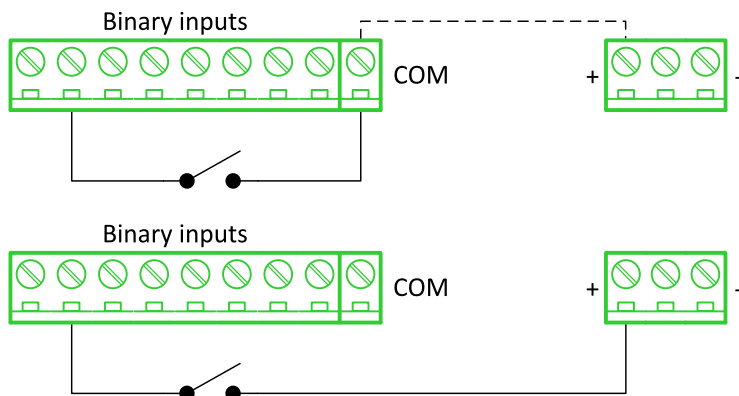
Binary inputs - pull up



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.

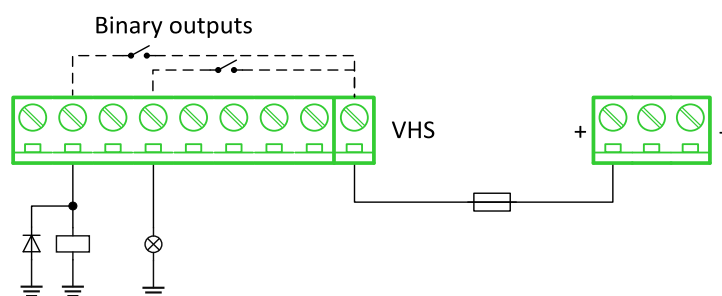
Binary inputs - pull down



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).

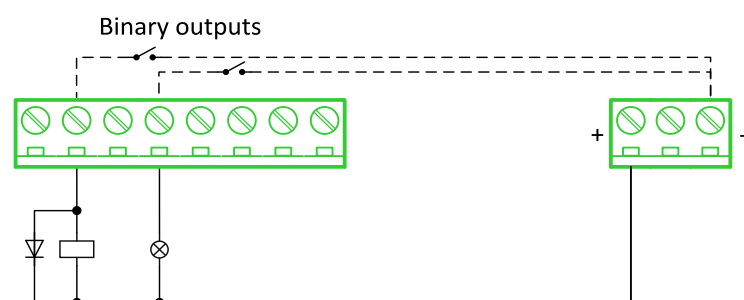
On lower picture is case of wiring between BIN2 and Ucc (+). Both ways are correct.

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.

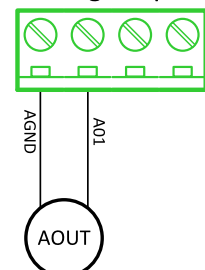
Binary outputs - low side



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	CAN1A (page 18)
Protection	IP20
Storage temperature	- 40 °C to + 80 °C

Operating temperature	- 30 °C to + 70 °C
Dimensions (WxHxD)	110x110x46 mm (4,3"x4,3"x1,8")
Weight	240 grams

Analog outputs

Number of channels	2
Voltage	Range 0-10 V Accuracy: ± 20 mV + $\pm 0,5$ % of actual value I _{max} 5 mA
Current	Range: 0-20 mA Accuracy: ± 100 μ A + $\pm 0,5$ % of actual value R _{max} 500 Ω
PWM	Level 5 V Frequency - adjustable 200÷2400 Hz I _{max} 20 mA

Binary inputs

Number of channels	8 for Intel® IO8/8, 16 for Intel® IO16/0
Input resistance	4400 Ω
Input range	0 to 36 V DC
Switching voltage level for open contact indication	0 to 2 V DC
Max voltage level for close contact indication	6 to 36 V DC

Binary outputs

Number of channels	8 for Intel® IO8/8, 0 for Intel® IO16/0
Max current	500 mA
Max switching voltage	36 V DC

 [back to Extension modules](#)

IGL-RA15

Remote annunciator (IGL-RA15) is designed as an extension signaling unit. The module is connected to controller by **CAN1A (page 18)** 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 7.52 IGL-RA15

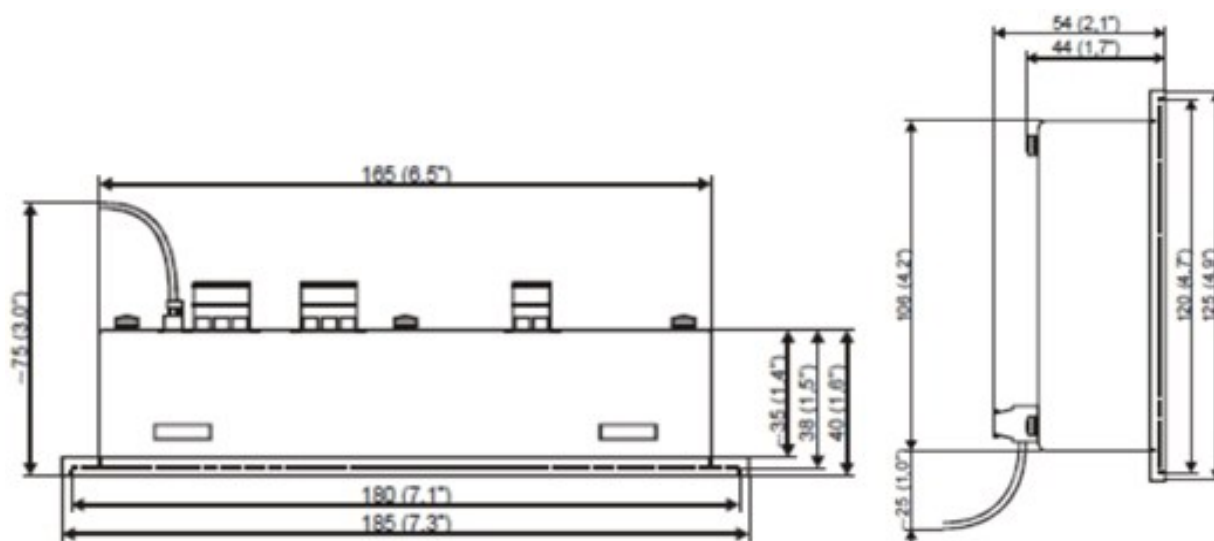


Image 7.53 IGL-RA15 dimensions

Terminals

Horn	Horn
CAN	CAN1A (page 18) line
Power	Power supply

CAN address

Address	Jumper A	Jumper B
1	OPEN	OPEN
5+6	CLOSED	OPEN
Customer defined	CLOSED	CLOSED

SW changing of **CAN1A (page 18)** address is enabled only when both jumpers are closed. Any one of these addresses (1+2 or 3+4 or 5+6 or 7+8) can be set by following steps:

- Switch to programming mode (Hold the Horn reset and Lamp test when unit is powering on). Status led is yellow

- Press Lamp test sixteen times
- Set the address up by pressing Horn reset.
 - The number of red luminous LEDs means the **CAN1A (page 18)** 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 (page 793)**

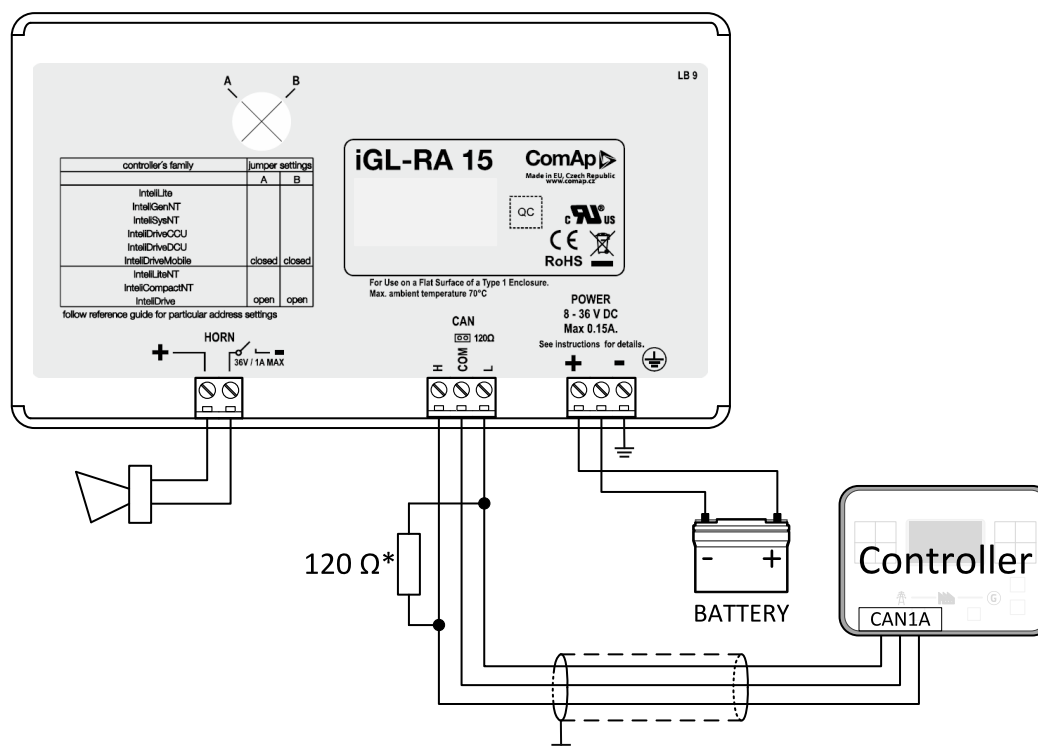
The horn can be silenced:

- 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 (page 794)** 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	CAN1A (page 18)
Humidity	85%
Storage temperature	- 30 °C to + 80 °C
Operating temperature	- 20 °C to + 70 °C
Dimensions (WxHxD)	180x120x55 mm
Weight	950 g

Horn output

Maximum current	1.0 A
Maximum switching voltage	36 V DC

CAN bus interface

Galvanic separated	
Maximal CAN bus length	200 m
Speed	250 kbps
Nominal impedance	120 Ω
Cable type	twisted pair (shielded)
Following dynamic cable parameters are important especially for maximal 200 meters CAN bus length	
Nominal Velocity of Propagation	min. 75 % (max. 4,4 ns/m)
Wire crosscut	min. 0,25 mm ²
Maximal attenuation (at 1 MHz)	2 dB/100m
Recommended Industrial Automation & Process Control Cables	
BELDEN (www.belden.com)	<ul style="list-style-type: none"> > 3082A DeviceBus for Allen-Bradley DeviceNet > 3083A DeviceBus for Allen-Bradley DeviceNet > 3086A DeviceBus for Honeywell SDS > 3087A DeviceBus for Honeywell SDS > 3084A DeviceBus for Allen-Bradley DeviceNet > 3085A DeviceBus for Allen-Bradley DeviceNet > 3105A Paired EIA Industrial RS485 cable
LAPP CABLE (www.lappcable.com)	<ul style="list-style-type: none"> > Unitronic BUS DeviceNet Trunk Cable > Unitronic BUS DeviceNet Drop Cable > Unitronic BUS CAN > Unitronic-FD BUS P CAN UL/CSA

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

🔍 back to Extension modules

IGS-PTM

IGS-PTM module is extension module equipped with binary inputs, binary outputs, analog inputs and analog output. The module is connected to controller by **CAN1A** (page 18) bus. It is possible to connect up to 4 IGS-PTM external units to one controller.



Image 7.54 IGS-PTM

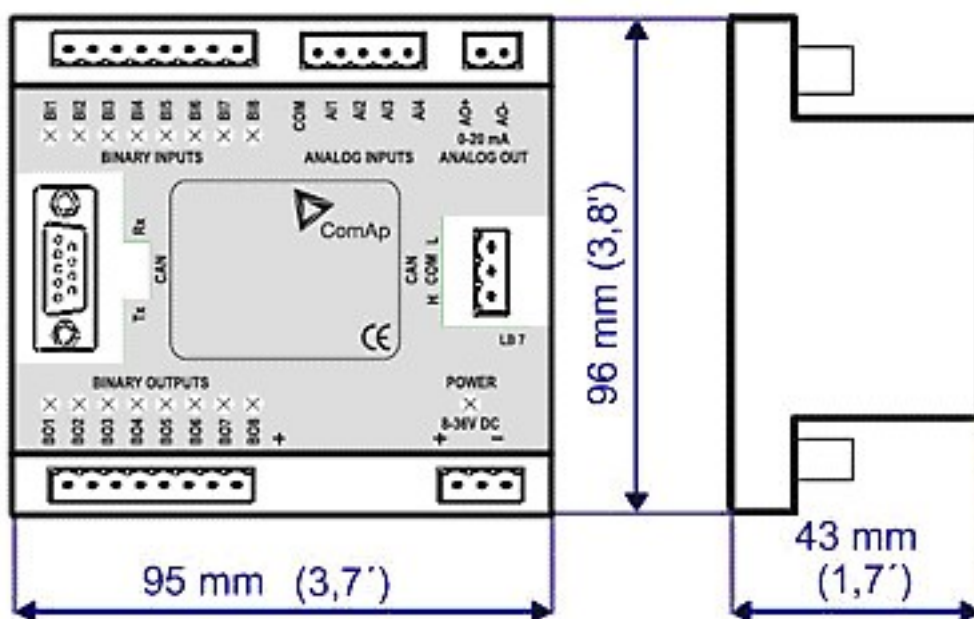
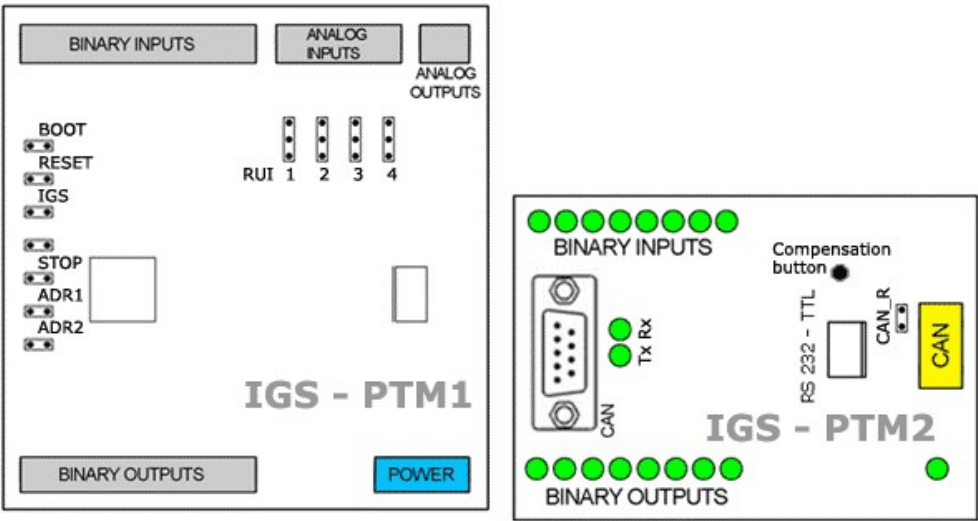


Image 7.55 IGS-PTM dimensions

Terminals



Binary inputs	8 binary inputs
Analog inputs	4 analog inputs
Analog outputs	1 analog output
Binary outputs	8 binary outputs
CAN	CAN1A (page 18) 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

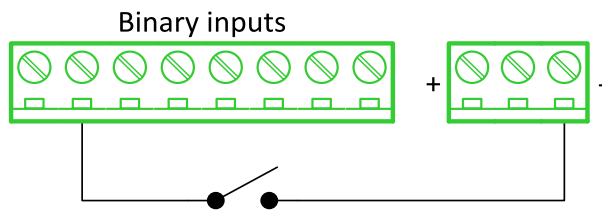
Each binary output has LED which indicates output signal. Binary output LED is shining when binary output is set.

LED at power connector - status LED

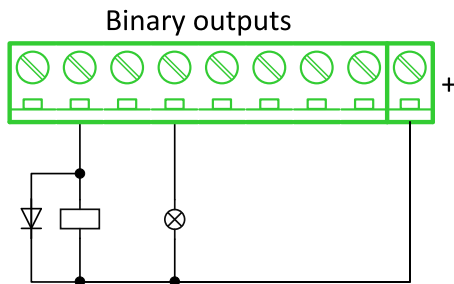
LED status	Description
Dark	No required power connected.
Quick flashing	Program check failure.
One flash and pause	Compensation fail.
Three flashes and pause	Compensation successful.
Flashes	There is no communication between IGS-PTM and the controller.
Lights	Power supply is in the range and communication between IGS-PTM and controller properly works.

Wiring

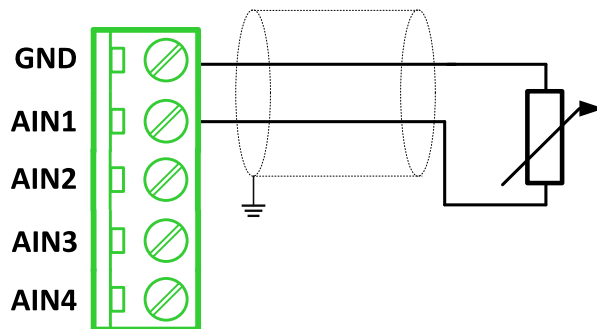
Binary inputs



Binary outputs



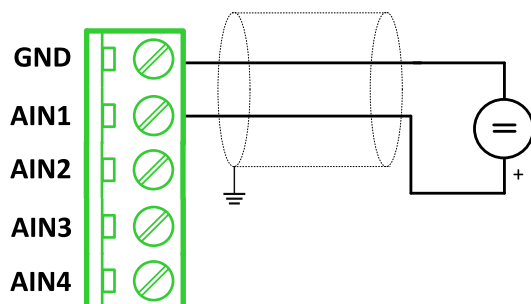
Resistance sensor



Note: Range: 0- 2400 Ω

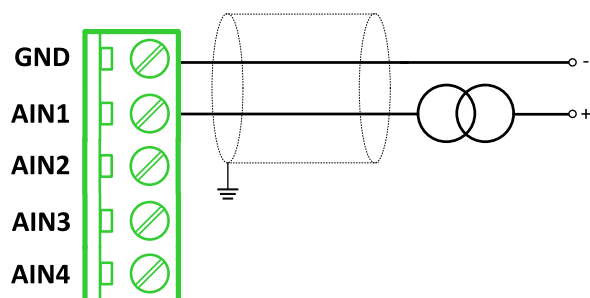
IMPORTANT: Physical analog input range is 0-250 Ω . In sensor configuration in PC tool it is necessary to chose 0-2400 Ω sensor HW type to ensure proper function of analog input.

Voltage sensor



Note: Range 0-100 mV

Current sensor - passive

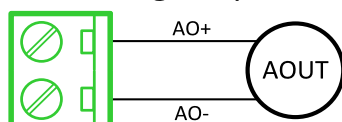


Note: Range: $\pm 0-20\text{ mA}$

IMPORTANT: Physical analog input range is 0-20mA. In sensor configuration in PC tool it is necessary to chose +- 20mA active sensor HW type to ensure proper function of analog input.

Analog outputs

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	CAN1A (page 18)
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	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 Ω 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 Ω
Input range	0 to 36 V DC
Switching voltage level for open contact indication	0 to 2 V DC
Max voltage level for close contact indication	8 to 36 V DC

Binary outputs

Number of channels	8
Max current	500 mA
Max switching voltage	36 V DC
Number of channels	8
Voltage	Range 0-100 mV Accuracy: 1,5 % \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 Ω Accuracy: 1 % \pm 2 ohm out of measured value

 [back to Extension modules](#)

Inteli AIO9/1

Inteli AIO9/1 module is an extension module equipped with analog inputs and outputs – designed for DC measurement. The module is connected to controller by **CAN1A (page 18)** 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 7.56 Intel AIO9/1

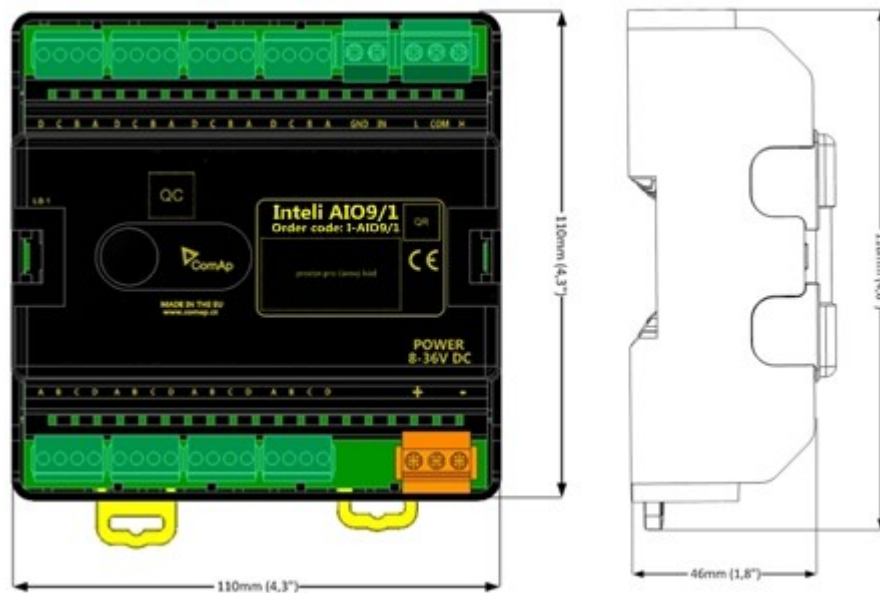
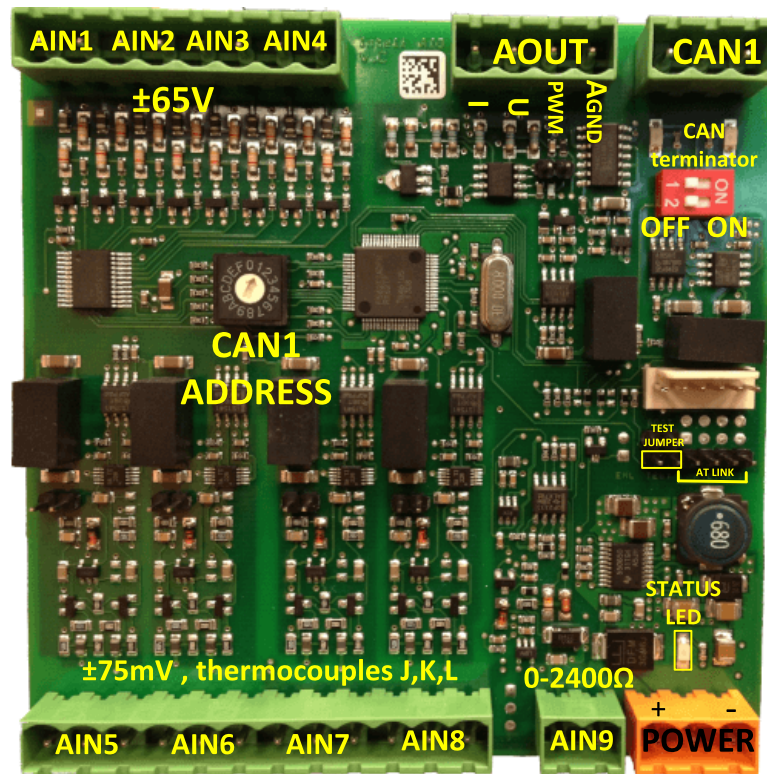


Image 7.57 Intel AIO9/1 dimensions

Terminals



ANALOG INPUT	9 channels
ANALOG OUTPUTS	1 channel
CAN	CAN1 line
POWER	Power supply
CAN LED Tx, Rx	Indication transmitted or received data
Status LED	LED indication of correct function
CAN terminator	Terminating CAN resistor (active in position "ON")
TEST jumper	Upgrade of SW
AT-LINK	Connector for AT-LINK (Upgrade of SW)

Analog inputs

- 4 channels AIN1 – AIN4 can be configured as:
 - Sensor $\pm 65V$ (determined for measurement of battery voltage)
- 4 channels AIN5 – AIN8 can be configured as:
 - Thermocouples – type J,K or L (in $^{\circ}C$ or $^{\circ}F$)
 - Sensor $\pm 75mV$ DC – (for connecting current shunts)
- 1 channel AIN9 can be configured as:
 - RTD (Pt1000, Ni1000)
 - Common resistance 0-2400 Ω

Analog outputs

- 1 channel AOUT1. Type of output:
 - 0-10V DC
 - 0-20mA
 - PWM (5 V, freq 2.4 Hz ±2.4 kHz)
- Analog output has 4-pins connector – GND and one pin for each type of output.

All analog inputs can be configured to any logical function or protection.

Supported sensors

Sensors		
User curves	±65 V DC (fix linear)	Thermocpl (nc) K [°C] (fix)
PT1000 [°C] (fix)	±75 mV (fix linear)	Thermocpl (nc) L [°C] (fix)
NI1000 [°C] (fix)	Thermocpl J [°C] (fix)	Thermocpl (nc) J [°F] (fix)
PT1000 [°F] (fix)	Thermocpl K [°C] (fix)	Thermocpl (nc) K [°F] (fix)
NI1000 [°F] (fix)	Thermocpl L [°C] (fix)	Thermocpl (nc) L [°F] (fix)
0-2400 Ω (fix linear)	Thermocpl (nc) J [°C] (fix)	

Address and DIP switch setting

Address configuration

DIP switch determinates CAN address for analog inputs and outputs.

Programming Firmware

Firmware upgrade is available via AT-link (TTL). For programming it is necessary to close jumper TEST and switch OFF and ON the power supply.

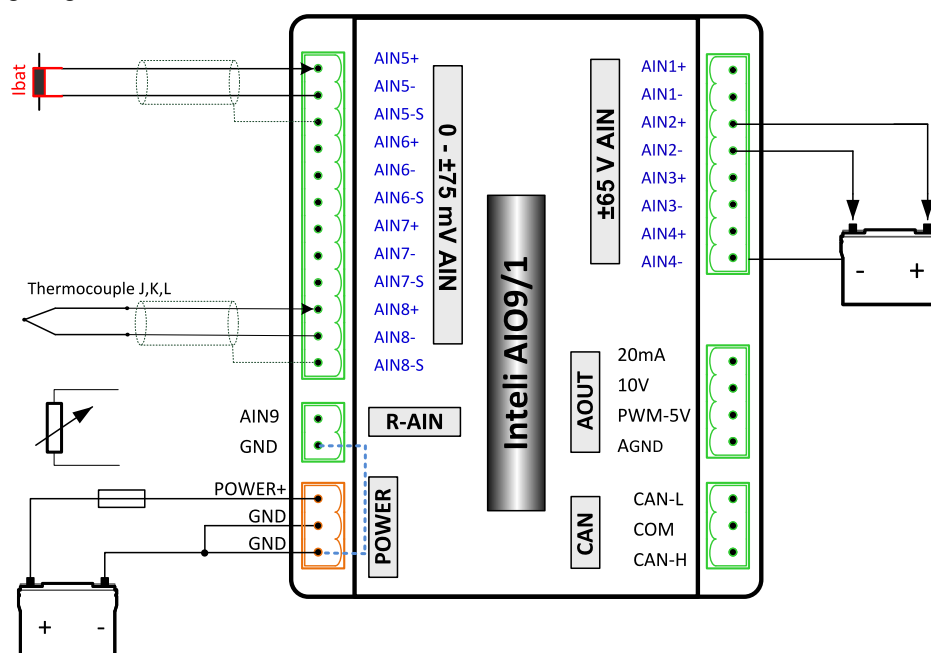
For programming use FlashProg PC tool version 4.4 or higher.

LED indication

LED status	Description
Dark	Fw in module does not work correctly.
Flashing	Module does not communicate with controller (in case non-zero CAN address)
Fast flashing	Detection of CAN communication speed
Lights	Power supply is in the range and the communication between Inteli AIN8TC and controller works properly. Or power supply is in range and zero CAN address is set. (in case zero CAN address module doesn't communicate with the controller)

Wiring

The following diagrams show the correct connection of sensors.



Measuring resistance – AIN9

- 2 – wire measurement



Ranges: Pt1000, Ni1000, 0 – 2400 Ω .

Analog input 9 is determined for measuring resistance only.

Technical data

General data

Dimension (W × H × D)	110 × 110 × 46 mm (4.3" × 4.3" × 1.8")
Weight	248 grams
Interface to controller	CAN1 – galvanic separated from power supply and measurement,

Analog inputs (not electric separated)

9 channels		
AIN1-AIN4 – Voltage inputs	Range	0-65 V \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 μ V (\pm 3 $^{\circ}$ C)

AIN5-AIN8 – Voltage inputs	measurement	
	Range	± 75 mV (nominal) (measurement up to ±80 mV)
	Accuracy of measurement	± 0.1 % of actual value + ± 75 µV Galvanic separated from power supply
AIN9 resistance input	Range	0- 2400 Ω
	Accuracy of measurement	± 0.5 % of actual value + ± 4 Ω Pt1000, Ni1000 ± 2,5 °C It is not galvanic separated from power supply.

Analog output

I 0-20mA /500Rmax. ± 1 % of actual value + ± 200 uA
U 0-10V ± 0.5 % of actual value + ± 50 mV
PWM – 5 V, 200 Hz-2.4kHz 15 mA max.
Galvanic separated from power supply

Galvanic separation	CAN bus is galvanic separated from the measurement and power supply
----------------------------	---

Power supply	8 to 36 V DC
Protection	IP20
Current consumption	150 mA at 24 V ÷ 400 mA at 8 V
Storage temperature	- 40 °C to + 80 °C
Operating temperature	- 30 °C to + 80 °C

The product is fully supported in firmware IGS-NT 3.1.1 or higher.

For information about support of this module in IGS-NT fw branches and ID-DCU – please read New Feature Lists.

🔍 back to Extension modules

Inteli AIN8TC

Inteli AIN8TC module is extension module equipped with 8 analog inputs dedicated for thermocouple sensors only. The module is connected to controller by **CAN1A (page 18)** 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 7.58 Intel AIN8TC

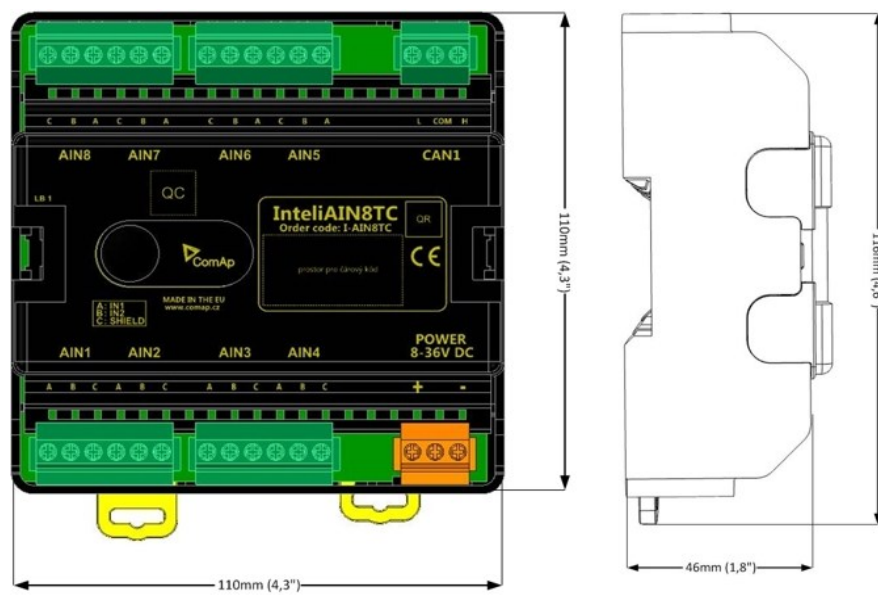
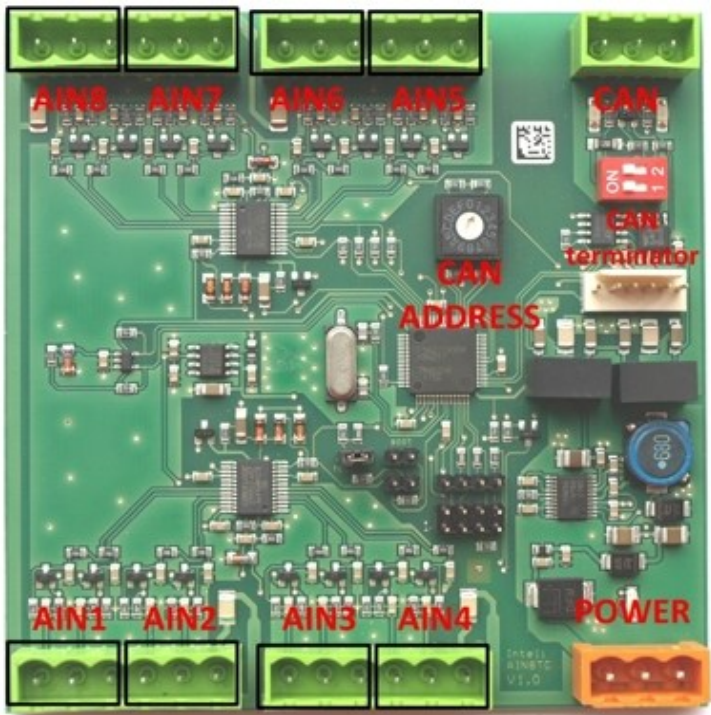


Image 7.59 Intel AIN8TC dimensions

Terminals



Analog input	8 analog Inputs
CAN	CAN1A (page 18) 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.

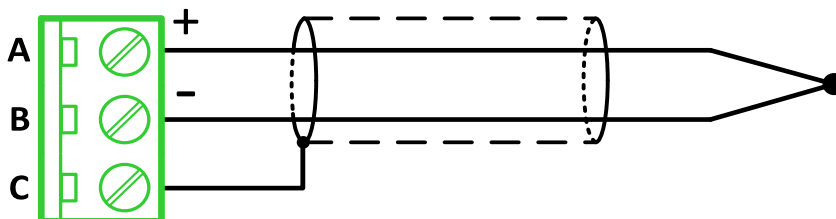
LED indication

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 Intel AIN8TC and controller works properly. Or power supply is in range and zero CAN address is set. (in case zero CAN address module doesn't communicate with the controller)

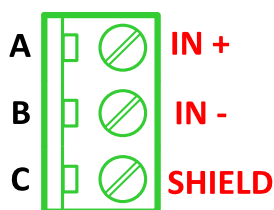
Wiring

The following diagrams show the correct connection of sensors.

Thermocouple



Terminator



Technical data

General data

Power supply	8 to 36 V DC
Current consumption	35 mA at 24 V ÷ 100 mA at 8 V
Interface to controller	CAN1A (page 18)
Protection	IP20
Storage temperature	- 40 °C to + 80 °C
Operating temperature	- 30 °C to + 70 °C
Dimensions (WxHxD)	110 × 110 × 46 mm (4.3" × 4.3" × 1.8")
Weight	237.5 grams

Analog inputs

Number of channels	8, no galvanic separated
Voltage	Range: ± 100 mV Accuracy: ± 0.1 % of actual value + ± 100 µV (± 3 °C)

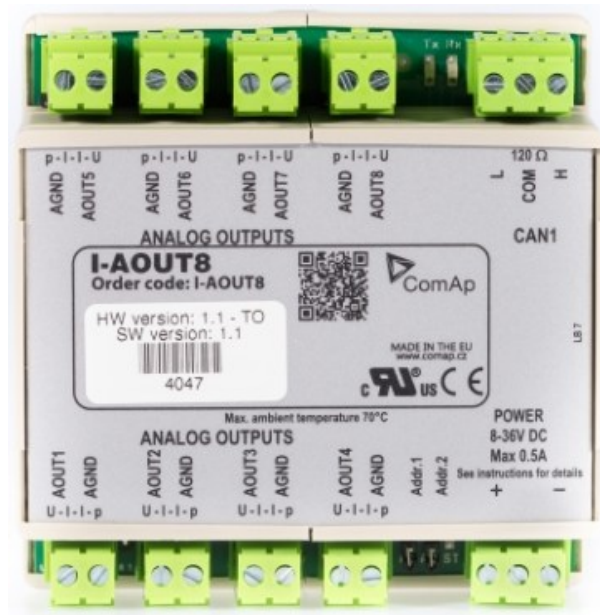
🔍 back to Extension modules

I-AOUT8

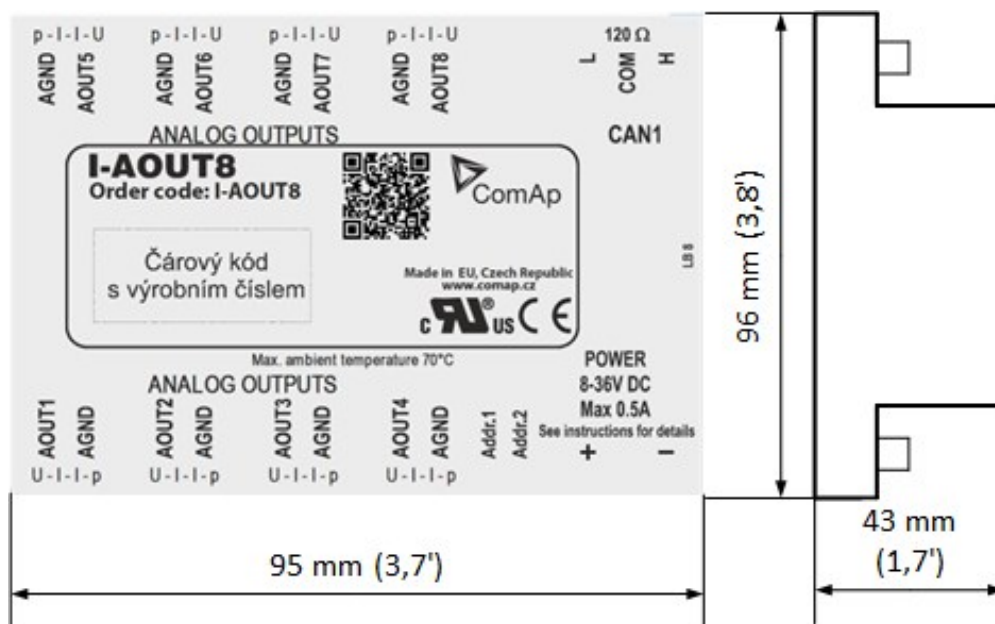
I-AOUT8 is an extension unit with 8 analog outputs. Each analog output can be switched to

- 0 to 20 mA DC
- 0 to 10 V DC
- PWM (Pulse With Modulation on 1,2 kHz)

The module is connected to controller by **CAN1A (page 18)** 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.

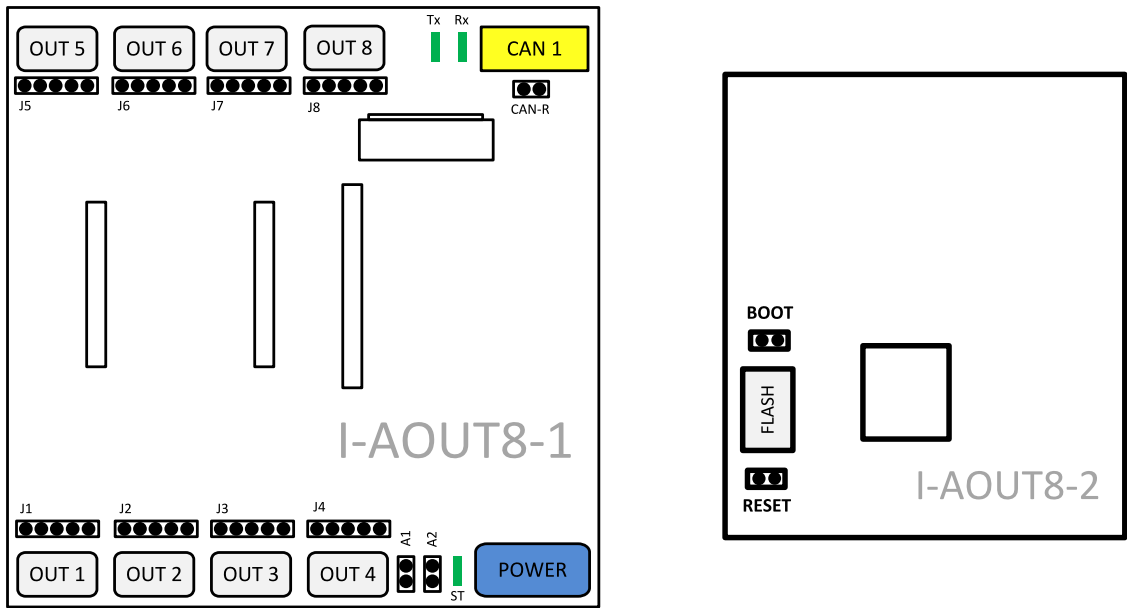


Dimensions



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 7.2 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 7.3 Setting output mode

Programming firmware

Firmware upgrade is via AT-link (TTL). For programming it is necessary to close jumper BOOT. RESET jumper is used to reset the device. Close jumper to reset the device. For programming is used FlashProg PC tool.

CAN1 termination

I-AOUT8 has own CAN terminating resistor (120 ohm). Close jumper CAN-R to connect terminating resistor to CAN bus, open jumper CAN-R disconnecting terminating resistor.

Wiring

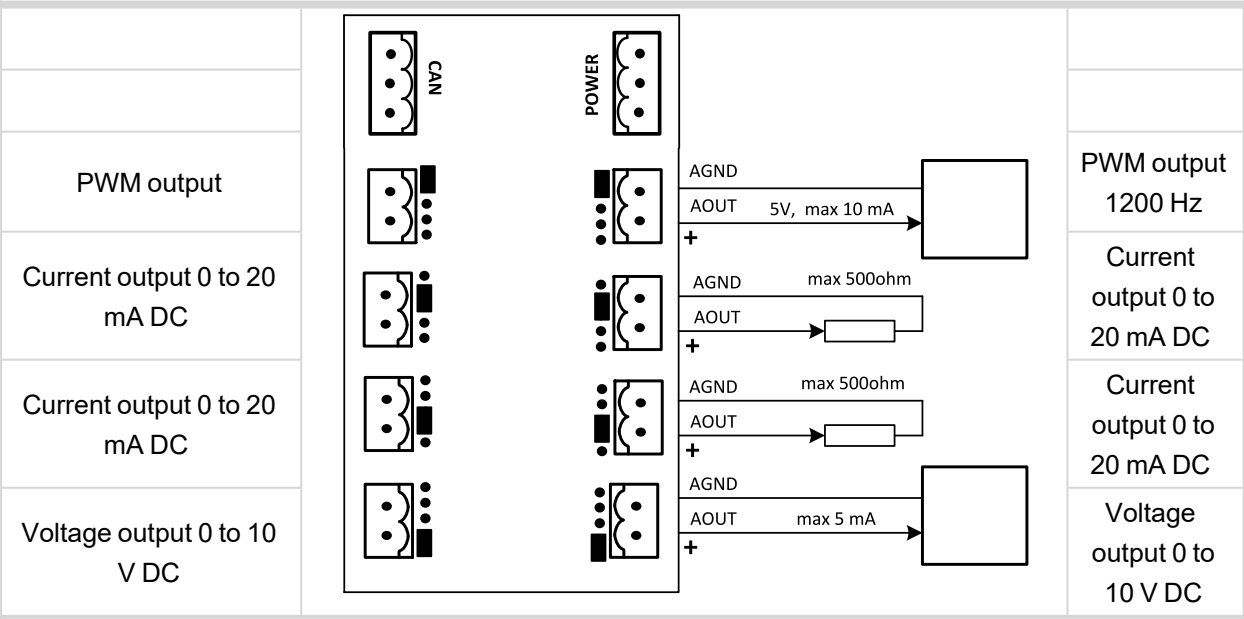


Image 7.60 Possible output modes

Technical data

Dimension (W × H × D)	95 × 96 × 43 mm (3.7' × 3.8' × 1.7')
Interface to controller	CAN
Output	8 analog, no galvanic separation

Type of analog output
0 to 10V DC ± 1 % , max 5 mA DC
0 to 20 mA DC ± 1 % , max 500 Ω
PWM 1200 Hz, 5V DC level, max 10 mA DC

Power supply	8 to 36 V DC
Analog output refreshment	320 ms
Current consumption	max 300 mA (100 mA at 24 V)
RS232 interface	TTL, firmware upgrade via AT-link.
Storage temperature	-40 °C to +80 °C
Operating temperature	- 30 °C to + 70 °C
Heat radiation	2.5 W

🔍 back to Extension modules

IS-AIN8

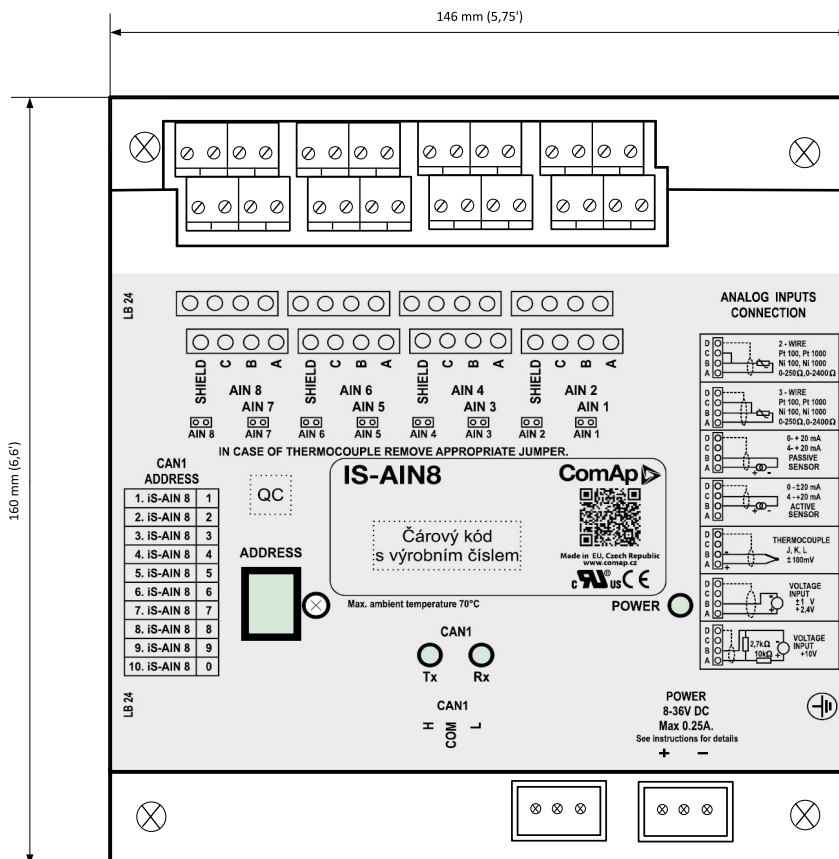
IS-AIN8 is input extension module equipped with 8 analog inputs which can be configured to:

- Resistor two wire input
- Resistor three wire input
- Current input
- Thermocouple input
- Voltage input

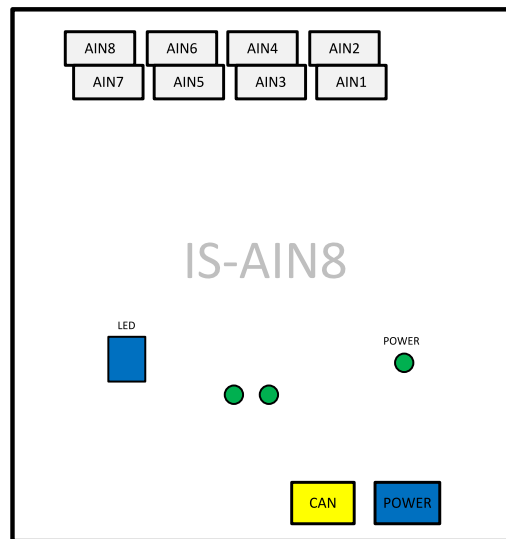
All inputs can be configured to any logical function or protection. It is possible to connect up to 10 IS-AIN external units to one controller. IS-AIN8 is connected to controller **CAN1A (page 18)** bus.

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 adress

Supported sensors

Sensors				
PT100 [°C] (fix)	PT100 [°F] (fix)	+ -1V	4-20mA passive	0-250 ohm
PT1000 [°C] (fix)	PT1000 [°F] (fix)	0-2.4V	4-20mA active	0-2400 ohm
NI100 [°C] (fix)	NI100 [°F] (fix)	0-5V	0-20mA passive	0-10k ohm
NI1000 [°C] (fix)	NI1000 [°F] (fix)	0-10V	+ -20mA active	

Note: It is also possible to use User Curves as sensor.

TC Sensors	
Thermocpl J [°C] (fix)	Thermocpl (nc) J [°C] (fix)
Thermocpl K [°C] (fix)	Thermocpl (nc) K [°C] (fix)
Thermocpl L [°C] (fix)	Thermocpl (nc) L [°C] (fix)
Thermocpl J [°F] (fix)	Thermocpl (nc) J [°F] (fix)
Thermocpl K [°F] (fix)	Thermocpl (nc) K [°F] (fix)
Thermocpl L [°F] (fix)	Thermocpl (nc) L [°F] (fix)

Note: “nc” means “not cold junction compensation (by external sensor). In this case is used internal temperature sensor on the PCB

CAN Address

CAN 1 address is set by following procedure:

1. Press Address button during IS-AIN8 power supply on to switch to addressing mode.
2. Then repeatedly press or keep pressed address button to adjust required address according to controller configuration.
3. After setting requested address, release the buttons and wait until the digits blink – it indicates writing of the change address to EEPROM memory.

	CAN 1 Address
1. IS-AIN8	1
2. IS-AIN8	2
3. IS-AIN8	3
4. IS-AIN8	4
5. IS-AIN8	5
6. IS-AIN8	6
7. IS-AIN8	7
8. IS-AIN8	8
9. IS-AIN8	9
10. IS-AIN8	0

Table 7.4 Table of recommended CAN1 address setting

SW version check

Let suppose IS-AIN8 of SW version 1.4. Shortly press address button. Following sequence appears on the display: number “1”, one second pause, number “4”, two second pause, number “1”, one second pause, number “4”, two second pause and finally IS-AIN8 actual address. Error message (e.g. SD BOUT2) appears on Controller screen when Binary input or output Address x is configured but corresponding unit is not recognized (no message is received from CAN bus). Check IS configuration and corresponding external IS-AIN8, IS-BIN8/16 unit address setting.

LED indication

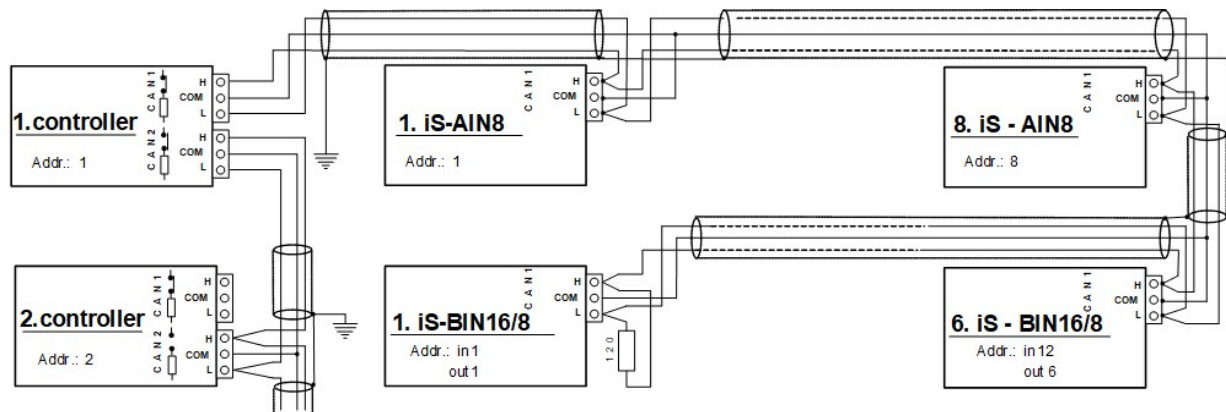
Power LED		Address LDD	
Lighting	Blink	Lighting	Blink
Power supply and CAN address are with no problems	CAN1 address is adjusted different in IS-AIN8 and in controller	Displaying current CAN1 address	Displaying current SW version

Table 7.5 LED / LDD status

Tx		Rx	
Lighting	Blink	Lighting	Blink
Any data are transmitted on the CAN1 line	Data are transmitted on the CAN1 line	Any data are received on the CAN1 line	Data are received on the CAN1 line

Table 7.6 Tx/Rx LED status

Wiring



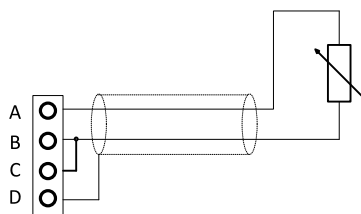
Note: CAN bus line has to be terminated by 120 Ω resistors on the both ends.

For longer distances is recommended to connect CAN COM terminals between all controllers and cable shielding to the **ground in one point!** External units can be connected on the CAN bus line in any order, but line arrangement (no tails no star) is necessary.

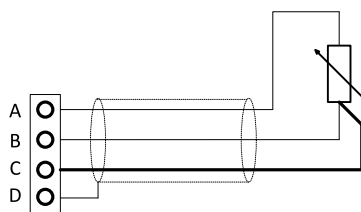
Recommended CAN bus data cables see in Chapter Technical data.

IG-MU and IG-IB units are connected to CONTROLLER CAN2 bus.

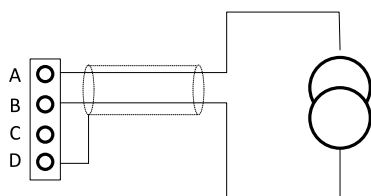
Select sensor characteristic from the list or define user sensor characteristic in PC configuration tool.



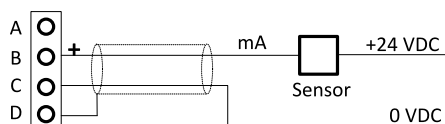
- > Resistor sensor input – two wire connection.
- > Range 0 to 2400 Ω .
- > Pt100, Pt1000, Ni100, Ni1000
- > D terminal is shielding



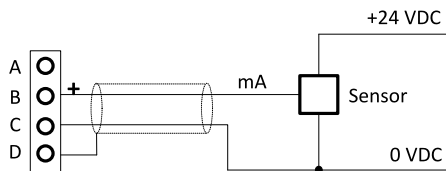
- > Resistor sensor input – three wire connection.
- > Range 0 to 2400 Ω .
- > Pt100, Pt1000, Ni100, Ni1000 – recommended.
- > D terminal is shielding



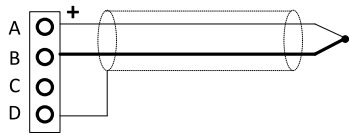
- > Passive current sensor (current source is in IS-AIN8)
- > Range 0 to +20 mA or 4 to +0 mA
- > D terminal is shielding



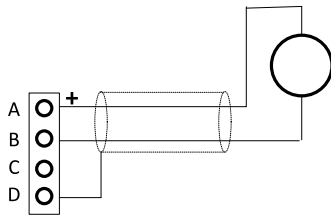
- > Active current sensor (current source is in sensor)
- > Range -20mA to +20 mA or 4 to +20 mA



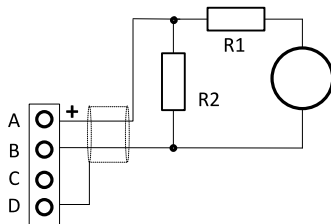
- > D terminal is shielding



- > 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 ± 1000 mV.
- > D terminal is shielding



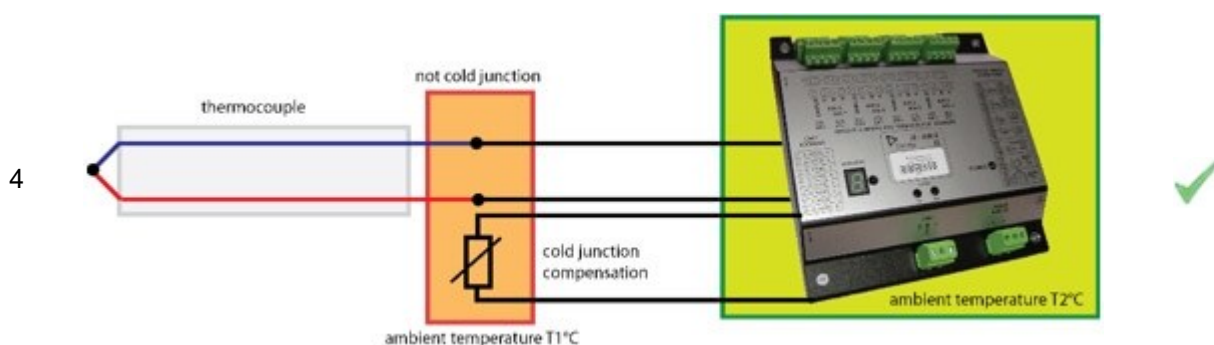
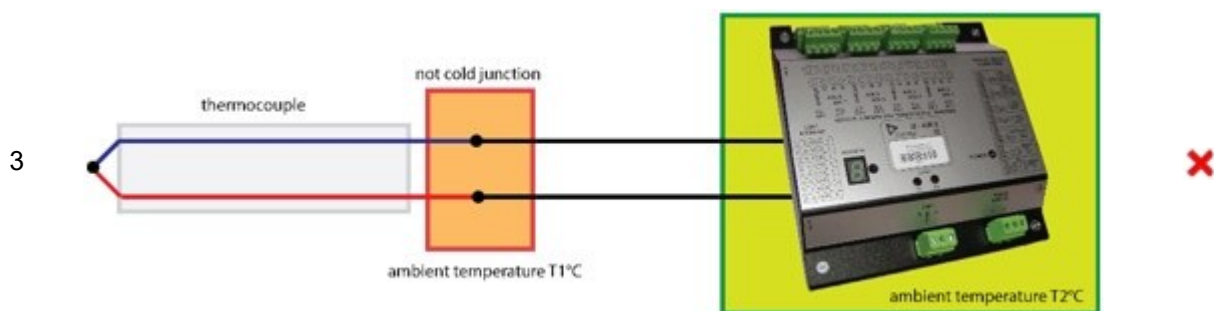
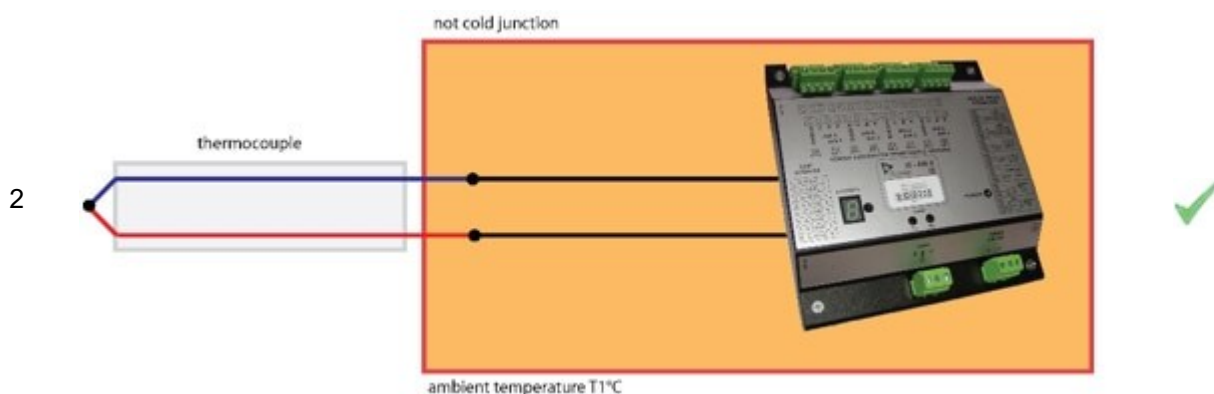
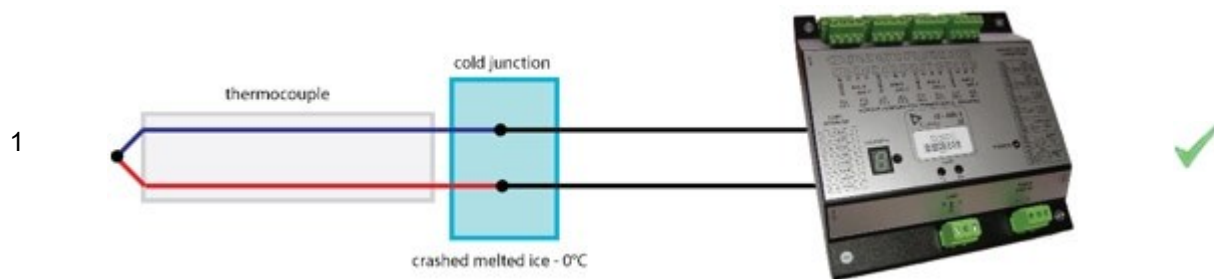
- > For 10 V input voltage range connects external resistors R1, R2 and select sensor characteristic 10 V
- > R1=10 k Ω , R2=2.7 k Ω .
- > D terminal is shielding

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°C. This is very difficult to provide in real application.
- **Example 2** shows the correct temperature measurement. The 3rd metal (the cable between IS-AIN8 and thermocouple) is connected in ambient environment which temperature is not 0°C, but T1°C. Resultant temperature is correct, because is compensated by internal IS-AIN8 temperature sensor. The temperature of IS-AIN8 and junction is the same $T - T1 + T1$ (reduced and compensated by T1).

- **Example 3** shows the incorrect temperature measurement. The 3rd metal (the cable between IS-AIN8 and thermocouple) is connected in ambient environment which temperature is not 0°C, but T1°C. Resultant temperature is T-T1 (reduced by T1). Internal IS-AIN8 compensation should not 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°C, but T1°C. Resultant temperature is correct, because is compensated by external temperature sensor, T+T1 (reduced and compensated by T1).

Cold Junction Compensation (CJC) settings

- **Example 1** is not a practical in regard of ice bath. In this case should any of not compensated (nc) sensors for analog input be selected base on used thermocouple.

Name	Not Used	Sensor	Thermo(nc) J/°C
Dimension	°C	Resolution	Thermocpl K/°F
Bargraph 0%	-32 768	Offset	Thermocpl L/°F
Bargraph 100%		Bargraph 100%	Thermo(nc) J/°C
Functions	Click + to add item	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, cold 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 T1 sensor 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%	Bargraph 100%
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 Temp 1.

- 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 Temp 1.

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

Dimension (W × H × D)	146 × 160 × 46 mm (5.79' × 6.6' × 1.83')
Interface to Controller	CAN1
Analog inputs	8, galvanic separated from power supply, 16 bit *

Power supply	8 to 36 V DC
Current consumption	250 mA at 24 V
Protection front panel	IP20
Humidity	95% without condensation
Storage temperature	-40 °C to +80 °C
Operating temperature	- 30 °C to + 70 °C
Heat radiation	2 W

* each analog input can be software configured to:

		Measuring range		Accuracy
		From	To	
Resistance		0 Ω	2400 Ω	± 0.5 %
		0 Ω	250 Ω	± 1.0 %
Current	Passive	0/4 mA	20 mA	± 0.5 %
	Active	4 mA	20 mA	± 0.5 %
	Active	0 mA	± 20 mA	± 0.5 %
Voltage	Thermocouples J, K, L type			± 0.2 %
		0 mV	100 mV	± 0.2 %
		- 1000 mV	+ 1000 mV	± 0.5 %
		0 mA	2500 mV	± 0.5 %

Standard conformity	
Low Voltage Directive	EN 61010-1:95 +A1:97
Electromagnetic Compatibility	EN 50081-1:94, EN 50081-2:96 EN 50082-1:99, EN 50082-2:97

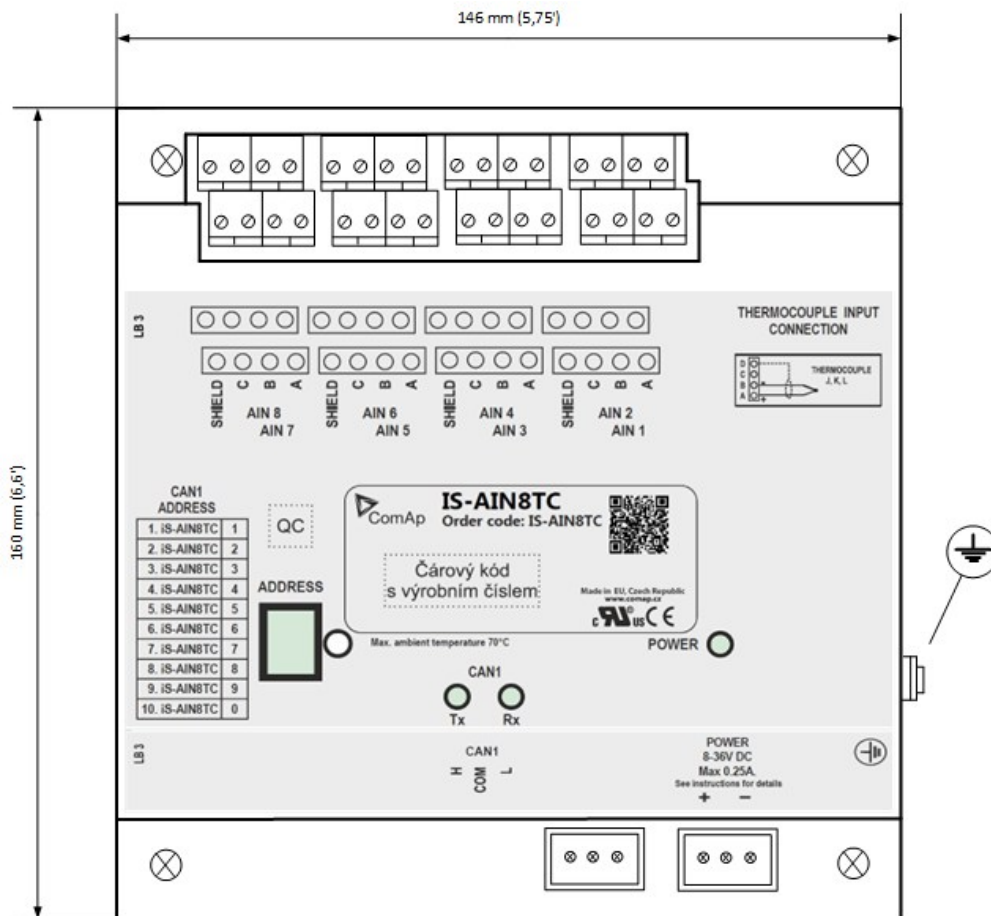
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IS-AIN8TC

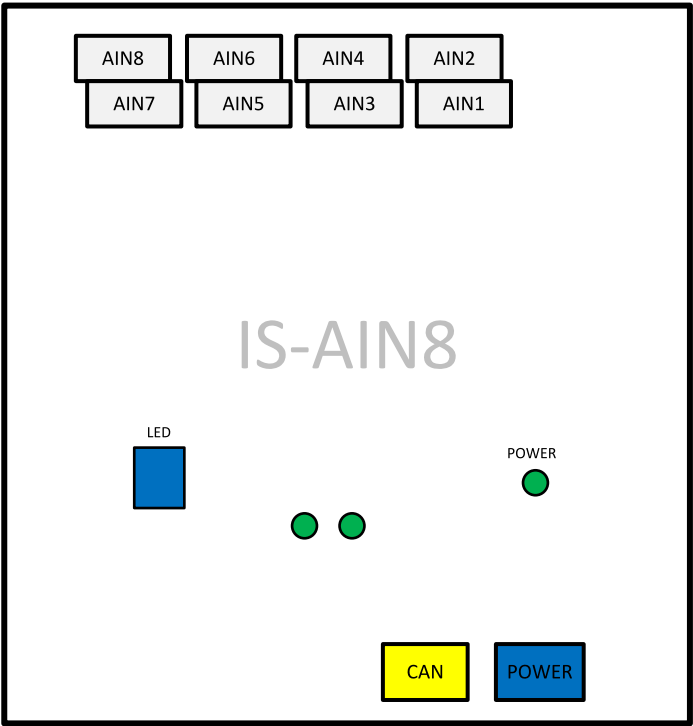
IS-AIN8 is input extension module equipped with 8 analog inputs dedicated for thermocouple sensors only.

All inputs can be configured to any logical function or protection. It is possible to connect up to 10 IS-AIN8TC external units to one controller. IS-AIN8TC is connected to controller **CAN1A (page 18)** bus.

The detection of communication speed is indicated by fast flashing of status LED. Once the speed is detected the module remains set for the speed even when the communication is lost. Renewal of communication speed detection is done by reset of the module.



Terminals



AIN1 – AIN8	8 analog inputs
CAN	CAN1 line
POWER	Power supply
POWER	State indication
Rx, Tx	Data transmitted and received on CAN1 line
LDD	CAN1 address

Supported sensors

Sensors	
Thermocpl J [°C] (fix)	Thermocpl (nc) J [°C] (fix)
Thermocpl K [°C] (fix)	Thermocpl (nc) K [°C] (fix)
Thermocpl L [°C] (fix)	Thermocpl (nc) L [°C] (fix)
Thermocpl J [°F] (fix)	Thermocpl (nc) J [°F] (fix)
Thermocpl K [°F] (fix)	Thermocpl (nc) K [°F] (fix)
Thermocpl L [°F] (fix)	Thermocpl (nc) L [°F] (fix)

Note: “nc” means “not cold junction compensation (by external sensor). In this case is used internal temperature sensor on the PCB

CAN Address

CAN1 address is set by following procedure:

1. Press Address button during IS-AIN8TC power supply on to switch to addressing mode.
2. Then repeatedly press or keep pressed address button to adjust required address according to controller configuration.
3. After setting requested address, release the buttons and wait until the digits blink – it indicates writing of the change address to EEPROM memory.

	CAN11 Address
1. IS-AIN8TC	1
2. IS-AIN8TC	2
3. IS-AIN8TC	3
4. IS-AIN8TC	4
5. IS-AIN8TC	5
6. IS-AIN8TC	6
7. IS-AIN8TC	7
8. IS-AIN8TC	8
9. IS-AIN8TC	9
10. IS-AIN8TC	0

Table 7.7 Table of recommended CAN1 address setting

SW version check

Shortly press address button. Following sequence appears on the display: number “1”, one second pause, number “4”, two second pause, number “1”, one second pause, number “4”, two second pause and finally IS-AIN8TC actual address.

Error message (e.g. SD BOUT2) appears on Controller screen when Binary input or output Address x is configured but corresponding unit is not recognized (no message is received from CAN bus). Check IS configuration and corresponding external IS-AIN8TC, IS-BIN8/16 unit address setting.

LED indication

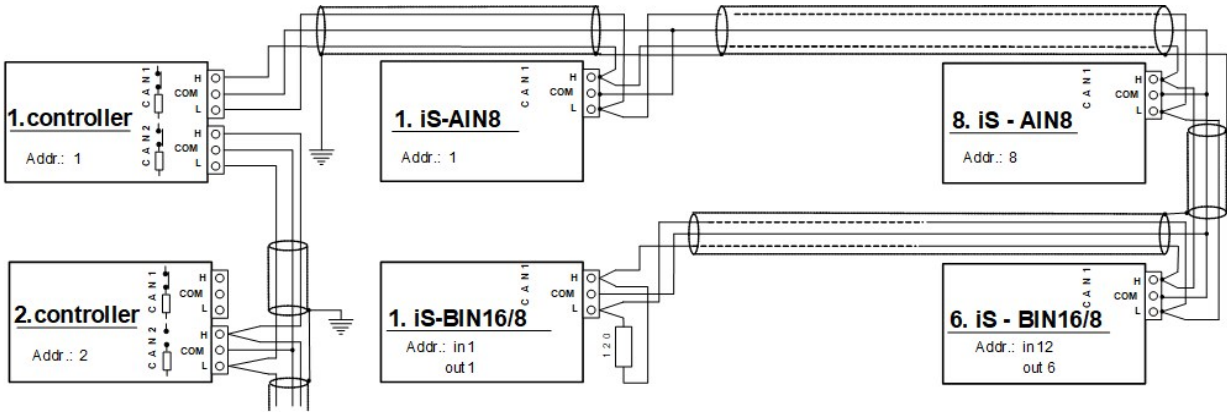
Power LED		Address LDD	
Lighting	Blink	Lighting	Blink
Power supply and CAN address are with no problems	CAN1 address is adjusted different in IS-AIN8TC and in controller	Displaying current CAN1 address	Displaying current SW version

Table 7.8 LED/LDD status

Tx		Rx	
Dark	Blink	Dark	Blink
Any data are transmitted on the CAN1 line	Data are transmitted on the CAN1 line	Any data are received on the CAN1 line	Data are received on the CAN1 line

Table 7.9 Tx/Rx LED status

Wiring



Note: CAN bus line has to be terminated by 120 ohm resistors on the both ends.
For longer distances is recommended to connect CAN COM terminals between all controllers and cable shielding to the **ground in one point!**
External units can be connected on the CAN bus line in any order, but line arrangement (no tails no star) is necessary.
Recommended CAN bus data cables see in Chapter Technical data.
IG-MU and IG-IB units are connected to CONTROLLER CAN2 bus.

Select sensor characteristic from the list or define user sensor characteristic in PC configuration tool.

Thermocouple J, K, L, D terminal is shielding

Cold Junction Compensation (CJC) settings

Please have a look at **Cold Junction Compensation (CJC)** (page 818) iS-AIN8 chapter.

Technical data

Dimension (W × H × D)	110 × 110 × 46 mm (4.3" × 4.3" × 1.8")
Weight	237.5 grams
Interface to controller	CAN1

Analog inputs (not electric separated)	8, no galvanic separated
Measuring	±100 mV
Accuracy	± 0.1 % of actual value + ± 100 µV (± 3 °C)

Internal sensor for measuring cold junction - Accuracy	±1 °C in temperature range -20 °C ÷ +70 °C
Galvanic separation	CANbus is galvanic separated from the measurement and power supply. All analog inputs are galvanic separated from power supply. Analog inputs are not galvanic separated between channels

Power supply	8 to 36 V DC
Protection	IP20
Current consumption	35 mA at 24 V ÷ 100 mA at 8 V
Storage temperature	-40 °C to +80 °C
Operating temperature	- 30 °C to + 70 °C
Heat radiation	2 W

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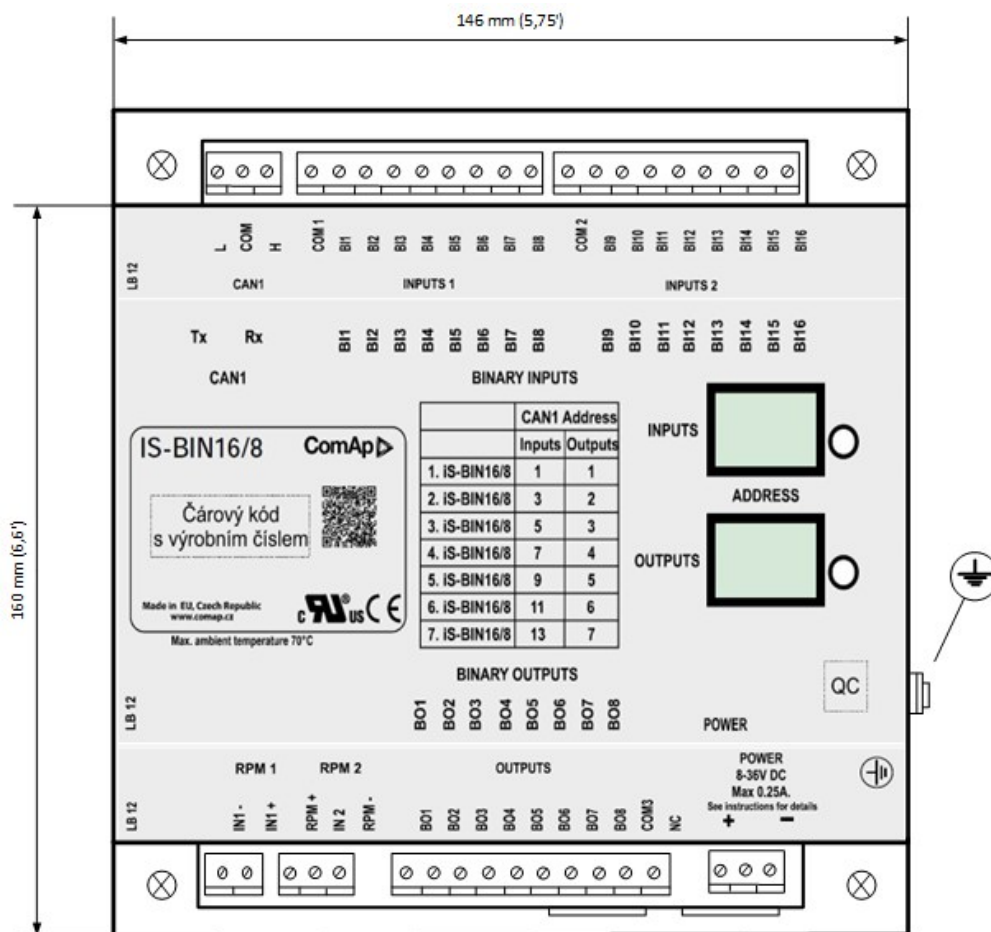
IS-BIN16/8

IS-BIN16/8 is an extension module with 16 binary inputs (galvanic separated) and 8 binary output (galvanic separated), 2 pulse inputs (frequency measurement or pulse counting). All I/O can be configured to any logical function or protection. It is possible to connect up to 7 IS-BIN16/8 external units to one controller. External modules IS-BIN16/8 is connected to controller **CAN1A (page 18)** bus. To operate external modules:

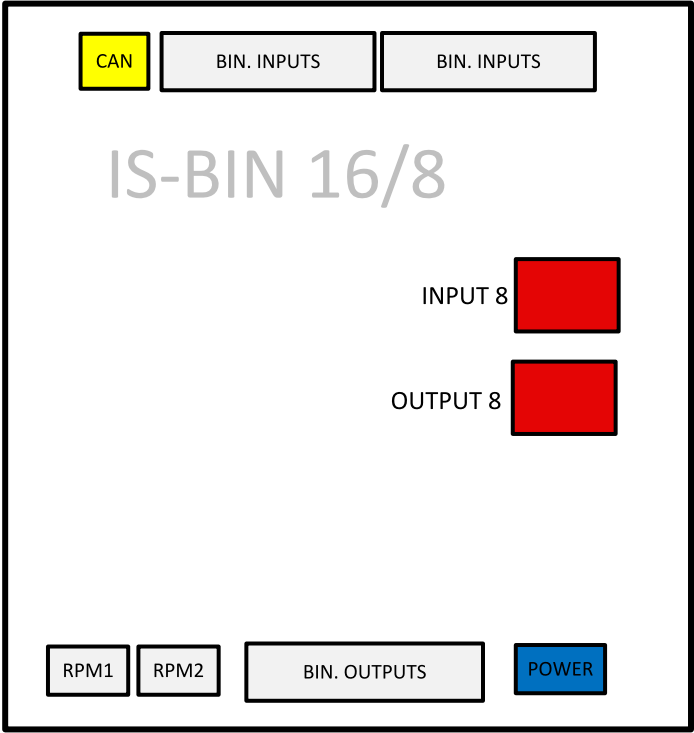
- Connect all external modules to CAN1 bus line
- On each module adjust I/O CAN1 address in the range of 1 to 7 for IS-BIN16/8 output, 1,3,5,7,9,11,13 for IS-BIN18/8 inputs
- In case of use generic module in configuration you can set CAN address from 1 – 12
- In case of set 0 CAN address - inputs/ outputs are deactivated
- Input output address is displayed on the front panel LCD's
- Use PC configuration tool to configure controller according external modules setting

IS-BIN16/8 module has two separate CAN1 addresses for binary inputs Group 1, Group 2 and binary output Group (total three addresses). The CAN1 address for BI Group 1 and for BO Group 2 can be adjusted on the IS-BIN16/8. The address for BI Group 2 is set automatically to the address following BI Group 1.

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



Terminals



CAN	CAN1 line
BINARY INPUTS	16 binary inputs
BINARY OUTPUT	8 binary output
RPM1, RPM2	2 frequency inputs
POWER	Power supply
INPUTS	LDD CAN address
OUTPUT	LDD CAN address

CAN Address

CAN 1 address is setting by following procedure:

- Press Address buttons (for INPUTS address and OUTPUT address) during IS-BIN8 power supply on to switch to addressing mode.
- Then repeatedly press or keep pressed address button to adjust required address according to CONTROLLER configuration.
- After setting requested address, release the buttons and wait until the digits blink – it indicates write the changed address to EEPROM memory.

	CAN 1 Address	
	Inputs	Output
1. IS-BIN16/8	1	1
2. IS-BIN16/8	3	2
3. IS-BIN16/8	5	3

4. IS-BIN16/8	7	4
5. IS-BIN16/8	9	5
6. IS-BIN16/8	11	6
7. IS-BIN16/8	16	7

Table 7.10 Table of recommended CAN1 address setting

SW version check

Let suppose IS-AIN8 of SW version 1.4. Shortly press address button. Following sequence appears on the display: number “1”, one second pause, number “4”, two second pause, number “1”, one second pause, number “4”, two second pause and finally IS-AIN8 actual address.

Error message (e.g. SD BOUT2) appears on Controller screen when Binary input or output Address x is configured but corresponding unit is not recognized (no message is received from CAN bus). Check IS configuration and corresponding external IS-AIN, IS-BIN unit address setting.

LED indication

Tx			Rx		
Dark	Blink	Light	Dark	Blink	Light
Any data are transmitted on the CAN1 line	Data are transmitted on the CAN1 line		Any data are received on the CAN1 line	Data are received on the CAN1 line	

Table 7.11 Tx / Rx LED status

Wiring

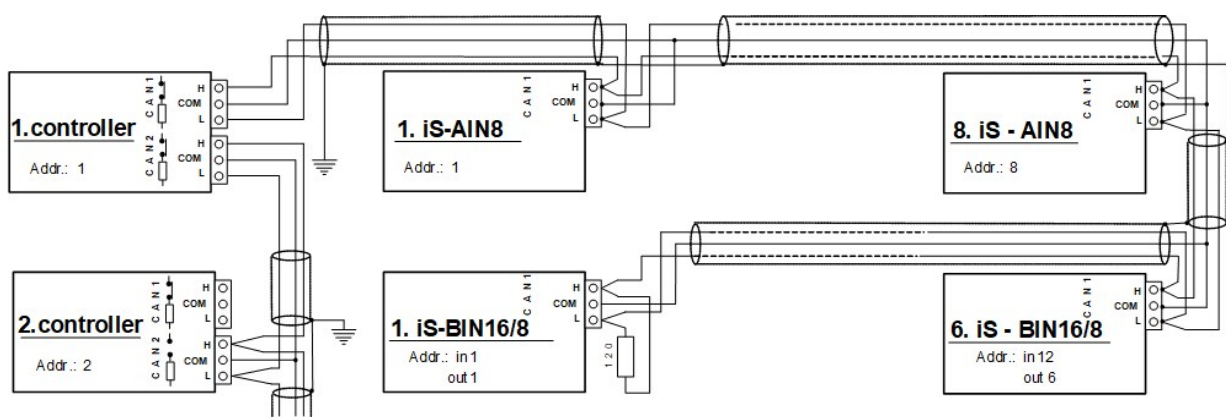


Image 7.61 CAN bus line has to be terminated by 120 ohm resistors on the both ends.

Note: CAN bus line has to be terminated by 120 ohm resistors on the both ends.

For longer distances is recommended to connect CAN COM terminals between all controllers and cable shielding to the **ground in one point!**

Recommended CAN bus data cables see in Chapter Technical data.

External units can be connected on the CAN bus line in any order, but line arrangement (no tails no star) is necessary-

Recommended CAN bus data cables see in Chapter Technical data.

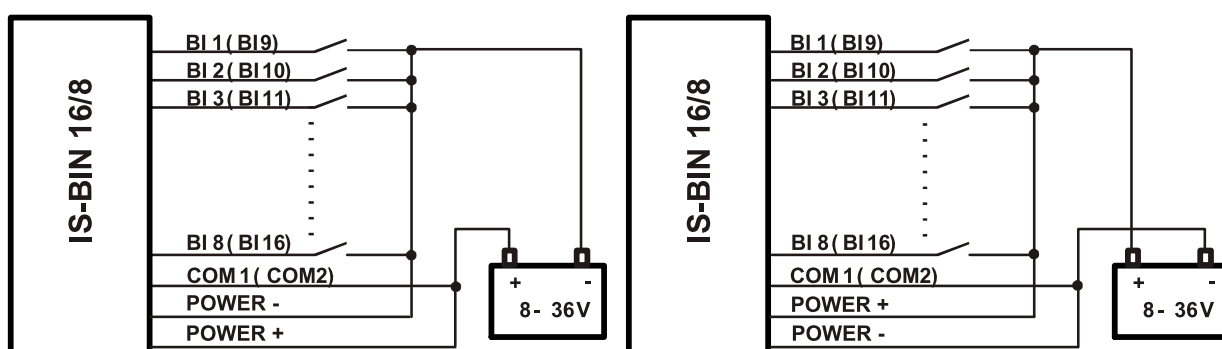
Binary inputs

There are two groups of eight Binary inputs BI1 to BI8 and BI9 to BI16. Each group has a separate Common terminal COM1 and COM2. The Common terminal can be connected to positive or negative pole – see following drawing. Binary inputs are galvanically separated from IS-BIN16/8 power supply.

Note: See the *Theory of binary inputs and outputs (page 773)* (Pull Up, Pull Down, High side switch, Low side switch).

Binary inputs Common terminal is connected to **positive** supply terminal, Binary inputs contacts are closed to **negative** supply terminals.

Binary inputs common terminal is connected to **negative** supply terminal, Binary inputs contacts are closed to **positive** supply terminals.



Input voltage range for opened contact is from 8 VDC to Power supply VDC. Input voltage range for closed contact is from 0 to 2 VDC. Voltage level is defined between Binary input and Binary input COM terminal and does not depend on “positive” or “negative” connection.

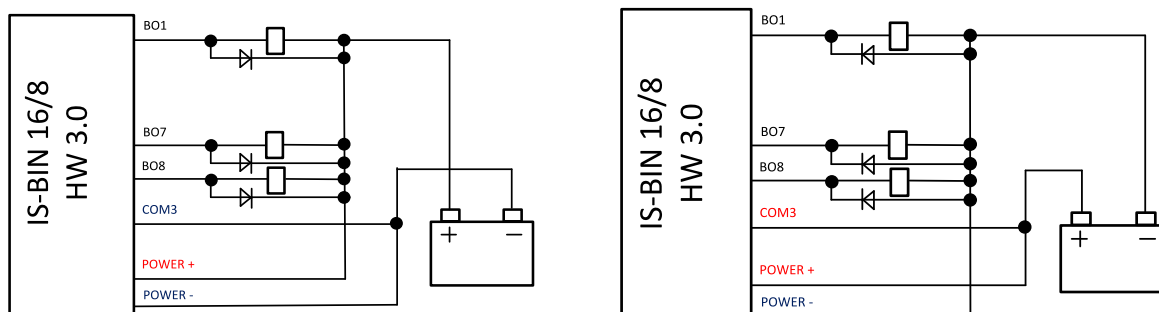
IMPORTANT: Impulse inputs are not supported by the controller.

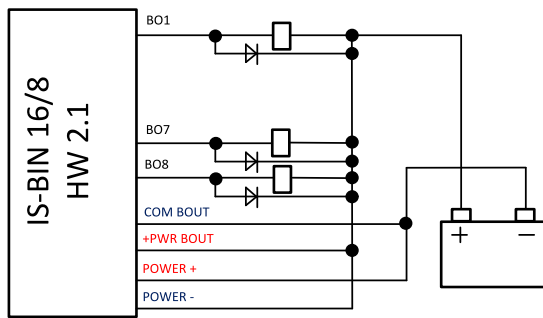
Binary output

The Common terminal can be connected to positive or negative pole (HW3.0 only) – see following drawing. Binary outputs are galvanic separated from IS-BIN16/8 power supply (have a look at technical data). The maximum load values are 0.5 A / 36V for one output.

Binary output common terminal is connected to **negative** supply terminal, Binary output contacts are closed to **positive** supply terminals.

Binary output common terminal is connected to **positive** supply terminal, Binary output contacts are closed to **negative** supply terminals.





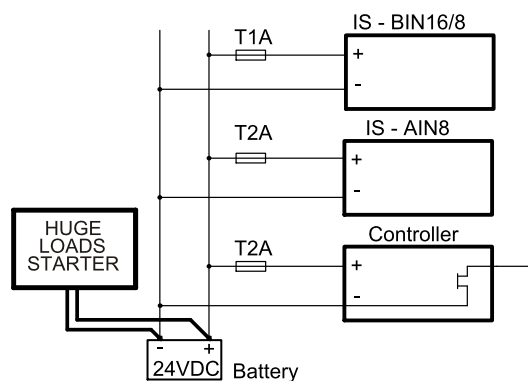
Power supply fusing

A (2) respectively (1) amp fuse should be connected in-line with the power to the controller and modules, these items should never be connected directly to the starting battery.

Take care for proper controller, extension units and relays power supply fusing. Fuse value and type depends on number of connected devices and wire length.

Controller or unit	Fuse
Controller	T1A or T2A
IS-AIN8	T2A
IS-BIN16/8	T1A

Table 7.12 Recommended fuse (not fast) types



For more extension units use separate fusing according to the table above.

Controller power supply should never be connected to starter terminals.

Technical data

Dimension (W × H × D)	146 × 160 × 46 mm (5.79' × 6.6' × 1.83')
Interface to controller	CAN1
Binary inputs (galvanic separated) <i>Voltage level is defined between binary input and binary input COM terminal</i>	
Number of inputs	8 + 8
Input resistance	3000 Ω

Input voltage range	0-36 VDC
Input voltage level for open contact	8 to Power supply VDC
Input voltage level for close contact	0 to 2 VDC

Frequency inputs* (for IS-CU only)	
RPM1	
Type of sensor	Magnetic pick-up
Minimum input voltage	2 Vpk-pk (from 4 Hz to 4 kHz)
Maximum input voltage	50 Veff
Maximum measured frequency	8 kHz (min. input voltage 6Vpk-pk), frequency mode
RPM2	
Type of sensor	Contact or Active sensor
Minimal pulse width	10 ms, integration mode
Maximum measured frequency	60 Hz, integration mode

Relays outputs (<i>galvanic separated</i>) only HW 3.0 (<i>non galvanic separated</i>) HW 2.1	
Number of output	8
Maximum current	0.5A DC
Maximum switching voltage	36 VDC

Power supply	8 to 36 V DC
Protection front panel	IP20
Current consumption	250 mA** at 24 V
Humidity	95% without condensation
Storage temperature	-40 °C to +80 °C
Operating temperature	- 30 °C to + 70 °C
Heat radiation	2 W

Standard conformity	
Number of output	8
Low Voltage Directive	EN 61010-1:95 +A1:97
Electromagnetic Compatibility	EN 50081-1:94, EN 50081-2:96 EN 50082-1:99, EN 50082-2:97

*RPM1, RPM2 are available in IS-CU only

**During powering up current can be up to 1.5A

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